National River Flow Archive | UK Centre for Ecology & Hydrology

# National River Flow Archive

UK Centre for Ecology & Hydrology

# NRFA PEAK FLOW DATASET VERSION 13

Note on changes from v12.1

VERSION: 2.0

STATUS: FINAL

DATE: AUGUST 2024

AUTHOR: STEPHEN TURNER, CATHERINE SEFTON, GAYATRI SUMAN, AMIT KUMAR, OLIVER SWAIN, RAFAEL BARBEDO, RICHARD SMITH, ADAM GRIFFIN, HADUSH MERESA, GIANNI VESUVIANO

## DOCUMENT VERSION CONTROL

| Version | Date | Author | Description |
|---|---|---|---|
| 1.0 | 05 AUGUST 2024 | STEPHEN TURNER, CATHERINE SEFTON, GAYATRI SUMAN, AMIT KUMAR, OLIVER SWAIN, RAFAEL BARBEDO, RICHARD SMITH, ADAM GRIFFIN, HADUSH MERESA, GIANNI VESUVIANO | First draft of note on changes from v12.1. |
| 1.1 | 14 AUGUST 2024 | As above. | Second draft of note on changes from v12.1, including FEH analysis of impact of data changes between v12.1 and v13, and other updates following external review. |
| 1.2 | 15 AUGUST 2024 | As above. | Third draft of note on changes from v12.1, including additional figures on changes in record length and size of pooling groups between v12.1 and v13, and other presentational updates following external review. |
| 2.0 | 21 AUGUST 2024 | As above. | Final release note for v13 of the NRFA Peak Flow Dataset. |

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# 1 INTRODUCTION

Version 13 of the NRFA Peak Flows Dataset contains AMAX and POT data for 921 gauging stations, of which 617 are in England, 174 are in Scotland, 92 are in Wales and 38 are in Northern Ireland. A total of 543 stations are recommended for use in pooling groups ('Suitable for Pooling'), 354 stations are 'Suitable for QMED' and 24 stations are 'Suitable for Neither'.

## 1.1 Content of Version 13

This V13 release contains the following updates:

- Network changes
- An additional water year of data (updated to 30th September 2023) for all active peak flow stations in the UK
- Full Period of Record Review for a subset of stations in the dataset (98 stations across the UK)
- Modifications to existing time series
- Amendments to FEH Catchment Descriptors

The V13 release note also includes:

- Impact of the data changes (extended in V13)

## 1.2 Version 13 Data Files

There are two versions of data files that accompany version 13 NRFA Peak Flows Dataset. Please note that the flow data within each file version is identical. The two file versions contain different elements for use with existing and future versions of the statistical methods, as applied within the WINFAP software.

1) Version 13.0.2 is for use with WINFAP 5.1 or below. The format of this version is identical to previous NRFA Peak Flow Dataset files.
2) Version 13.0.3 is for use with WINFAP 5.2 and future versions. The files will become available on the NRFA Website when WINFAP 5.2 is released. The changes to these files include:
    a) Timestamps are added to the .AM and .PT files – this will resolve issues with events on 1st October being assigned to the wrong water year and the subsequent year being rejected erroneously.
    b) Flow values consistently rounded to 3 decimal places.
    c) Adding the IHDTM easting and northing.
    d) Addition of the station name to the file names.

All improvements are aimed at enhancing the utility of the data files provided in the NRFA Peak Flow Dataset and we encourage users to download new versions of WINFAP when released.

# 2 NETWORK CHANGES

A number of changes have been made to the gauging stations for which peak flow data are held on the NRFA since the release of version 12.1. Key changes are noted in this section.

## 2.1 Removal of Gauging Stations

Eight stations have been removed from the dataset, listed in Table 1. Daily flows are still held on the NRFA where indicated although peak flow data will no longer be available on the website.

**Table 1:** Stations removed from the dataset in version 13.

| Station Number | Station Name | Measuring Authority | NRFA daily flow station | Suitability | Comment |
|---|---|---|---|---|---|
| **32029** | Flore at Experimental Catchment | EA-LN | Yes | QMED | No confidence in data and lack of further information on historical site. |
| **36005** | Brett at Hadleigh | EA-EA | Yes | Pooling | Uncertainty related to non-modularity mean there is limited confidence in high flows. |
| **55009** | Monnow at Kentchurch | NRW | Yes | Neither | No confidence in high flows and FEH Neither station. |
| **56019** | Ebbw at Aberbeeg | NRW | Yes | Neither | No confidence in high flows and FEH Neither station. |
| **60005** | Bran at Llandovery | NRW | Yes | Neither | No confidence in high flows and FEH Neither station. |
| **61003** | Gwaun at Cilrhedyn Bridge | NRW | Yes | Neither | No confidence in high flows and FEH Neither station. |
| **69011** | Micker Brook at Cheadle | EA-GMMC | No | QMED | No confidence in high flows because persistent debris limits validation of stage data. |
| **84025** | Luggie Water at Oxgang | SEPA-SW | Yes | QMED | No confidence in high flows due to diverging rating extrapolation from available gaugings. |

## 2.2 Addition of Gauging Stations

12 stations have been added to the dataset in version 13, listed in Table 2.

**Table 2:** Stations added to the dataset in version 13.

| Station Number | Station Name | Measuring Authority | NRFA daily flow station | Suitability | Comment |
|---|---|---|---|---|---|
| **7009** | Mosset Burn at Wardend Bridge | SEPA-NW | Yes | Pooling | Good confidence in flood estimation due to weir and vertical concrete banks, informed by fixed acoustic measurements. |
| **7012** | Lossie at Ballachraggan | SEPA-NW | Yes | Pooling | Hydraulic modelling proves confidence in flood estimation above gaugings. |
| **9005** | Allt Deveron at Cabrach | SEPA-NW | Yes | Pooling | Good confidence in flood estimation, informed by gaugings, and weir provides a stable control and simple rating history. |
| **14002** | Dighty Water at Balmossie Mill | SEPA-NE | Yes | QMED | Good performing station at high flows, most flows contained. |
| **15025** | Ericht at Craighall | SEPA-NE | Yes | Pooling | Good performing station at high flows, all flows contained. |
| **19014** | Brox Burn at Newliston | SEPA-SE | Yes | Pooling | Good performing station at high flows, all flows contained. |
| **21014** | Tweed at Kingledores | SEPA-SE | Yes | QMED | Most flows contained, some higher events spill onto floodplain. |
| **26015** | Driffield Canal at Wansford Bridge | EA-Y | Yes | Pooling | Replacement for 26010 Driffield Canal at Snakeholme Lock. |
| **28035** | Leen at Triumph Road Nottingham | EA-EM | Yes | Pooling | Good performing station at high flows, all flows contained. |
| **63002** | Rheidol at Llanbadarn Fawr | NRW | Yes | QMED | Station improved following bank stabilisation works leading to good performance. |
| **64010** | Mawddach at Tyddyn Gwladys | NRW | Yes | QMED | Following rating review, station is deemed suitable to be added to the Peak Flow Dataset. |
| **69045** | Bollin at Bollington Mill Total | EA-GMMC | Yes | Pooling | Replacement for 69006 Bollin at Dunham Massey. |

## 2.3 Reopening of Gauging Stations

One station has been reopened in version 13, listed in Table 3.

**Table 3:** Gauging stations reopened in version 13.

| Station Number | Station Name | Measuring Authority | NRFA daily flow station | Suitability | Comment |
|---|---|---|---|---|---|
| **54111** | Avon at Rugby | EA-WM | Yes | Pooling | Flow processing re-established at the site from 01/04/2012. |

## 2.4 Closure of Gauging Stations

Five stations have been closed in version 13, listed in Table 4. Previously recorded flow data for these stations are still contained in the dataset and shown on the NRFA website, but there will be no further updates in future.

**Table 4:** Gauging stations closed in version 13.

| Station Number | Station Name | Measuring Authority | NRFA daily flow station | Suitability | Comment |
|---|---|---|---|---|---|
| **39019** | Lambourn at Shaw | EA-T | Yes | Pooling | Station closed on 05/11/2019 due to removal of the weir. Replaced by ultrasonic gauge in similar location – to be added to a future version of the dataset. |
| **43012** | Wylye at Norton Basant | EA-WX | Yes | Pooling | Station closed on 18/07/2024 due to modification of weir structure to aid fish passage. Replaced by ultrasonic gauge in similar location – to be added to a future version of the dataset. |
| **66004** | Wheeler at Bodfari | NRW | Yes | QMED | Station closed on 14/07/2023 due to landowner issues. |
| **69006** | Bollin at Dunham Massey | EA-GMMC | Yes | QMED | Station closed on 09/01/2002 and replaced by 69045 Bollin at Bollington Mill (added in v13 – see Section 2.2). |
| **71003** | Croasdale Beck at Croasdale Flume | EA-CL | Yes | Pooling | Station closed on 01/10/2014 due to issues with gravel accumulation. |

## 2.5 Changes to Station Numbers

One station number has changed in version 13 in Wales, shown in Table 5.

**Table 5:** Stations with changes to station numbers in version 13.

| Station Number | Station Name | Measuring Authority | Old Number | New Number |
|---|---|---|---|---|
| **59004** | Twrch at Gurnos | NRW | 59003 | 59004 |

## 2.6 Changes to FEH Indicative Suitabilities

Indicative suitabilities have changed at 19 stations, ten in Scotland, four in England, three in Northern Ireland and two in Wales, shown in Table 6. Four stations have been upgraded whilst 15 stations have been downgraded.

**Table 6:** Stations with changes to indicative suitability in version 13.

| Station Number | Station Name | Measuring Authority | V12.1 Suitability | V13 Suitability | Upgrade (↑) / Downgrade (↓) - Reason |
|---|---|---|---|---|---|
| **8008** | Tromie at Tromie Bridge | SEPA-NW | Pooling | QMED | ↓ - Low confidence in calibration above QMED. |
| **13001** | Bervie at Inverbervie | SEPA-NE | Pooling | QMED | ↓ - Low confidence in calibration above QMED. |
| **21003** | Tweed at Peebles | SEPA-SE | Pooling | QMED | ↓ - Flood plain segment at the current station is underestimating the highest events. |
| **28060** | Dover Beck at Lowdham | EA-EM | Pooling | Neither | ↓ - Structure may be drowning more often, compared to historically. Few gaugings to inform to what extent. |
| **40018** | Darent at Lullingstone | EA-KSL | QMED | Pooling | ↑ - New gaugings and revised rating brings greater confidence in flows. |
| **65007** | Dwyfor at Garndolbenmaen | NRW | QMED | Neither | ↓ - Not gauged up to QMED, uncertainties in whether the weir goes non-modular before QMED, and although bypassing occurs the level at which this begins is unknown. |
| **67010** | Gelyn at Cynefail | NRW | QMED | Neither | ↓ - Not gauged up to QMED and bypassing has been observed below QMED. |
| **68001** | Weaver at Ashbrook | EA-GMMC | QMED | Pooling | ↑ - Suitable for Pooling due to gaugings above QMED and most AMAX contained. |
| **68005** | Weaver at Audlem | EA-GMMC | QMED | Pooling | ↑ - Suitable for Pooling due to gaugings above QMED that show the rating performs well out-of-bank. |
| **77003** | Liddel Water at Rowanburnfoot | SEPA-SW | QMED | Neither | ↓ - Temporary downgrade due to discontinuity in flow series reflecting issues with calibration. |
| **78005** | Kinnel Water at Bridgemuir | SEPA-SW | Pooling | QMED | ↓ - Rating doesn't consider the floodplain flow. |
| **92002** | Allt Coire nan Con at Polloch | SEPA-NW | QMED | Pooling | ↑ - New gaugings bring greater confidence in flows. |
| **93001** | Carron at New Kelso | SEPA-NW | Pooling | QMED | ↓ - Low confidence in calibration above QMED. |
| **96001** | Halladale at Halladale | SEPA-NW | Pooling | QMED | ↓ - Low confidence in calibration above QMED. |
| **96003** | Strathy at Strathy Bridge | SEPA-NW | Pooling | QMED | ↓ - Low confidence in calibration above QMED. |
| **96004** | Strathmore at Allnabad | SEPA-NW | Pooling | QMED | ↓ - Low confidence in calibration above QMED. |
| **201007** | Burn Dennet at Burndennet | DfIR | Pooling | Neither | ↓ - Temporary downgrade until rating is revised and contradictory bankfull heights are investigated. |

| Station Number | Station Name | Measuring Authority | V12.1 Suitability | V13 Suitability | Upgrade (↑) / Downgrade (↓) - Reason |
|---|---|---|---|---|---|
| **203033** | Upper Bann at Bannfield | DfIR | Pooling | QMED | ↓ - Unaccounted floodplain flow above QMED. |
| **203043** | Oonawater at Shanmoy | DfIR | Pooling | QMED | ↓ - Unaccounted floodplain flow above QMED. |

## 2.7 Component Stations

At several gauging stations, flows are derived from measurements taken at more than one location (for example low flows may be measured at a weir and high flows measured at a gauged section a short distance up/downstream). There are several such stations around the UK that the NRFA and/or Measuring Authority treat as a combined station.

