

# **Updates to the WINFAP-FEH design flood estimation software**

**Dr Thomas Kjeldsen**

**Centre for Ecology and Hydrology, Wallingford**

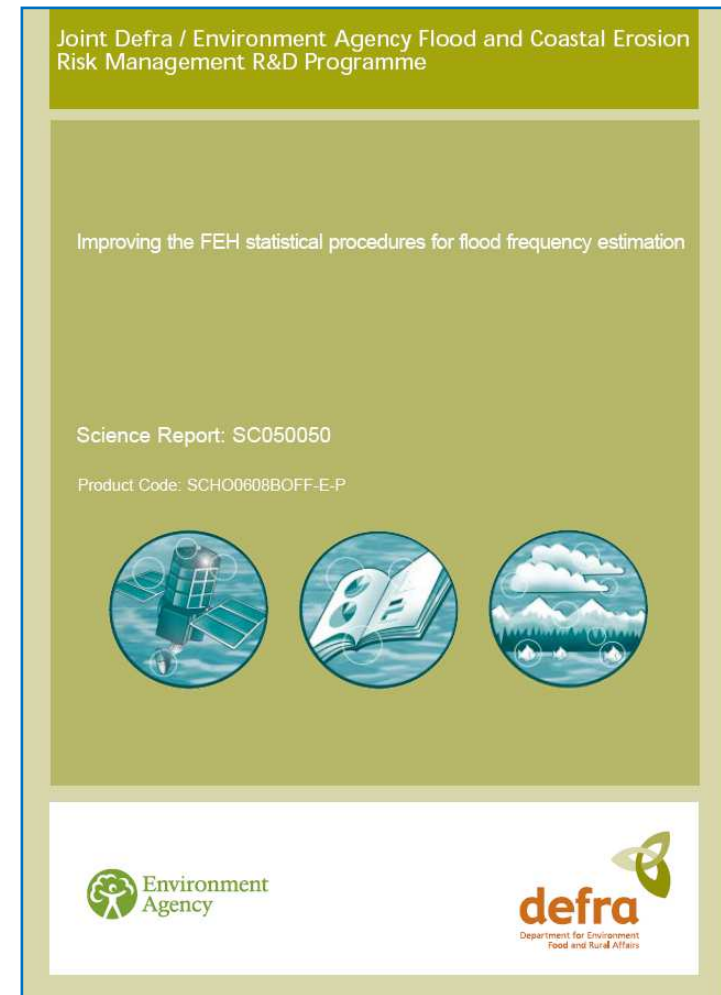
**and**

**Dr David Mould**

**Wallingford HydroSolutions**

**[david.mould@hydrosolutions.co.uk](mailto:david.mould@hydrosolutions.co.uk)**

- New catchment descriptors
- Improved QMED estimation equation
- Enhanced QMED adjustment (donor sites)
- Improved pooling group development
  - Enhanced single site analysis
  - New similarity index



## **New catchment descriptors**

1. **FPEXT: Floodplain extent**  
Fraction of catchment inundated by 100-year flood
2. **FPLOC: Floodplain location**  
Measure of distance from FP to channel
3. **FPDBAR: Average floodplain depth**  
Effectively a measure of water volume, and so attenuation
4. **CENTROID: Catchment's central location**  
In contrast to catchment outlet; used in QMED donor adjustment

- **Improved QMED<sub>CDS</sub> equation**

- QMED = Median annual maximum flow
- Estimated from catchment descriptors

FEH (1999): 
$$QMED_{\text{med}} = 1.172 \text{ AREA}^{AE} \left( \frac{\text{SAAR}}{1000} \right)^{1.560} \text{ FARE}^{2.642} \left( \frac{\text{SPRHOST}}{100} \right)^{1.211} 0.0198^{\text{RESHOST}}$$

- **Improved QMED<sub>CDS</sub> equation**

- QMED = Median annual maximum flow
- Estimated from catchment descriptors

FEH (1999):

$$QMED_{\text{rural}} = 1.172 \text{ AREA}^{AE} \left( \frac{\text{SAAR}}{1000} \right)^{1.560} \text{ FARL}^{2.642} \left( \frac{\text{SPRHOST}}{100} \right)^{1.211} 0.0198^{\text{RESHOST}}$$

Kjeldsen  
*et al.* (2008):

$$QMED = 8.3062 \text{ AREA}^{0.8510} 0.1536 \left( \frac{1000}{\text{SAAR}} \right) \text{ FARL}^{3.4451} 0.0460^{\text{BFIHOST}^2}$$