No changes have been made to the composition of these gauging stations since v4.1, although new component stations may have been added to the dataset since v4.1.

## 2.8 Stations Where No POT Data are Presented

No POT data are presented on the NRFA website or given in the dataset for stations listed in ANNEX 3 .

Stations are usually listed as 'POT excluded' because the gauged catchment response does not lend itself to POT analysis. Such catchments are usually, but not exclusively, those dominated by baseflow and are therefore concentrated on the large chalk aquifers of southern and eastern England.

Four stations were added to the list in version 13, shown in Table 7 and marked with a * in ANNEX 3 .

**Table 7** Stations which have been made POT Excluded in version 13.

| Station Number | Station Name | Measuring Authority |
|---|---|---|
| **26015** | Driffield Canal at Wansford Bridge | EA-Y |
| **28060** | Dover Beck at Lowdham | EA-EM |
| **64010** | Mawddach at Tyddyn Gwladys | NRW |
| **69045** | Bollin at Bollington Mill Total | EA-GMMC |

## 2.9 Trends in AMAX Timeseries

Identification and interpretation of trends in observed time series are a necessary foundation for the development of appropriate water policy and management responses to climate-driven change.

The trend analysis has been undertaken on the version 13 data following the Hannaford et al, 2021 methodology. There is more information about the trend analysis methodology on the NRFA Website.

Practitioners should **not** change their process because of this alone but instead should consult any guidance issued by the Measuring Authority for the region they are working in:

- England – Environment Agency: Guidance around non-stationary analysis is provided in the Flood Estimation Guidelines (LIT 11832), latest version published 23/12/2022. The Environment Agency National Flood Hydrology team released guidance on the use of trend information in WINFAP 5.1 in September 2023 and this is available on request from FloodHydrology@environment-agency.gov.uk.
- Wales – Natural Resources Wales
- Scotland – Scottish Environment Protection Agency
- Northern Ireland – Department for Infrastructure – Rivers

Mann-Kendall scores and significance of trends are presented in the WINFAP files as an **indication** of whether a trend is present (or not) in the AMAX timeseries and are calculated on the full period-of-record available for each individual gauging station excluding rejected years and/or unrepresentative periods. Stations are eligible for trend analysis where at least 27 valid AMAX values were available and 10% or less of AMAX values were missing during that period.

Table 8 shows a comparison of the number of stations eligible for trend analysis and the change in significant positive and negative trends (5% level) between this version and the previous one, and Figure 1 shows the results of the trend analysis.

**Table 8** Comparison of trend tests between version 12.1 and version 13.

| Version | No. of Stations Included | % of stations with significant positive trends (5% level) | % of stations with significant negative trends (5% level) |
|---|---|---|---|
| **12.1** | 707 | 21.07 | 3.25 |
| **13** | 723 | 20.75 | 3.32 |

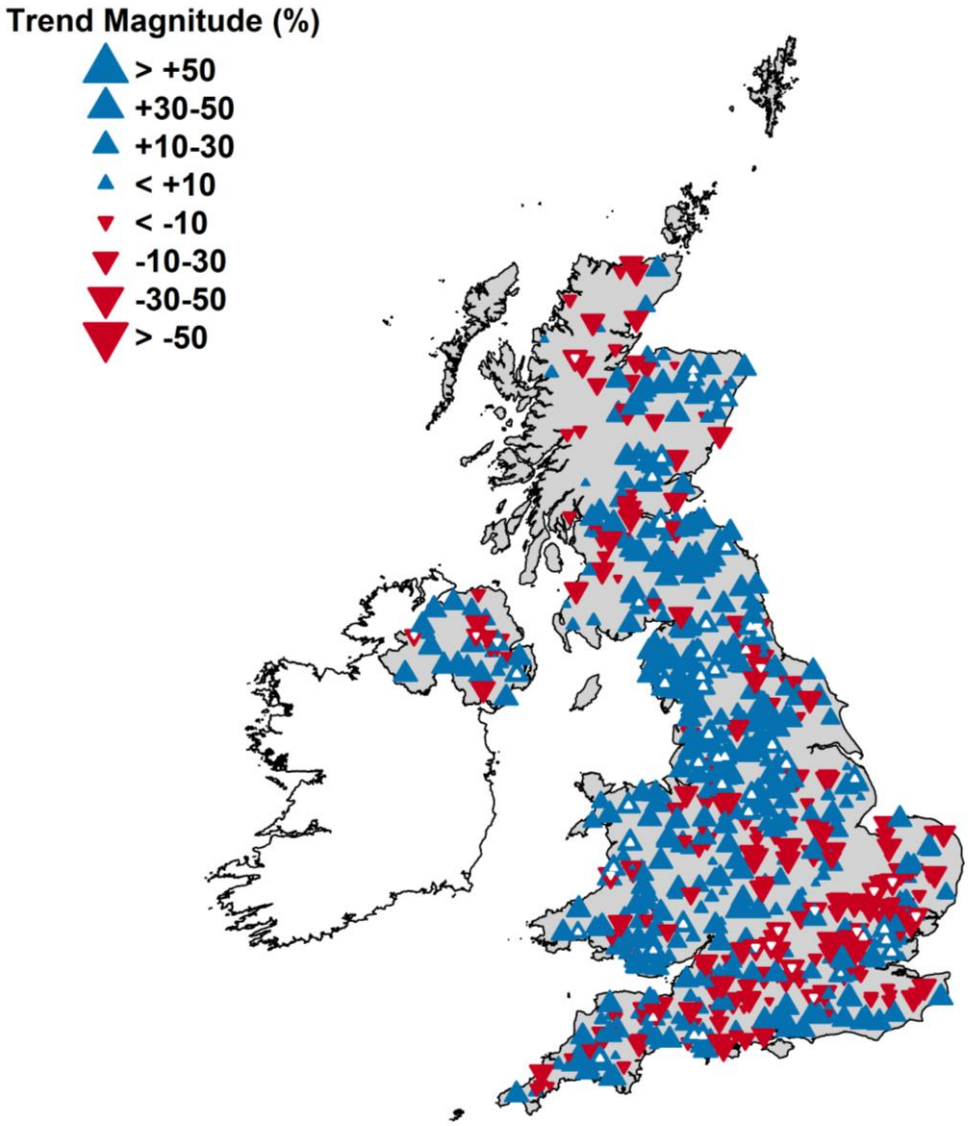


**Figure 1** Trend analysis of AMAX for gauging station period of record excluding rejected years and/or unrepresentative periods. Magnitude is shown according to the key as a percentage change. White colouration of Triangles denotes a significant trend using the Mann-Kendall test (5%) level accounting for serial correlation where present. Analysis based on NRFA Peak Flow Dataset version 13 using the standard NRFA trend testing approach (see Hannaford et al. 2021 for further details).

# 3 ANNUAL UPDATE

As part of the stewardship arrangements for the national Peak Flows Dataset by the UK Centre for Ecology & Hydrology through the National River Flow Archive, a programme of annual updates has been implemented. It is intended that all currently operating NRFA Peak Flow stations are updated each year with the addition of one water year of data.

## 3.1 Addition of water year 2022/2023

The version 13 files contain AMAX and POT time-series data updated to 30th September 2023 for all currently operational NRFA Peak Flow gauging stations in England, Scotland, Wales, and Northern Ireland.

## 3.2 New AMAX 1 records

New AMAX records (AMAX 1, the highest ranking in the period of record) were set at 12 stations in water year 2022/2023, listed in Table 9 with the percentage of the previous AMAX 1.

**Table 9:** New AMAX 1 records set in water year 2022/2023.

| Station Number | Station Name | Measuring Authority | % of previous AMAX 1 |
|---|---|---|---|
| **12008** | Feugh at Heugh Head | SEPA-NE | 102.6 |
| **14002** | Dighty Water at Balmossie Mill | SEPA-NE | 105.9 |
| **18023** | Monachyle Burn at Upper Monachyle | SEPA-SE | 100.3 |
| **19017** | Gogar Burn at Turnhouse | SEPA-SE | 112.7 |
| **44001** | Frome at East Stoke Total | EA-WX | 103.6 |
| **44002** | Piddle at Baggs Mill | EA-WX | 109.1 |
| **79004** | Scar Water at Capenoch | SEPA-SW | 116.6 |
| **79005** | Cluden Water at Fiddlers Ford | SEPA-SW | 111.4 |
| **79006** | Nith at Drumlanrig | SEPA-SW | 101.7 |
| **80001** | Urr at Dalbeattie | SEPA-SW | 100.1 |
| **84004** | Clyde at Sills of Clyde | SEPA-SW | 110.6 |
| **84040** | Clyde at Abington | SEPA-SW | 103.2 |

# 4 PERIOD OF RECORD REVIEW

A programme of Period of Record Reviews is undertaken as part of the stewardship arrangements for the national Peak Flows Dataset by the UK Centre for Ecology & Hydrology through the National River Flow Archive. It is intended that a subset of the NRFA Peak Flow stations is subject to a Period of Record Review each year and released in the next scheduled release of files for use in WINFAP. There are often larger full network tasks undertaken too, for example, to look at a piece of metadata for the whole region.

The Period of Record Review is extensive and covers a full review of:

- Flow and stage data (including extension of recent and where applicable, early records)
- Gaugings and ratings
- Missing data periods
- FEH Suitability
- Metadata (station descriptions, station type, datum history, POT threshold, bankfull stage)
- Unrepresentative data periods and rejected data.

This section lists the stations and time periods included in the Period of Record Review published in version 13. Major changes to the use of the data – POT thresholds, unrepresentative periods and rejected data – are detailed in Section 5.

## 4.1 Stations Included

The Period of Record Review covered 98 stations; 23 in Scotland, 61 in England, and 14 in Northern Ireland, listed in Table 10. At 5 existing NRFA Peak Flow stations in Scotland, the period of record has been extended by 16 water years to end with water year 2022/2023.

The Period of Record Review process for version 13 also involved the following activities:

- In Wales, a review of metadata, gaugings and ratings for 28 peak flow stations, sense checks of datum histories, historical continuity of data, gaugings and rating histories, and review of AMAX rejection, station descriptions and FEH suitability categories and comments. A full list of Welsh stations that have been through this review and when, is available in ANNEX 1 .
- Furthermore, digital start dates were updated for all sites in Wales.
- For England, a review of photographs was also undertaken.

**Table 10** Stations included in the Period of Record Review in version 13.

| Station Number | Station Name | Measuring Authority | Start date | End date |
|---|---|---|---|---|
| **8004** | Avon at Delnashaugh | SEPA-NW | 2013/2014 | 2022/2023 |
| **8007** | Spey at Invertruim | SEPA-NW | 1952/1953 | 2022/2023 |
| **9004** | Bogie at Redcraig | SEPA-NW | 1980/1981 | 2022/2023 |
| **9006** | Deskford Burn at Cullen | SEPA-NW | 1991/1992 | 2022/2023 |
| **10002** | Ugie at Inverugie | SEPA-NE | 1971/1972 | 2022/2023 |
| **11002** | Don at Haughton | SEPA-NE | 1971/1972 | 2022/2023 |
| **12003** | Dee at Polhollick | SEPA-NE | 1975/1976 | 2022/2023 |
| **15016** | Tay at Kenmore | SEPA-NE | 1990/1991 | 2022/2023 |
| **19001** | Almond at Craigiehall | SEPA-SE | 1955/1956 | 2022/2023 |
| **19006** | Water of Leith at Murrayfield | SEPA-SE | 1992/1993 | 2022/2023 |
| **20003** | Tyne at Spilmersford | SEPA-SE | 1992/1993 | 2022/2023 |
| **20007** | Gifford Water at Lennoxlove | SEPA-SE | 1973/1974 | 2022/2023 |
| **21003** | Tweed at Peebles | SEPA-SE | 1947/1948 | 2022/2023 |
| **21024** | Jed Water at Jedburgh | SEPA-SE | 2015/2016 | 2022/2023 |

| Station Number | Station Name | Measuring Authority | Start date | End date |
|---|---|---|---|---|
| **22004** | Aln at Hawkhill | EA-NE | 1959/1960 | 1979/1980 |
| **24005** | Browney at Burnhall | EA-NE | 1954/1955 | 2022/2023 |
| **24006** | Rookhope Burn at Eastgate | EA-NE | 1960/1961 | 1979/1980 |
| **25003** | Trout Beck at Moor House | EA-NE | 1962/1963 | 2022/2023 |
| **25808** | Burnt Hill at Moor House | EA-NE | 1953/1954 | 1961/1962 |
| **25809** | Bog Hill at Moor House | EA-NE | 1953/1954 | 1961/1962 |
| **25810** | Sike Hill at Moor House | EA-NE | 1955/1956 | 1961/1962 |
| **27009** | Ouse at Skelton | EA-Y | 1885/1886 | 2022/2023 |
| **28007** | Trent at Shardlow | EA-EM | 1990/1991 | 2022/2023 |
| **28012** | Trent at Yoxall | EA-WM | 1965/1966 | 2022/2023 |
| **28022** | Trent at North Muskham | EA-EM | 1968/1969 | 2022/2023 |
| **28060** | Dover Beck at Lowdham | EA-EM | 1971/1972 | 2022/2023 |
| **28095** | Tame at Hopwas Bridge | EA-WM | 1985/1986 | 2022/2023 |
| **31004** | Welland at Tallington Total | EA-LN | 1981/1982 | 2022/2023 |
| **31005** | Welland at Tixover | EA-LN | 1997/1998 | 2022/2023 |
| **31023** | West Glen at Easton Wood | EA-LN | 1981/1982 | 2022/2023 |
| **31026** | Egleton Brook at Egleton | EA-LN | 1980/1981 | 2013/2014 |
| **34006** | Waveney at Needham Mill | EA-EA | 1970/1971 | 2022/2023 |
| **36005** | Brett at Hadleigh | EA-EA | 1962/1963 | 2022/2023 |
| **37005** | Colne at Lexden | EA-EA | 1959/1960 | 2022/2023 |
| **37006** | Can at Beach's Mill | EA-EA | 1961/1962 | 2022/2023 |
| **37019** | Beam at Bretons Farm | EA-HNL | 1964/1965 | 2022/2023 |
| **38002** | Ash at Mardock | EA-HNL | 1979/1980 | 2022/2023 |
| **38021** | Turkey Brook at Albany Park | EA-HNL | 1970/1971 | 2022/2023 |
| **39005** | Beverley Brook at Wimbledon Common | EA-KSL | 1941/1942 | 2022/2023 |
| **39006** | Windrush at Newbridge | EA-T | 1950/1951 | 2022/2023 |
| **39023** | Wye at Bourne End Hedsor | EA-T | 1964/1965 | 2022/2023 |
| **39025** | Enborne at Brimpton | EA-T | 1967/1968 | 2022/2023 |
| **39035** | Churn at Cerney Wick | EA-T | 1969/1970 | 2022/2023 |
| **39081** | Ock at Abingdon | EA-T | 1978/1979 | 2022/2023 |
| **39090** | Cole at Inglesham | EA-T | 1976/1977 | 2022/2023 |
| **39093** | Brent at Monks Park | EA-HNL | 1978/1979 | 2022/2023 |
| **39096** | Wealdstone Brook at Wembley | EA-HNL | 1978/1979 | 2022/2023 |
| **40016** | Cray at Crayford | EA-KSL | 1989/1990 | 2022/2023 |
| **40018** | Darent at Lullingstone | EA-KSL | 1989/1990 | 2022/2023 |
| **40022** | Great Stour at Chart Leacon | EA-KSL | 1979/1980 | 2022/2023 |
| **43012** | Wylye at Norton Bavant | EA-WX | 1986/1987 | 2022/2023 |
| **43019** | Shreen Water at Colesbrook | EA-WX | 1991/1992 | 2022/2023 |
| **44006** | Sydling Water at Sydling St Nicholas | EA-WX | 1991/1992 | 2022/2023 |
| **47001** | Tamar at Gunnislake | EA-DC | 1955/1956 | 2022/2023 |
| **48006** | Cober at Helston County Bridge | EA-DC | 2003/2004 | 2022/2023 |
| **48011** | Fowey at Restormel | EA-DC | 1960/1951 | 2022/2023 |
| **49002** | Hayle at St Erth | EA-DC | 1967/1968 | 2022/2023 |
| **51002** | Horner Water at West Luccombe | EA-WX | 1991/1992 | 2022/2023 |
| **53002** | Semington Brook at Semington | EA-WX | 1967/1968 | 2022/2023 |
| **53018** | Avon at Bathford | EA-WX | 1969/1970 | 2022/2023 |
| **53029** | Biss at Trowbridge | EA-WX | 1983/1984 | 2022/2023 |

| Station Number | Station Name | Measuring Authority | Start date | End date |
|---|---|---|---|---|
| **54006** | Stour (Worcs) at Kidderminster Callows Lane | EA-WM | 1990/1991 | 2017/2018 |
| **54111** | Avon at Rugby | EA-WM | 1988/1989 | 2022/2023 |
| **68001** | Weaver at Ashbrook | EA-GMMC | 1977/1978 | 2022/2023 |
| **68005** | Weaver at Audlem | EA-GMMC | 1972/1973 | 2022/2023 |
| **69011** | Micker Brook at Cheadle | EA-GMMC | 1967/1968 | 2005/2006 |
| **70005** | Lostock at Littlewood Bridge | EA-CL | 1975/1976 | 2021/2022 |
| **71003** | Croasdale Beck at Croasdale Flume | EA-CL | 1982/1983 | 2021/2022 |
| **75005** | Derwent at Portinscale | EA-CL | 1975/1976 | 2014/2015 |
| **75007** | Glenderamackin at Threlkeld | EA-CL | 1975/1976 | 2022/2023 |
| **76001** | Haweswater Beck at Burnbanks | EA-CL | 1977/1978 | 2022/2023 |
| **76003** | Eamont at Udford | EA-CL | 1975/1976 | 2014/2015 |
| **76007** | Eden at Sheepmount | EA-CL | 1975/1976 | 2022/2023 |
| **76008** | Irthing at Greenholme | EA-CL | 1974/1975 | 2022/2023 |
| **76011** | Coal Burn at Coalburn | EA-CL | 1990/1991 | 2022/2023 |
| **77002** | Esk at Canonbie | SEPA-SW | 1962/1963 | 2022/2023 |
| **80001** | Urr at Dalbeattie | SEPA-SW | 1985/1986 | 2022/2023 |
| **84003** | Clyde at Hazelbank | SEPA-SW | 1955/1956 | 2022/2023 |
| **84004** | Clyde at Sills of Clyde | SEPA-SW | 1955/1956 | 2022/2023 |
| **84013** | Clyde at Daldowie | SEPA-SW | 2009/2010 | 2022/2023 |
| **84017** | Black Cart Water at Milliken Park | SEPA-SW | 1967/1968 | 2022/2023 |
| **85002** | Endrick Water at Gaidrew | SEPA-SW | 1978/1979 | 2022/2023 |
| **92002** | Allt Coire nan Con at Polloch | SEPA-NW | 2001/2002 | 2022/2023 |
| **95004** | Abhainn a'Chnocain at Elphin | SEPA-NW | 2008/2009 | 2022/2023 |
| **201007** | Burn Dennet at Burndennet | DfIR | 1974/1975 | 2022/2023 |
| **202001** | Roe at Ardnargle | DfIR | 1974/1975 | 2022/2023 |
| **203010** | Blackwater at Maydown Bridge | DfIR | 1969/1970 | 2022/2023 |
| **203024** | Cusher at Gamble's Bridge | DfIR | 1970/1971 | 2022/2023 |
| **203046** | Rathmore Burn at Rathmore Bridge | DfIR | 1981/1982 | 2022/2023 |
| **203093** | Main at Shane's Viaduct | DfIR | 1983/1984 | 2022/2023 |
| **204001** | Bush at Seneirl Bridge | DfIR | 1982/1973 | 2022/2023 |
| **205004** | Lagan at Newforge | DfIR | 1972/1973 | 2022/2023 |
| **205008** | Lagan at Drumiller | DfIR | 1973/1974 | 2022/2023 |
| **205011** | Annacloy at Kilmore Bridge | DfIR | 1979/1980 | 2022/2023 |
| **205020** | Enler at Comber | DfIR | 1983/1984 | 2022/2023 |
| **206001** | Clanrye at Mountmill Bridge | DfIR | 1971/1972 | 2022/2023 |
| **236005** | Colebrooke at Ballindarragh Bridge | DfIR | 1974/1975 | 2022/2023 |
| **236007** | Sillees at Drumrainey Bridge | DfIR | 1980/1981 | 2022/2023 |

# 5 MODIFICATIONS TO EXISTING TIME SERIES

## 5.1 POT Independence

For stations in England operated by the Environment Agency and in Wales operated by Natural Resources Wales, the rules for independence between POT events have been clarified such that the minimum discharge in the trough between the two peaks must be less than two-thirds of the discharge of **both peaks** (FEH guidelines states the first peak, but this requires subsequent manual re-processing to remove spurious peaks). Previous Environment Agency data updates by the NRFA and under the HiFlows-UK initiative may also have utilised the 'both peaks rule'.

These rules apply at all Environment Agency and Natural Resources Wales operated stations to POT events for water years **2014/2015** onwards. Additionally, for the stations listed in the linked Workbook, due to changes to stage-discharge relationships or other re-processing, the new independence rules apply from the date shown to the end of the period of record. Users should therefore be aware that at these stations the independence criteria used to generate the POT series updates **may** therefore vary throughout the flow record.

No changes have been made to the independence extraction criteria for POT data in Scotland or Northern Ireland.

## 5.2 POT Thresholds

The POT Threshold has changed at two stations, shown in Table 11. POT Thresholds are assessed and should be set to produce around 3-5 POTs per year. Where this number is lower or higher the threshold is changed. The national position is that changes to the POT Thresholds are only implemented where it is possible to do so for the whole period-of-record. This means that thresholds are not changed where there are pre-digital data that cannot be reprocessed (most notably, to implement a threshold reduction) or reasonably rejected.

**Table 11:** Stations with changes to POT Thresholds in version 13.

| Station Number | Station Name | Measuring Authority | V12 POT Threshold | V13 POT Threshold |
|---|---|---|---|---|
| **10002** | Ugie at Inverugie | SEPA-NE | 18.334 | 22 |
| **28007** | Trent at Shardlow | EA-EM | 142.434 | 135 |

## 5.3 Minor Changes to AMAX and POT Records

Major changes to time series can be made through the Period of Record Review (see Section 4) or through rating changes submitted as part of the Annual Update process (see Section 5.4).

Other minor changes to individual events can be made outside of these processes. Four stations had edits to the historical time series in version 13, listed in Table 12.