- Enhanced QMED donor adjustment**
  - QMED adjustment from nearby donor gauge
  - Uses data to improve estimate at ungauged site
  - Functionality new to WINFAP-FEH 3

Estimate QMED

Select method for estimating QMED

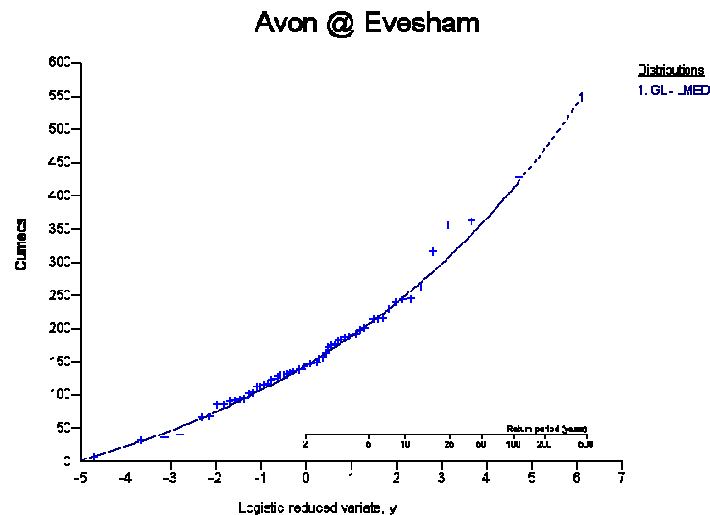
Method QMED

AM 16.016  
 PDT NA  
 Catchment descriptors 22.860  
 User defined value  
 Donor station 20.241

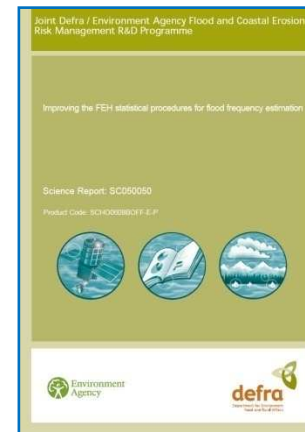
	Station	QMED donor	Centroid X	Centroid Y	Centroid distance (km)	AREA	SAAR	BFIHOST	FARL	U
1	39026 (Cherwell @ Ba		449514	249775		204.570	664	0.410	0.950	0
2	33018 (Tove @ Cappe	20.241	463136	247958	13.74	132.650	661	0.368	0.986	0
3	33037 (Bedford Duse	C 23.011	470035	238160	23.58	801.650	648	0.437	0.943	0
4	33005 (Bedford Duse	C 20.007	467160	231972	25.07	387.740	655	0.480	0.983	0
5	54106 (Stour @ Shipst	22.253	424857	236671	27.92	185.160	677	0.454	0.993	0
6	39034 (Evenlode @ C	23.490	432691	223000	31.62	427.140	691	0.699	0.965	0
7	54102 (Avon @ Libour	24.099	462407	279063	32.00	109.570	668	0.354	0.906	0
8	39002 (Thames @ Day	23.480	430925	212889	41.31	3480.010	690	0.650	0.953	0
9	39006 (Windrush @ N	22.452	418884	219840	42.83	361.600	744	0.790	0.951	0

< Back Next > Cancel Help

- **Improved Estimation of Growth Curve**
  - First update since 1999
  - New pooling group equation including new CDs
  - Standard pooling group size of 500 station years
  - new pooled growth curve weighting scheme: no reliance of weightings on Rank (CD distance)



- Includes method updates



- Includes updated urban adjustment procedures
- Overhauled user interface
- 9<sup>th</sup> September 2009



- Enhanced Single Site analysis
  - Pooling methods for Gauged sites
  - Weighting 80% to gauged record

**Pooling-group development**

Name: 39026 (29-04-2009 16:42)

Site of interest: 39026 (Cherwell @ Banbury)

Define custom pooling group size

Pooling group size (years of AM data): 500

Date validation

Use FEH rejected sites

Subject Site:

Ungauged

Gauged (Enhanced single site)