**Table 12:** Stations with minor changes to time series in version 13.

| Station Number | Station Name | Measuring Authority | Details of change |
|---|---|---|---|
| **26003** | Foston Beck at Foston Mill | EA-Y | Corrected stage data due to error found with incorrect weir settings affecting data between June 2013 and March 2023. |
| **27030** | Dearne at Adwick | EA-Y | Data edited since 2013 when fish pass was installed. Data shown is total flow from weir and fish pass. Previous data had some double counting. |

| Station Number | Station Name | Measuring Authority | Details of change |
|---|---|---|---|
| **57015** | Taff at Merthyr Tydfil | NRW | Correction to POT record between March 1979 and March 1982 including removal of non-independent POT from 10/03/1981 10:00. |
| **58006** | Mellte at Pontneddfechan | NRW | Corrected WY1981/1982 AMAX to 64.896 $m^3/s$ (from 100.322 $m^3/s$) based on paper files. |
| **84014** | Avon Water at Fairholm | SEPA-SW | Corrected WY1969/1970 AMAX from 01/10/1970 00:00:00 to 21/02/1970 01:00:00 following discovery of incorrect stage for the 01/10/1970 00:00:00 event. Once corrected this event was less than the 21/02/1970 01:00:00 event. |

## 5.4 Changes to Stage-Discharge Ratings and Reprocessed Data

Stage-discharge ratings have changed at 25 stations as part of the routine Annual Update of the dataset. The period of re-processed flow data is listed in Table 13, all stations have been re-processed to the end of the record (water year 2022/2023). For stations included in the Period of Record Review (see Table 10), ratings have been reviewed and data re-processed as required.

**Table 13:** Stations with changes to stage-discharge ratings (in addition to those that have been changed through the Period of Record Review) and re-processed data in version 13.

| Station Number | Station Name | Measuring Authority | Start date of re-processed data |
|---|---|---|---|
| **6012** | Enrick at White Bridge | SEPA-NW | 27/12/2007 |
| **15007** | Tay at Pitnacree | SEPA-NE | 30/12/2015 |
| **21007** | Ettrick Water at Lindean | SEPA-SE | 29/10/2021 |
| **27090** | Swale at Catterick Bridge | EA-Y | 22/01/2008 |
| **27095** | Pickering Beck at Pickering | EA-Y | 03/04/2018 |
| **27097** | Aire at Bingley | EA-Y | 04/06/2000 |
| **28083** | Trent at Darlaston | EA-WM | 12/10/2012 |
| **43005** | Avon at Amesbury | EA-WX | 05/04/1987 |
| **43006** | Nadder at Wilton | EA-WX | 24/03/1987 |
| **43007** | Stour at Throop | EA-WX | 28/03/1987 |
| **43008** | Wylye at South Newton | EA-WX | 02/01/1987 |
| **52016** | Currypool Stream at Currypool Farm | EA-WX | 23/01/2023 |
| **52025** | Hillfarrance Brook at Milverton | EA-WX | 09/01/1992 |
| **54029** | Teme at Knightsford Bridge | EA-WM | 31/05/2005 |
| **55023** | Wye at Redbrook | NRW | 12/11/1969 |
| **55029** | Monnow at Grosmont | NRW | 13/11/2009 |
| **57004** | Cynon at Abercynon | NRW | 01/09/1957 |
| **57006** | Rhondda at Trehafod | NRW | 16/10/1998 |
| **57009** | Ely at St Fagans | NRW | 05/09/2008 |
| **60012** | Twrch at Ddol Las | NRW | 24/09/1982 |
| **62002** | Teifi at Llanfair | NRW | 07/10/2008 |

| Station Number | Station Name | Measuring Authority | Start date of re-processed data |
|---|---|---|---|
| **65007** | Dwyfor at Garndolbenmaen | NRW | 10/03/1982 |
| **66001** | Clwyd at Pont-y-Cambwll | NRW | 07/11/1982 |
| **66011** | Conwy at Cwmlanerch | NRW | 07/12/1964 |
| **67006** | Alwen at Druid | NRW | 29/01/1960 |

## 5.5 Unrepresentative Data Periods

Some periods of data are unsuitable for use in WINFAP because they are unrepresentative of the hydrological behaviour of the catchment. These are shown on the NRFA website by pink shading on the AMAX and POT graphs (e.g. https://nrfa.ceh.ac.uk/data/station/peakflow/48011). The unrepresentative periods occur in two main situations:

1. Where there is a clear change in the catchment during the period of record. The most common example is where a large reservoir has been built and therefore caused a change in the FARL (Flood Attenuation by Reservoirs and Lakes) value.
2. Where data quality has changed significantly during the period of record. The indicative suitability has been based on the better data, providing the length of record is reasonable. In these cases, the years of poorer quality have been rejected.

New unrepresentative periods have been added at 11 stations (Table 14), removed at 4 stations (Table 15) and edited at 1 station (Table 16). The end dates for ongoing unrepresentative periods at a further 14 were extended to the end of water year 2022/2023.

**Table 14:** Unrepresentative periods added in version 13.

| Station Number | Station Name | Measuring Authority | Start Date | End Date | Comments |
|---|---|---|---|---|---|
| **28012** | Trent at Yoxall | EA-WM | 01/10/1980 | 01/10/1987 | Interpolation of flow data did not provide accurate representation of on-site conditions. |
| **43007** | Stour at Throop | EA-WX | 01/10/2022 | 30/09/2023 | Large tree caught on weir for entire water year. The data has been edited so that the stage has been reduced by 10% to account for the overestimation in stage caused by the debris, but this is a best estimate and data is marked as suspect. |
| **49002** | Hayle at St Erth | EA-DC | 01/02/1957 | 06/01/1968 | Not possible to derive a rating for the velocity-area prior to installation of weir in 1968 because of variable weed growth. |
| **53002** | Semington Brook at Semington | EA-WX | 01/07/1968 | 26/11/2006 | Spot flows suggest high flows were underestimated prior to installation of acoustics. |
| **54111** | Avon at Rugby | EA-WM | 01/01/1975 | 01/10/1988 | Uncertainty in high flows before flood alleviation scheme due to lack of high flow gaugings, poor fit to ratings, and gaps in the record. |

| Station Number | Station Name | Measuring Authority | Start Date | End Date | Comments |
|---|---|---|---|---|---|
| **55002** | Wye at Belmont | EA-WM | 16/12/1908 | 01/07/1973 | Confidence in rating validity before 1973 is limited, especially at the top end, but suitable for QMED from 1935 and for Pooling from 1973. |
| **63002** | Rheidol at Llanbadarn Fawr | NRW | 01/10/1963 | 01/10/2001 | Uncertainty in flows before flood banks were constructed in 2001. |
| **64010** | Mawddach at Tyddyn Gwladys | NRW | 01/05/2001 | 07/07/2004 | Station was destroyed following large floods during this period. Previously this period was unrated, and any use of the data during the period should be done with extreme caution and acknowledgement of the information above. |
| **65007** | Dwyfor at Garndolbenmaen | NRW | 21/04/1975 | 25/08/2001 | Low number of gaugings, of uncertain quality, and all well below QMED and the lowest AMAX/POT. Frequency of gaugings increased from 2002. |
| **79004** | Scar Water at Capenoch | SEPA-SW | 19/09/1963 | 30/09/1981 | Rating applied does not represent the channel state before the gabion weir was built on 10/08/1981. |
| **203011** | Main at Dromona | DfIR | 01/10/2015 | 01/10/2023 | Uncertain change post-2015, meaning low flows are likely underestimated. Rejected until further investigations and amendment to rating. |

**Table 15:** Unrepresentative periods removed in version 13.

| Station Number | Station Name | Measuring Authority | Start Date | End Date | Comments |
|---|---|---|---|---|---|
| **19006** | Water of Leith at Murrayfield | SEPA-SE | 01/10/2016 | 30/09/2017 | Flood defence constructed during this period, flows have now been modelled to reflect natural conditions. |
| **21024** | Jed Water at Jedburgh | SEPA-SE | 27/01/2016 | 23/01/2018 | Landslide affected flows during this period, a new rating better reflects flows during this period. |
| **24005** | Browney at Burnhall | EA-NE | 01/09/2015 | 01/05/2017 | Flows were rejected due to a weir blockage, however peak flows were unaffected |
| **60009** | Sawdde at Felin-y-cwm | NRW | 01/10/2008 | 01/10/2022 | Rating did not perform well, however a new rating and reprocessed data has solved the issue. |

**Table 16:** Unrepresentative periods edited in version 13.

| Station Number | Station Name | Measuring Authority | Start Date | End Date | Comments |
|---|---|---|---|---|---|
| **21003** | Tweed at Peebles | SEPA-SE | 28/05/1939 | 28/12/1940 | End date changed from 1959 to 1940 following digitising and reprocessing of early record. |

## 5.6 Rejected Data

AMAX and POT data that are unsuitable for use in flood estimation are marked as rejected in the dataset and not included in flood estimation calculations. These are shown by red bars (for AMAX) and red crosses (for POTs) on the NRFA website AMAX and POT graphs respectively (e.g. https://nrfa.ceh.ac.uk/data/station/peakflow/19006). All data falling within unrepresentative periods (see section 5.5 Unrepresentative Data Periods) are rejected.

In addition, where periods of missing data are likely to have included the true AMAX, any AMAX recorded during that water year is likely rejected, following an assessment of timing and magnitude of the submitted event and the 'true' event. If there is little difference or a significant event, despite the 'true' AMAX being missed, the events can remain unrejected to aid flood estimation. Where the true AMAX is recorded, the event is not rejected.

AMAX rejections have been added at 20 stations (Table 17) and removed at 2 stations (Table 18).

**Table 17**: AMAX data now classed as rejected in version 13.

| Station Number | Station Name | Measuring Authority | Rejected water years(s) |
|---|---|---|---|
| **26015** | Driffield Canal at Wansford Bridge | EA-Y | 2009 |
| **28007** | Trent at Shardlow | EA-EM | 1990 |
| **28012** | Trent at Yoxall | EA-WM | 1975 |
| **37019** | Beam at Bretons Farm | EA-HNL | 2000 |
| **38001** | Lee at Feildes Weir | EA-HNL | 1916 |
| **39005** | Beverley Brook at Wimbledon Common | EA-KSL | 1969 |
| **39018** | Ock at Abingdon | EA-T | 1961 |
| **40018** | Darent at Lullingstone | EA-KSL | 1989, 2010 |
| **40022** | Great Stour at Chart Leacon | EA-KSL | 1978 |
| **43012** | Wylye at Norton Bavant | EA-WX | 1987 |
| **45005** | Otter at Dotton | EA-DC | 1961 |
| **53029** | Biss at Trowbridge | EA-WX | 1989, 1990 |
| **63003** | Wyre at Llanrhystud | NRW | 1998 |
| **66004** | Wheeler at Bodfari | NRW | 1983, 1984 |
| **67008** | Alyn at Pont-y-Capel | NRW | 1964, 1965 |
| **69007** | Mersey at Ashton Weir | EA-GMMC | 2022 |
| **69045** | Bollin at Bollington Mill Total | EA-GMMC | 1999 |
| **76007** | Eden at Sheepmount | EA-CL | 1968 |
| **204001** | Bush at Seneirl Bridge | DfIR | 1974 |
| **205011** | Annacloy at Kilmore Bridge | DfIR | 1979 |

**Table 18:** AMAX data no longer classed as rejected in version 13.

| Station Number | Station Name | Measuring Authority | Water year re-instated |
|---|---|---|---|
| **15016** | Tay at Kenmore | SEPA-NE | 1974 |
| **67015** | Dee at Manley Hall | NRW | 1973 |

## 5.7 Datum Changes

A short table is provided on the NRFA website, at the bottom of the station information page (e.g. https://nrfa.ceh.ac.uk/data/station/info/201002), for each station, which details the datum and control history over the period of record, with dates of applicability. The datum history has been updated at 37 stations listed in ANNEX 2 .

# 6 FEH CATCHMENT DESCRIPTORS

## 6.1 Changes to Existing Catchment Descriptors

Occasionally there are changes made to FEH catchment descriptors at stations following the uncovering of errors in the existing descriptors or other updates. In version 13, catchment descriptors at one station have been changed shown in Table 19.

**Table 19** Changes to catchment descriptors at individual stations in version 13.

| Station Number | Station Name | Measuring Authority | Reason |
|---|---|---|---|
| **6003** | Moriston at Invermoriston | NSHE | In version 12.1 and previous versions the FARL value represented the catchment post-reservoir, even though the station closed before the reservoir(s) in the catchment began impounding. The post-reservoir value of 0.813 has been changed to the pre-reservoir value of 0.985 to represent the pre-reservoir situation and match with the available data. |
| **43014** | East Avon at Upavon East | EA-WX | In version 12.1 and previous versions, FEH catchment descriptors were duplicated with 43017 West Avon at Upavon West. The gauging stations here are co-located, but measure the eastern (43014) and western (43017) branches of the Avon. Catchment descriptors have been updated in version 13 for 43014 East Avon at Upavon East to correctly represent the catchment of the eastern branch. |

# 7 IMPACT OF DATA CHANGES

As part of the NRFA and FEH's quality control procedures, the new data submitted within each data release cycle are assessed in terms of the impact they make on key flood estimation statistics – QMED, 30-year and 100-year return period flows, using single-site analysis, donor transfer and pooling group methods. Substantial changes to these statistics can occur due to:

- Extension or shortening of flow records
- Extreme high or low flows in one water year
- Rating changes causing reprocessed flows
- Introduction and removal of stations flagged as "Suitable for Pooling" as well as record length changes leading to changes to pooling groups.

Any stations with a >10% change between V12.1 and V13, in either direction, of any of the key flood estimation statistics are listed below in the below sections.

Additionally, existing key catchment descriptors: AREA, SAAR6190, BFIHOST19, FARL, FPEXT, URBEXT2000 were checked for changes between V12.1 and V13. No stations were found to have more than 5% change in any of these descriptors, except station 6008 and 43014 (see Section 6.1).

A more in-depth discussion of these changes will be found on the FEH UKCEH website alongside the release of V13, in the form of an appendix report.

## 7.1 Overall Changes Between Datasets

Due to changes in record length, and the introduction and removal of stations flagged as "Suitable for Pooling", the average number of stations in pooling groups has changed from 11.3 to 11.2 (mean difference -0.11, all within ±2 stations), which is similar to the change of 11.5 to 11.3 between V11.0 and V12.1 (mean difference -0.22, all within ±2 stations). The median record length change is +1 years as expected (25 stations had a record length change greater than ±2 years, shown in Figure 2). The record length and pooling group sizes of V12.1 and V13 are shown in Figure 3.

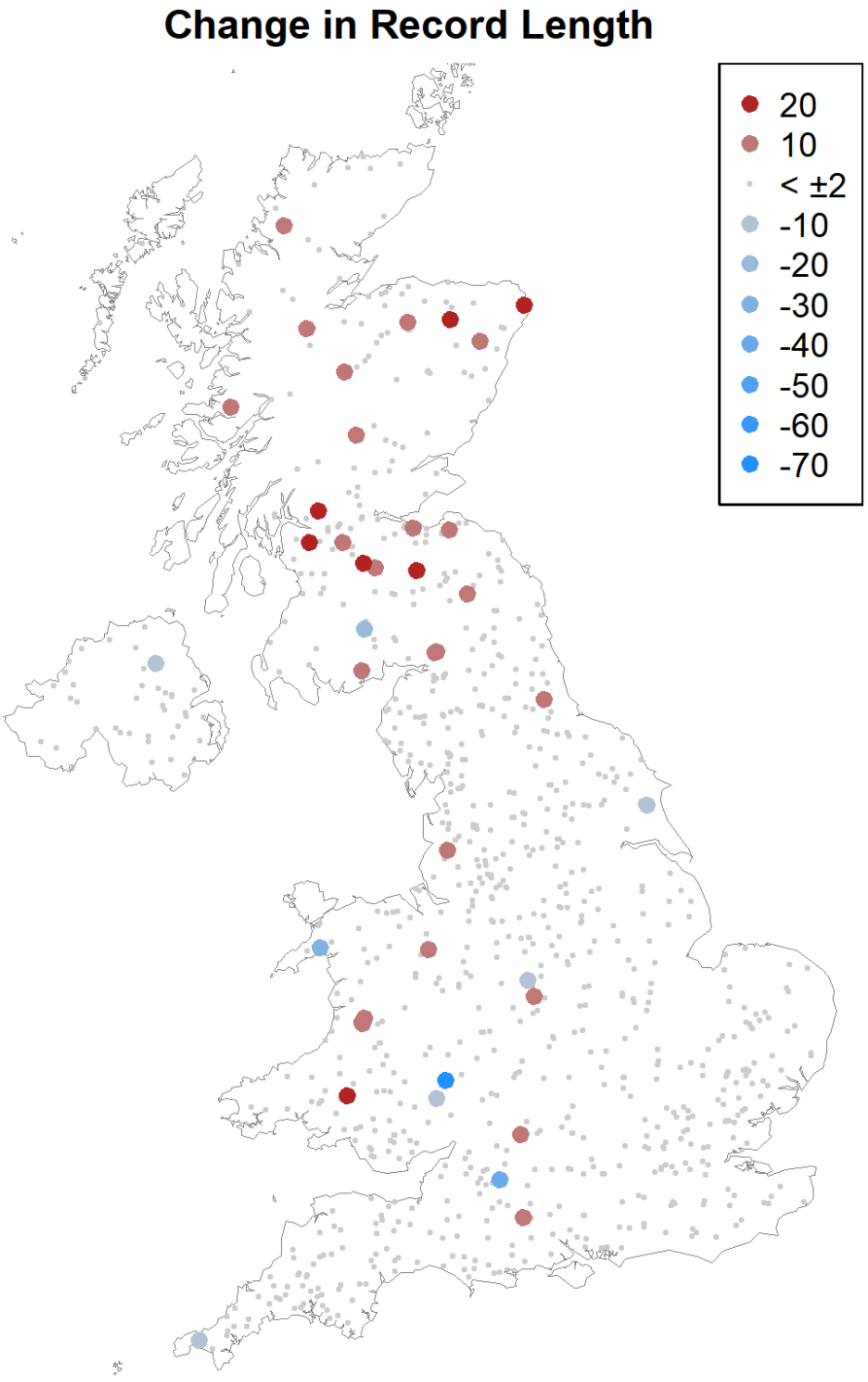


**Figure 2** Changes in record length between the stations in both V12.1 and V13. Sites with a change of record length less than 2 years are shown in small dots.

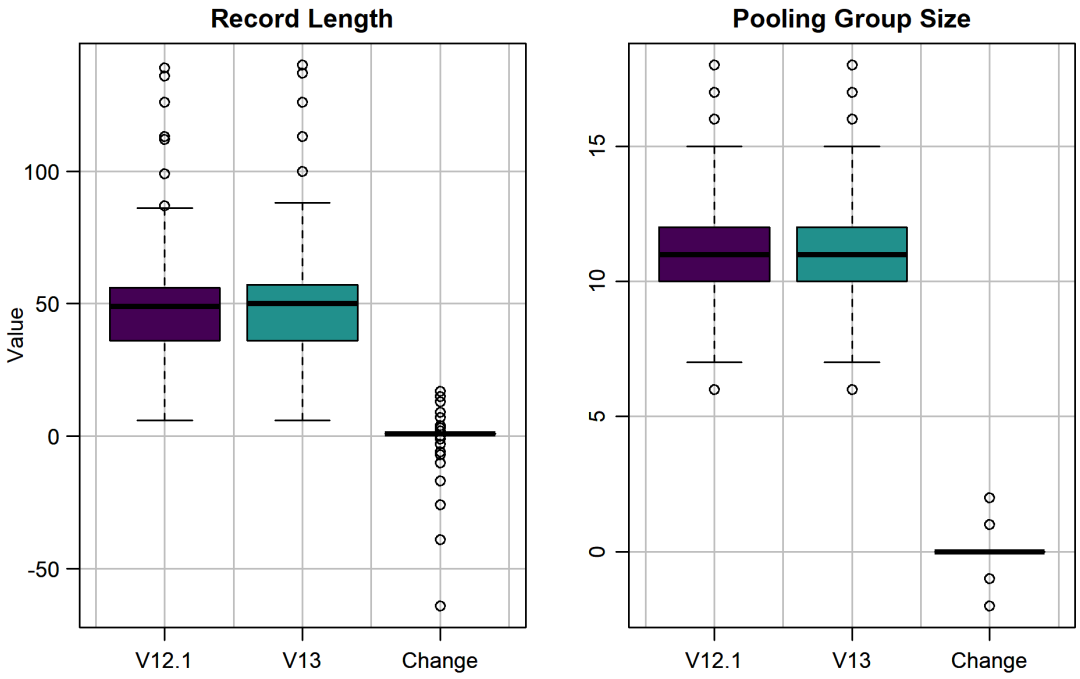


**Figure 3** Changes in record length and Pooling Group size between v12.1 and v13. Boxes show inter-quartile range, the difference between the 25th and 75th percentiles of the given statistic.

## 7.2 Impacts on Single-Site Flood Estimates

Differences between V12.1 and V13 have resulted in >10% changes in one or more single-site flood estimation statistics at 24 stations, listed in Table 20 and mapped in Figure 4.

**Table 20** Changes in gauged single-site QMED, 30- and 100-year return periods resulting from differences between V12.1 and V13. The asterisk indicates changes greater than 10%, positive or negative.

| NRFA Station | Station Name | Measuring Authority | % change in: | | | Comment |
|---|---|---|---|---|---|---|
| | | | QMED | 30-yr | 100-yr | |
| **8007** | Spey at Invertruim | SEPA-NW | -12.08* | -2.71 | 2.08 | Reduction of flows due to rating change. |
| **9004** | Bogie at Redcraig | SEPA-NW | -9.96 | -32.52* | -38.94* | Rating change and large amount of new data (2006-2022). |
| **9006** | Deskford Burn at Cullen | SEPA-NW | -10.42* | -9.90 | -10.23* | Rating change leading to the reduction of AMAX1. |
| **9010** | Deveron at Huntly | SEPA-NW | 24.08* | 15.03* | 10.34* | Short record (of 14 years) that fits to generalized logistic distribution (GLO) poorly, and WY2022/2023 is AMAX3. |
| **10002** | Ugie at Inverugie | SEPA-NE | 3.65 | 28.42* | 42.39* | Rating change and large amount of new data (2006-2022). |
| **11003** | Don at Bridge of Alford | SEPA-NE | 2.79 | 11.10 | 15.74* | WY2022/2023 is AMAX2, big gap from AMAX3. |
| **12008** | Feugh at Heugh Head | SEPA-NE | 1.41 | 7.23 | 10.05* | WY2022/2023 is new AMAX1. |
| **19017** | Gogar Burn at Turnhouse | SEPA-SE | 0.23 | 8.32 | 12.68* | WY2022/2023 is new AMAX1. |
| **21003** | Tweed at Peebles | SEPA-SE | 3.32 | 24.31* | 35.91* | Flows increased in early record due to rating change and reduction of unrepresentative period. |
| **28022** | Trent at North Muskham | EA-EM | -4.44 | -10.29* | -10.86* | Rating change leading to the reduction of flows. |
| **42003** | Lymington at Brockenhurst | EA-SSD | 10.89* | 7.86 | 5.84 | WY2022/2023 is in the top 10. AMAX series fits GLO poorly, step changes around QMED. |
| **43007** | Stour at Throop | EA-WX | 0.00 | 12.95* | 20.18* | Rating change which increased AMAX1. |
| **49005** | Bolingey Stream at Bolingey Cocks Bridge | EA-DC | -17.31* | -13.63* | -11.46* | A short record (of only 13 years) and WY2022/2023 was the lowest AMAX on record. |
| **52025** | Hillfarrance Brook at Milverton | EA-WX | -12.59* | -2.72 | 3.63 | Rating change leading to the reduction of flows. |
| **53002** | Semington Brook at Semington | EA-WX | 15.72* | 29.71* | 32.99* | Large amount of newly rejected data as likely underestimated (pre-2007). |

| | | | | | | |
|---|---|---|---|---|---|---|
| **54111** | Avon at Rugby | EA-WM | -10.45* | 11.81* | 20.02* | Large amount of newly rejected data (1975-1988), plus 11 years of new data added following re-opening. |
| **55029** | Monnow at Grosmont | NRW | -3.01 | 20.42* | 36.06* | Rating change leading to increase in the largest flows and reduction of lowest flows. |
| **57006** | Rhondda at Trehafod | NRW | -1.64 | -8.18 | -10.80* | Rating change leading to the reduction of flows. |
| **60009** | Sawdde at Felin-y-cwm | NRW | -12.19* | -12.73* | -13.54* | Removal of unrepresentative period between 2008 and 2022. |
| **65007** | Dwyfor at Garndolbenmaen | NRW | -15.80* | -27.28* | -30.07* | Large amount of newly rejected data (1975-2001). |
| **84017** | Black Cart Water at Milliken Park | SEPA-SW | -2.67 | -9.93 | -12.61* | Large amount of new data (2006-2022). |
| **85002** | Endrick Water at Gaidrew | SEPA-SW | 5.31 | 15.85* | 21.64* | Large amount of new data (2006-2022). |
| **92002** | Allt Coire nan Con at Polloch | SEPA-NW | 0.25 | 10.54* | 15.10* | WY2022/2023 is AMAX2, and rating change leading to increase in largest flows. |
| **106003** | Abhainn Roag at Mill Croft | SEPA-NW | 0.61 | 14.60* | 15.21* | Short record (of 15 years), and WY2022/2023 is AMAX2. |