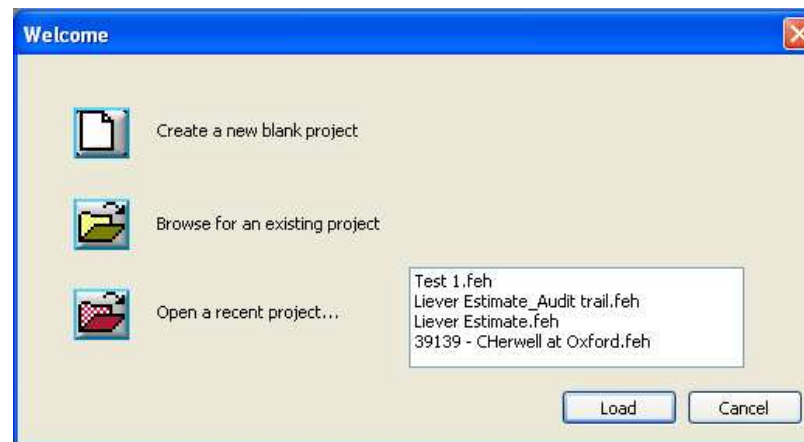
Date details:

Year type: Water year

Start date (month only): October

Create Cancel

- USB dongle for easy licensing
- User-friendly menus
- Return period calculator



- Improved pooling group development
  - Incorporating updated methods

Pooling-group details 33013 (29-04-2009 16:58)

AM Data Catchment Descriptors

	Station	Distance	Years of data	QMED obs	L-CV	L-SKEW	Discordant
1	33013 (Sapiston @ Rectory Brid	0.000	42	8.954	0.320	0.126	0.523
2	34001 (Yare @ Colney)	0.261	45	16.952	0.303	0.221	0.465
3	54041 (Tern @ Eaton on Tern)	0.446	31	12.794	0.208	0.122	0.728
4	39026 (Cherwell @ Banbury)	0.450	36	22.860	0.374	0.417	2.614
5	33020 (Alconbury Brook @ Brann	0.467	31	20.896	0.149	-0.344	2.356
6	68005 (Weaver @ Audlem)	0.485	34	21.623	0.224	0.391	1.376
7	53002 (Semington Brook @ Sem	0.534	27	15.555	0.102	0.003	1.464
8	33012 (Kym @ Meagre Farm)	0.534	43	16.215	0.280	0.073	0.175
9	25005 (Leven @ Leven Bridge)	0.536	43	34.899	0.250	0.296	0.640
10	37010 (Blackwater @ Appleford	0.552	41	16.484	0.293	0.076	0.434
11	33007 (Nar @ Marham)	0.580	35	3.949	0.247	0.102	0.216
12	54040 (Meese @ Tibberton)	0.584	30	11.571	0.172	0.081	0.514
13	68020 (Goway @ Bridge Trafford)	0.585	24	18.027	0.155	-0.186	0.769
14	33011 (Little Ouse @ County Bri	0.587	42	5.764	0.321	0.028	1.084
15							
16	Total		504				
17	Weighted means				0.255	0.112	

Key

- Short Records
- Discordant
- No Pooling
- No Pooling, No QMED

AM Graphs Add Site Remove Site OK



- Safe editing of catchment descriptors and flood data
- Copy and paste facility from tables
- Full integration with the HiFlows-UK website

The screenshot displays the 'Station details' window for station 39026 (Cherwell @ Banbury). The interface includes fields for station number, name, location, and catchment area, along with a table of annual maxima data.

Annual Maxima	Water year	Date	Cumecs
1	1966	11 Dec 1966	18,213
2	1967	12 Jul 1968	27,129
3	1968	14 Mar 1969	25,087
4	1969	21 Feb 1970	11,543
5	1970	01 Feb 1971	16,975
6	1971	03 Feb 1972	13,969
7	1972	08 Dec 1972	14,747
8	1973	03 Feb 1974	12,000
9	1974	09 Mar 1975	46,400
10	1975	02 Dec 1976	0,608
11	1976	24 Feb 1977	17,900
12	1977	28 Jan 1978	13,700
13	1978	02 Feb 1979	45,900
14	1979	28 Dec 1979	54,100
15	1980	07 Aug 1981	17,200
16	1981	30 Dec 1981	24,000
17	1982	01 May 1983	12,600
18	1983	27 Jan 1984	15,300
19	1984	07 Jun 1985	12,900
20	1985	10 Jan 1986	26,500
21	1986	08 Apr 1987	11,329
22	1987	01 Nov 1987	5,750
23	1988	07 Apr 1989	10,927
24	1989	08 Feb 1990	10,635
25	1990	10 Jan 1991	11,019
26	1991	26 Sep 1992	43,738
27	1992	14 Jan 1993	16,731
28	1993	06 Jan 1994	17,084
29	1994	02 Feb 1995	19,260
30	1995	23 Dec 1995	10,618
31	1996	19 Feb 1997	4,783