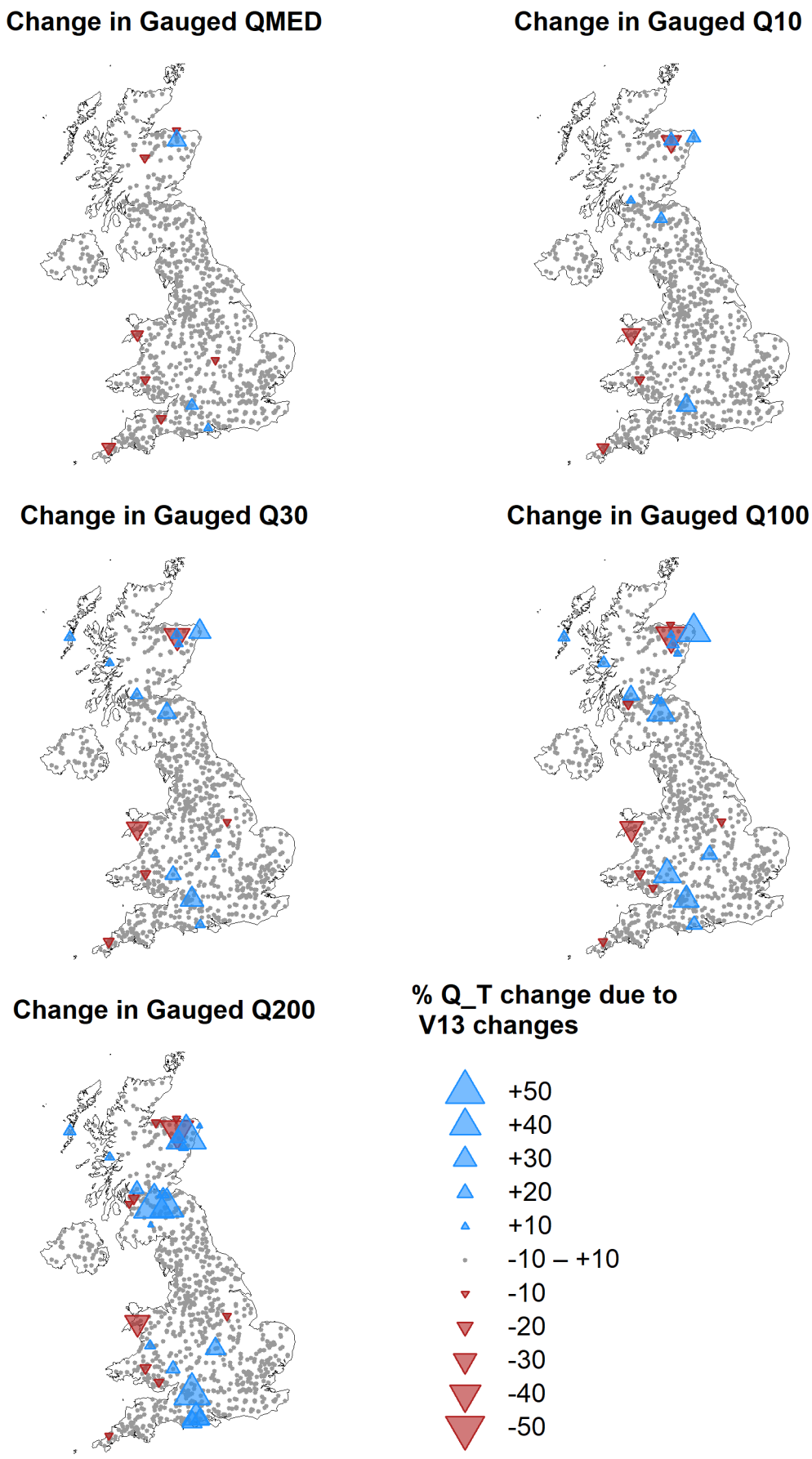


**Figure 4** Changes in Gauged QMED, 10-, 30-, 100- and 200-year return period flows due to differences between V12.1 and V13.

## 7.3 Impacts on Donor Adjusted QMED Estimates

Six stations showed a change in donor-adjusted QMED of greater than 10%, due to addition of data at donor stations, listed in Table 21.

**Table 21** Changes in donor-adjusted estimates of QMED resulting from differences between V12.1 and V13.

| NRFA Station | Station Name | Measuring Authority | % Change in Donor QMED | Comment |
|---|---|---|---|---|
| **6003** | Moriston at Invermoriston | SEPA-NW | 89.5 | Change in QMED descriptors at site |
| **7003** | Lossie at Sheriffmills | SEPA-NW | -10.2 | Changes in donor QMED |
| **26010** | Driffield Canal at Snakeholme Lock | EA-Y | 112.0 | New closest station had big impact |
| **32008** | Nene/Kislingbury at Dodford | EA-LN | -11.5 | Changes in donor QMED |
| **43014** | East Avon at Upavon East | EA-WX | 48.3 | Change in QMED descriptors at site |
| **67018** | Dee at New Inn | NRW | 12.7 | Changes in donor QMED |

## 7.4 Impacts on Pooled Flood Estimates

Differences between V12.1 and V13 have resulted in >10% changes in one or more pooled flood estimation statistics at 17 stations, listed in Table 22 and mapped in Figure 5.

**Table 22** Changes in pooled estimates of 5-, 30- and 100-year return periods resulting from differences between V12.1 and V13. The asterisk indicates changes greater than 10%, positive or negative.

| NRFA Station | Station Name | Measuring Authority | % change in: | | | Comment |
|---|---|---|---|---|---|---|
| | | | 5-year | 30-yr | 100-yr | |
| **9004** | Bogie at Redcraig | SEPA-NW | -15.85* | -22.03* | -25.11* | Rating change and large amount of new data (2006-2022). |
| **9010** | Deveron at Huntly | SEPA-NW | 23.04* | 21.54* | 20.60* | Short record (of 14 years) that fits to GLO poorly, and WY2022/2023 is AMAX3. |
| **10002** | Ugie at Inverugie | SEPA-NE | 10.17* | 19.59* | 25.76* | Large amount of new data (2006-2022). |
| **21003** | Tweed at Peebles | SEPA-SE | 9.17 | 18.29* | 24.31* | Flows increased in early record due to rating change. |
| **28022** | Trent at North Muskham | EA-EM | -7.15 | -9.75 | -10.68* | Rating change leading to the reduction of flows. |
| **28115** | Maun at Mansfield the Dykes | EA-EM | 4.70 | 7.85 | 10.61* | Two sites lost and three sites gained in pooling group (41002, 53017 out; 7009, 7012, 19014 in) (all three sites are new to V13). |
| **42003** | Lymington at Brockenhurst | EA-SSD | 11.30* | 12.64* | 13.76* | WY2022/2023 is in the top 10. AMAX series fits GLO poorly, step changes around QMED. |
| **44008** | South Winterbourne at Winterbourne Steepleton | EA-WX | 6.10 | 8.65 | 10.67 | Added station 7012 to pooling group (new to V13). |
| **44013** | Piddle at Little Puddle | EA-WX | 5.61 | 8.30 | 10.26 | Added 7009 and 7012 to pooling group (both sites are new to V13). |
| **49005** | Bolingey Stream at Bolingey Cocks Bridge | EA-DC | -15.90* | -13.32* | -11.47* | A short record (of only 13 years) and WY2022/2023 was the lowest AMAX on record. |
| **52025** | Hillfarrance Brook at Milverton | EA-WX | -11.42* | -8.14 | -5.36 | Rating change leading to the reduction of flows. |
| **53002** | Semington Brook at Semington | EA-WX | 20.88* | 24.90* | 26.01 | Large amount of newly rejected data (pre-2007). |
| **55029** | Monnow at Grosmont | NRW | 0.98 | 8.54 | 14.26 | Rating change leading to increase in the largest flows and reduction of lowest flows. |

| NRFA Station | Station Name | Measuring Authority | % change in: 5-year | 30-yr | 100-yr | Comment |
|---|---|---|---|---|---|---|
| **60009** | Sawdde at Felin-y-cwm | NRW | -11.21* | -9.69 | -8.68 | Removal of representative period between 2008 and 2022. |
| **65007** | Dwyfor at Garndolbenmaen | NRW | -18.54* | -21.40* | -22.67* | Large amount of newly rejected data (1975-2001). |
| **72817** | New Mill Brook at Hollowforth Hall | EA-CL | 6.44 | 9.03 | 10.87* | Pooling group change: 71013 out; 7009, 7012, 19014 in (all three sites are new to V13). |
| **85002** | Endrick Water at Gaidrew | SEPA-SW | 7.16 | 11.22* | 14.58* | Large amount of new data (2006-2022). |

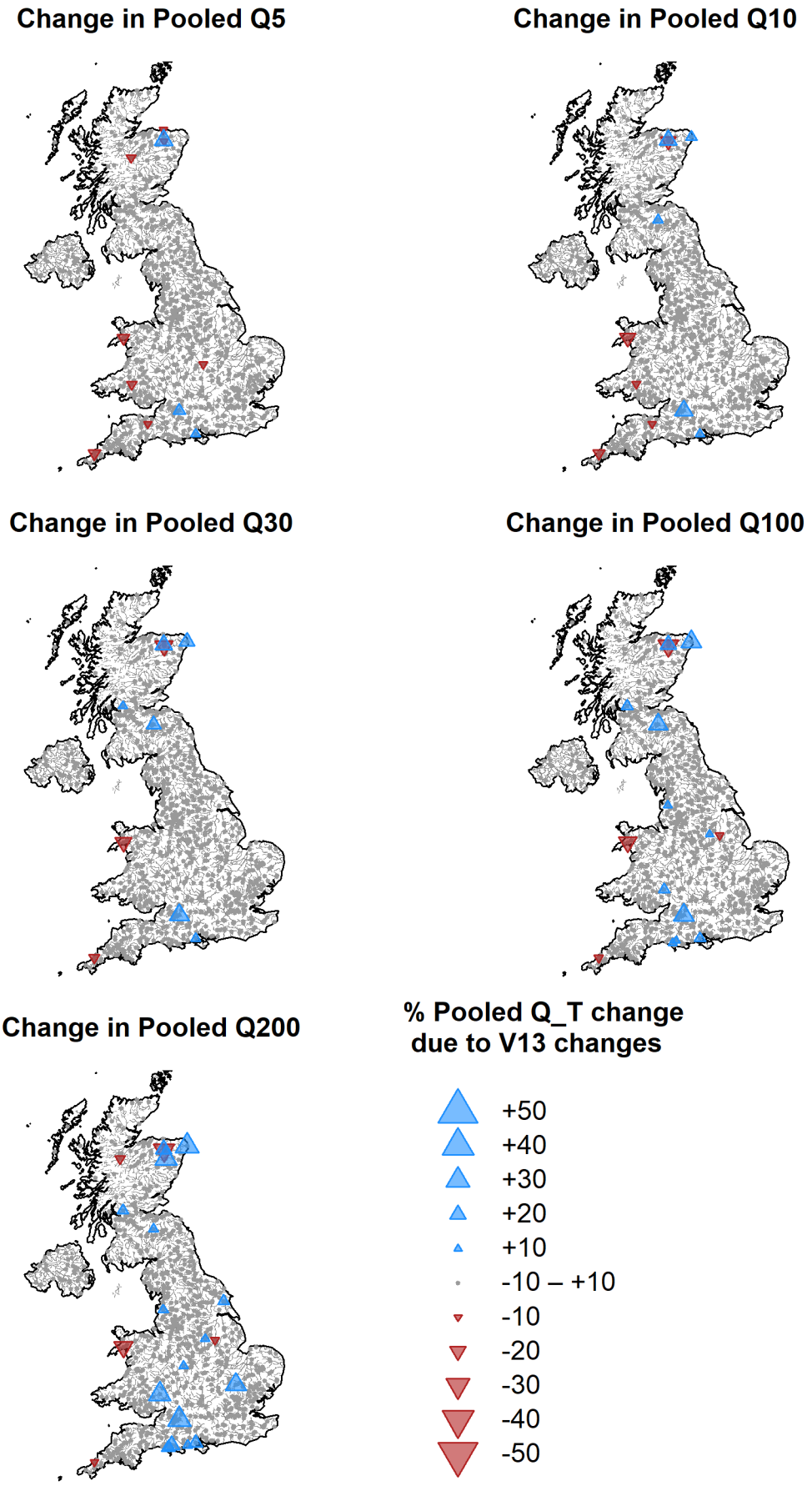


**Figure 5** Changes in Pooled 5-, 10-, 30-, 100- and 200-year return period flows due to differences between V12.1 and V13.

## 7.5 Impacts on Flood Estimates at Ungauged Locations

For a selection of 1,500 ungauged points on the GB gridded datasets (chosen to be representative of "All Catchments"), differences between V12.1 and V13 have been mapped in Figure 6, with changes of more than 10% highlighted. For this new dataset, it should be noted that most of the catchments are very small (less than 25km$^2$) and so all share quite similar pooling groups. The most common pooled stations experienced small changes in values this year, so the resultant pooled estimates exhibit very small changes. Note that this ungauged dataset is representative of the GB river network, not the NRFA station network, and so the big differences between Figure 5 and Figure 6 are not surprising, as few of the smallest catchments are gauged.

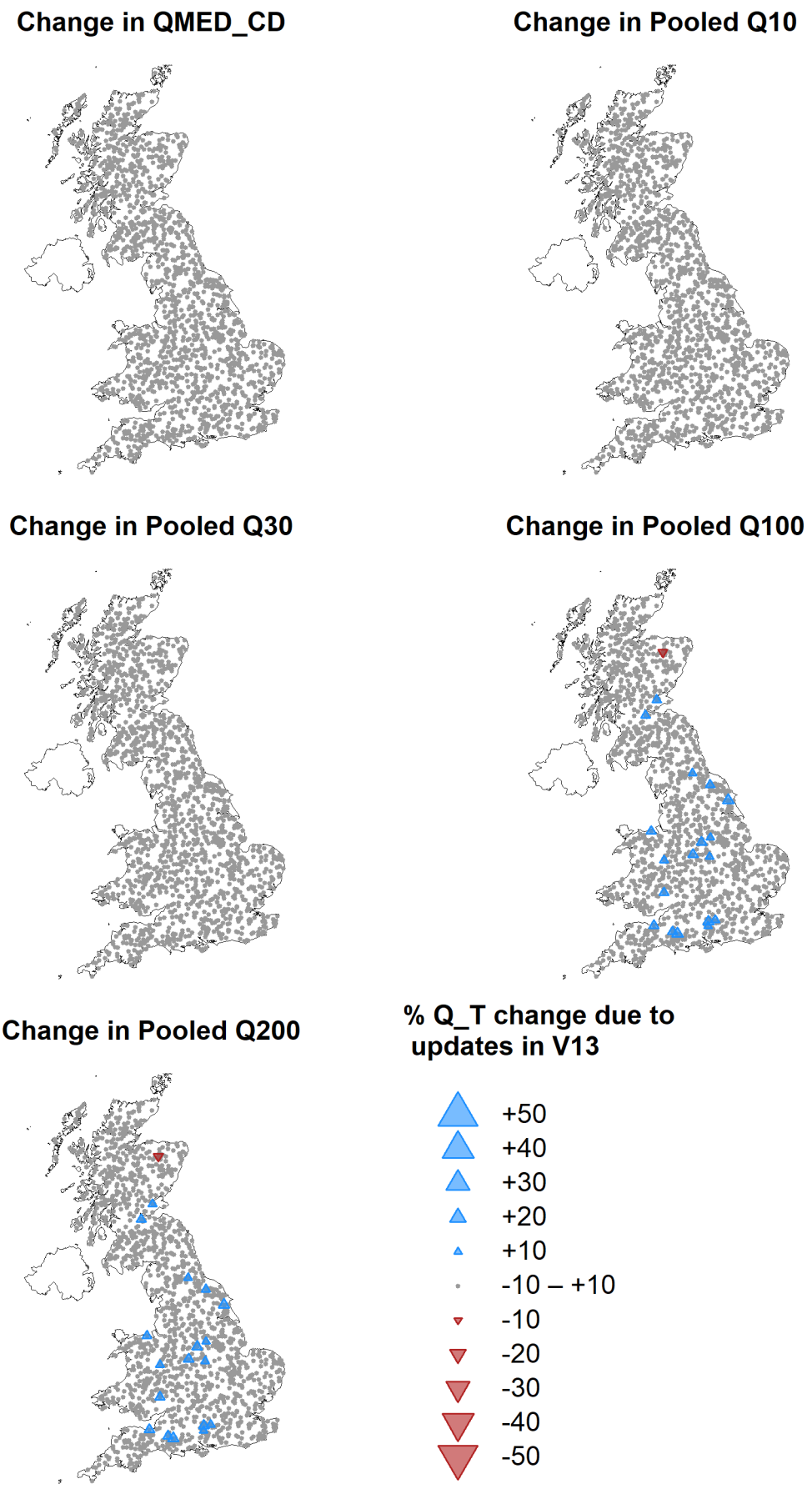


**Figure 6** Changes in QMED_CD, Pooled 10-, 30-, 100- and 200-year return period flows due to differences between V12.1 and V13 at ungauged locations.

# ANNEX 1 STATIONS UNDERGOING FULL METADATA REVIEW

For more information about the Natural Resources Wales full metadata review process see Section 4.1.

| Station Number | Station Name | Measuring Authority | Released in |
|---|---|---|---|
| **54014** | Severn at Abermule | NRW | V11 |
| **54025** | Dulas at Rhos-y-pentref | NRW | V11 |
| **54028** | Vyrnwy at Llanymynech | NRW | V11 |
| **54080** | Severn at Dolwen | NRW | V11 |
| **55004** | Irfon at Abernant | NRW | V11 |
| **55005** | Wye at Rhayader | NRW | V11 |
| **55007** | Wye at Erwood | NRW | V11 |
| **55009** | Monnow at Kentchurch | NRW | V11 |
| **55010** | Wye at Pant Mawr | NRW | V11 |
| **55012** | Irfon at Cilmery | NRW | V11 |
| **55016** | Ithon at Disserth | NRW | V11 |
| **55023** | Wye at Redbrook | NRW | V11 |
| **55025** | Llynfi at Three Cocks | NRW | V12 |
| **55026** | Wye at Ddol Farm | NRW | V12 |
| **55029** | Monnow at Grosmont | NRW | V12 |
| **55032** | Elan at Caban Dam | NRW | V12 |
| **56001** | Usk at Chainbridge | NRW | V12 |
| **56002** | Ebbw at Rhiwderin | NRW | V12 |
| **56003** | Honddu at The Forge Brecon | NRW | V12 |
| **56004** | Usk at Llandetty | NRW | V11 |
| **56006** | Usk at Trallong | NRW | V12 |
| **56011** | Sirhowy at Wattsville | NRW | V12 |
| **56012** | Grwyne at Millbrook | NRW | V12 |
| **56013** | Yscir at Pont-Ar-Yscir | NRW | V12 |
| **56019** | Ebbw at Aberbeeg | NRW | V12 |
| **57004** | Cynon at Abercynon | NRW | V12 |
| **57005** | Taff at Pontypridd | NRW | V12 |
| **57006** | Rhondda at Trehafod | NRW | V12 |
| **57007** | Taff at Fiddlers Elbow | NRW | V12 |
| **57008** | Rhymney at Llanedeyrn | NRW | V12 |
| **57009** | Ely at St Fagans | NRW | V12 |
| **57010** | Ely at Lanelay | NRW | V11 |
| **57014** | Rhymney at Bargoed | NRW | V12 |
| **57015** | Taff at Merthyr Tydfil | NRW | V12 |
| **57017** | Rhondda Fawr at Tynewydd | NRW | V12 |
| **58001** | Ogmore at Bridgend | NRW | V11 |
| **58002** | Neath at Resolven | NRW | V11 |
| **58005** | Ogmore at Brynmenyn | NRW | V11 |
| **58006** | Mellte at Pontneddfechan | NRW | V11 |
| **58007** | Llynfi at Coytrahen | NRW | V11 |
| **58008** | Dulais at Cilfrew | NRW | V11 |
| **58009** | Ewenny at Keepers Lodge | NRW | V11 |
| **58012** | Afan at Marcroft Weir | NRW | V12 |
| **59001** | Tawe at Ynystanglws | NRW | V12 |
| **59002** | Loughor at Tir-y-dail | NRW | V11 |

| Station Number | Station Name | Measuring Authority | Released in |
|---|---|---|---|
| **60001** | Tywi at Ty Castell | NRW | V12 |
| **60002** | Cothi at Felin Mynachdy | NRW | V12 |
| **60003** | Taf at Clog-y-Fran | NRW | V12 |
| **60005** | Bran at Llandovery | NRW | V13 |
| **60006** | Gwili at Glangwili | NRW | V13 |
| **60007** | Tywi at Dolau Hirion | NRW | V11 |
| **60009** | Sawdde at Felin-y-cwm | NRW | V13 |
| **60012** | Twrch at Ddol Las | NRW | V13 |
| **60013** | Cothi at Pont Ynys Brechfa | NRW | V13 |
| **60017** | Twrch at Gurnos | NRW | V13 |
| **61001** | Western Cleddau at Prendergast Mill | NRW | V13 |
| **61002** | Eastern Cleddau at Canaston Bridge | NRW | V13 |
| **61003** | Gwaun at Cilrhedyn Bridge | NRW | V13 |
| **62001** | Teifi at Glanteifi | NRW | V13 |
| **62002** | Teifi at Llanfair | NRW | V13 |
| **62003** | Teifi at Pont Llanio | NRW | V13 |
| **63001** | Ystwyth at Pont Llolwyn | NRW | V13 |
| **63003** | Wyre at Llanrhystud | NRW | V13 |
| **64001** | Dyfi at Dyfi Bridge | NRW | V11 |
| **64002** | Dysynni at Pont-y-Garth | NRW | V11 |
| **64006** | Leri at Dolybont | NRW | V11 |
| **64011** | Cerist at Llaw'r Cae | NRW | V11 |
| **65001** | Glaslyn at Beddgelert | NRW | V11 |
| **65004** | Gwyrfai at Bontnewydd | NRW | V11 |
| **65005** | Erch at Pencaenewydd | NRW | V11 |
| **65006** | Seiont at Peblic Mill | NRW | V13 |
| **65007** | Dwyfor at Garndolbenmaen | NRW | V13 |
| **66001** | Clwyd at Pont-y-Cambwll | NRW | V13 |
| **66002** | Elwy at Pant yr Onen | NRW | V13 |
| **66004** | Wheeler at Bodfari | NRW | V13 |
| **66005** | Clwyd at Ruthin Weir | NRW | V13 |
| **66006** | Elwy at Pont-y-Gwyddel | NRW | V13 |
| **66011** | Conwy at Cwmlanerch | NRW | V11 |
| **67005** | Ceiriog at Brynkinalt Weir | NRW | V13 |
| **67006** | Alwen at Druid | NRW | V13 |
| **67008** | Alyn at Pont-y-Capel | NRW | V13 |
| **67009** | Alyn at Rhydymwyn | NRW | V13 |
| **67010** | Gelyn at Cynefail | NRW | V13 |
| **67013** | Hirnant at Plas Rhiwedog | NRW | V13 |
| **67015** | Dee at Manley Hall | NRW | V13 |
| **67018** | Dee at New Inn | NRW | V11 |

# ANNEX 2 STATIONS WITH CHANGES TO DATUM HISTORY

For more information about datum history changes see section 5.7.

| Station Number | Station Name | Measuring Authority |
|---|---|---|
| **7009** | Mosset Burn at Wardend Bridge | SEPA-NW |
| **7012** | Lossie at Ballachraggan | SEPA-NW |
| **8004** | Avon at Delnashaugh | SEPA-NW |
| **8007** | Spey at Invertruim | SEPA-NW |
| **9004** | Bogie at Redcraig | SEPA-NW |
| **9005** | Allt Deveron at Cabrach | SEPA-NW |
| **14002** | Dighty Water at Balmossie Mill | SEPA-NE |
| **15025** | Ericht at Craighall | SEPA-NE |
| **19014** | Brox Burn at Newliston | SEPA-SE |
| **19017** | Gogar Burn at Turnhouse | SEPA-SE |
| **21014** | Tweed at Kingledores | SEPA-SE |
| **21029** | Tweed at Glenbreck | LRWD |
| **22004** | Aln at Hawkhill | EA-NE |
| **25003** | Trout Beck at Moor House | EA-NE |
| **25808** | Burnt Hill at Moor House | EA-NE |
| **25809** | Bog Hill at Moor House | EA-NE |
| **25810** | Sike Hill at Moor House | EA-NE |
| **26015** | Driffield Canal at Wansford Bridge | EA-Y |
| **27009** | Ouse at Skelton | EA-Y |
| **28007** | Trent at Shardlow | EA-EM |
| **28012** | Trent at Yoxall | EA-WM |
| **28022** | Trent at North Muskham | EA-EM |
| **28083** | Trent at Darlaston | EA-WM |
| **37006** | Can at Beach's Mill | EA-EA |
| **39005** | Beverley Brook at Wimbledon Common | EA-KSL |
| **39006** | Windrush at Newbridge | EA-T |
| **39081** | Ock at Abingdon | EA-T |
| **40016** | Cray at Crayford | EA-KSL |
| **40018** | Darent at Lullingstone | EA-KSL |
| **40022** | Great Stour at Chart Leacon | EA-KSL |
| **48006** | Cober at Helston County Bridge | EA-DC |
| **50007** | Taw at Taw Bridge | EA-DC |
| **60009** | Sawdde at Felin-y-cwm | NRW |
| **66005** | Clwyd at Ruthin Weir | NRW |
| **71003** | Croasdale Beck at Croasdale Flume | EA-CL |
| **78005** | Kinnel Water at Bridgemuir | SEPA-SW |
| **92002** | Allt Coire nan Con at Polloch | SEPA-NW |

# ANNEX 3 STATIONS THAT HAVE POT DATA EXCLUDED

No POT data are presented on the NRFA website or given in the dataset for stations listed in ANNEX 3 . Four stations were added to the list in version 13, marked with a *. For more information see section 2.8.

| Station Number | Station Name | Measuring Authority |
|---|---|---|
| **23002** | Derwent at Eddys Bridge | EA-NE |
| **26003** | Foston Beck at Foston Mill | EA-Y |
| **26009** | West Beck at Snakeholme Lock | EA-Y |
| **26010** | Driffield Canal at Snakeholme Lock | EA-Y |
| **26013** | Driffield Trout Stream at Driffield | EA-Y |
| **26014** | Water Forlornes at Driffield | EA-Y |
| **26015*** | Driffield Canal at Wansford Bridge | EA-Y |
| **26016** | Gypsey Race at Kirby Grindalythe | EA-Y |
| **26017** | Ings Beck at South Newbald | EA-Y |
| **27038** | Costa Beck at Gatehouses | EA-Y |
| **27073** | Brompton Beck at Snainton Ings | EA-Y |
| **28033** | Dove at Hollinsclough | EA-WM |
| **28060*** | Dover Beck at Lowdham | EA-EM |
| **29005** | Rase at Bishopbridge | EA-LN |
| **30005** | Witham at Saltersford Total | EA-LN |
| **30006** | Slea at Leasingham Mill | EA-LN |
| **30013** | Heighington Beck at Heighington | EA-LN |
| **30015** | Cringle Brook at Stoke Rochford | EA-LN |
| **31004** | Welland at Tallington Total | EA-LN |
| **32006** | Nene/Kislingbury at Upton Total | EA-LN |
| **32810** | Nene/Kislingbury at Upton Mill | EA-LN |
| **33005** | Bedford Ouse at Thornborough Mill | EA-EA |
| **33007** | Nar at Marham | EA-EA |
| **33012** | Kym at Meagre Farm | EA-EA |
| **33032** | Heacham at Heacham | EA-EA |
| **33049** | Stanford Water at Buckenham Tofts | EA-EA |
| **33050** | Snail at Fordham | EA-EA |
| **33052** | Swaffham Lode at Swaffham Bulbeck | EA-EA |
| **33054** | Babingley at Castle Rising | EA-EA |
| **33057** | Ouzel at Leighton Buzzard | EA-EA |
| **34007** | Dove at Oakley Park | EA-EA |
| **34008** | Ant at Honing Lock | EA-EA |
| **34011** | Wensum at Fakenham | EA-EA |
| **34012** | Burn at Burnham Overy | EA-EA |
| **34018** | Stiffkey at Warham | EA-EA |
| **35001** | Gipping at Constantine Weir | EA-EA |
| **35003** | Alde at Farnham | EA-EA |
| **35004** | Ore at Beversham | EA-EA |
| **35010** | Gipping at Bramford | EA-EA |
| **36001** | Stour at Stratford St Mary | ESW |
| **36002** | Glem at Glemsford | EA-EA |
| **36003** | Box at Polstead | EA-EA |
| **36004** | Chad Brook at Long Melford | EA-EA |
| **36006** | Stour at Langham | EA-EA |

| Station Number | Station Name | Measuring Authority |
|---|---|---|
| **36007** | Belchamp Brook at Bardfield Bridge | EA-EA |
| **36008** | Stour at Westmill | EA-EA |
| **36009** | Brett at Cockfield | EA-EA |
| **36010** | Bumpstead Brook at Broad Green | EA-EA |
| **36011** | Stour Brook at Sturmer | EA-EA |
| **36012** | Stour at Kedington | EA-EA |
| **36015** | Stour at Lamarsh | EA-EA |
| **37003** | Ter at Crabbs Bridge | EA-EA |
| **37005** | Colne at Lexden | EA-EA |
| **37007** | Wid at Writtle | EA-EA |
| **37008** | Chelmer at Springfield | EA-EA |
| **37009** | Brain at Guithavon Valley | EA-EA |
| **37010** | Blackwater at Appleford Bridge | EA-EA |
| **37011** | Chelmer at Churchend | EA-EA |
| **37012** | Colne at Poolstreet | EA-EA |
| **37013** | Sandon Brook at Sandon Bridge | EA-EA |
| **37016** | Pant at Copford Hall | EA-EA |
| **37017** | Blackwater at Stisted | EA-EA |
| **37031** | Crouch at Wickford | EA-EA |
| **37033** | Eastwood Brook at Eastwood | EA-EA |
| **38011** | Mimram at Fulling Mill | EA-HNL |
| **39010** | Colne at Denham | EA-HNL |
| **39015** | Whitewater at Lodge Farm | EA-T |
| **39020** | Coln at Bibury | EA-T |
| **39021** | Cherwell at Enslow Mill | EA-T |
| **39027** | Pang at Pangbourne | EA-T |
| **39033** | Winterbourne Stream at Bagnor | EA-T |
| **39034** | Evenlode at Cassington Mill | EA-T |
| **39037** | Kennet at Marlborough | EA-T |
| **39041** | Lambourn at Shaw Ultrasonic | EA-T |
| **39088** | Chess at Rickmansworth | EA-HNL |
| **39089** | Gade at Bury Mill | EA-HNL |
| **39095** | Quaggy at Manor House Gardens | EA-KSL |
| **39206** | Windrush at Newbridge Side Weir | EA-T |
| **39406** | Windrush at Newbridge Main Weir | EA-T |
| **40033** | Dour at Crabble Mill | EA-KSL |
| **41015** | Ems at Westbourne | EA-SSD |
| **41023** | Lavant at Graylingwell | EA-SSD |
| **42005** | Wallop Brook at Broughton | EA-SSD |
| **42006** | Meon at Mislingford | EA-SSD |
| **42007** | Alre at Drove Lane Alresford | EA-SSD |
| **42008** | Cheriton Stream at Sewards Bridge | EA-SSD |
| **42009** | Candover Stream at Borough Bridge | EA-SSD |
| **42010** | Itchen at Highbridge & Allbrook Total | EA-SSD |
| **42012** | Anton at Fullerton | EA-SSD |
| **42017** | Hermitage Stream at Havant | EA-SSD |
| **42202** | Itchen at Highbridge | EA-SSD |
| **42212** | Anton at Fullerton Bypass | EA-SSD |

| Station Number | Station Name | Measuring Authority |
|---|---|---|
| **42412** | Anton at Fullerton Main Weir | EA-SSD |
| **42810** | Alre at Drove Lane Alresford Main | EA-SSD |
| **42811** | Alre at Drove Lane Alresford Side | EA-SSD |
| **42813** | Itchen at Allbrook | EA-SSD |
| **43003** | Avon at East Mills Total | EA-WX |
| **43004** | Bourne at Laverstock | EA-WX |
| **43005** | Avon at Amesbury | EA-WX |
| **43008** | Wylye at South Newton | EA-WX |
| **43010** | Allen at Loverley Farm | EA-WX |
| **43012** | Wylye at Norton Bavant | EA-WX |
| **43018** | Allen at Walford Mill | EA-WX |
| **43028** | Chitterne Brook at Codford | EA-WX |
| **43029** | Wylye at Brixton Deverill | EA-WX |
| **44002** | Piddle at Baggs Mill | EA-WX |
| **44004** | Frome at Dorchester Total | EA-WX |
| **44006** | Sydling Water at Sydling St Nicholas | EA-WX |
| **44008** | South Winterbourne at Winterbourne Steepleton | EA-WX |
| **44009** | Wey at Broadwey | EA-WX |
| **44013** | Piddle at Little Puddle | EA-WX |
| **44014** | Piddle at Briantspuddle | EA-WX |
| **54003** | Vyrnwy at Vyrnwy Reservoir | NRW |
| **54027** | Frome at Ebley Mill | EA-WM |
| **54061** | Hodnet Brook at Hodnet | EA-WM |
| **54062** | Stoke Brook at Stoke on Tern | EA-WM |
| **55030** | Claerwen at Dol-y-mynach | NRW |
| **55035** | Iago at Iago flume | CEHW |
| **64010*** | Mawddach at Tyddyn Gwladys | NRW |
| **67020** | Dee at Chester Weir | NRW |
| **68007** | Wincham Brook at Lostock Gralam | EA-GMMC |
| **68010** | Fender at Ford Lane | EA-GMMC |
| **69002** | Irwell at Adelphi Weir | EA-GMMC |
| **69045*** | Bollin at Bollington Mill Total | EA-GMMC |
| **71003** | Croasdale Beck at Croasdale Flume | EA-CL |
| **84013** | Clyde at Daldowie | SEPA-SW |
| **85001** | Leven at Linnbrane | SEPA-SW |
| **205034** | Woodburn at Control | DfIR |
| **206006** | Annalong at Recorder | BCDWC |