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Implications of variations in stream specific conductivity for estimating baseflow using chemical mass balance and calibrated hydrograph techniques

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Supplementary data

Catchments

Barwon Catchment

Streamflow and SC data are from the Ricketts Marsh (223224), Kildean Lane (223247), Winchelsea (223201), Inverleigh (223218), and Pollocksford (233200) gauges on the main Barwon River and the Agroforestry (233250), Birregurra (223211), Warrambine (223223), and Leigh (223213) tributaries (Fig. S1).

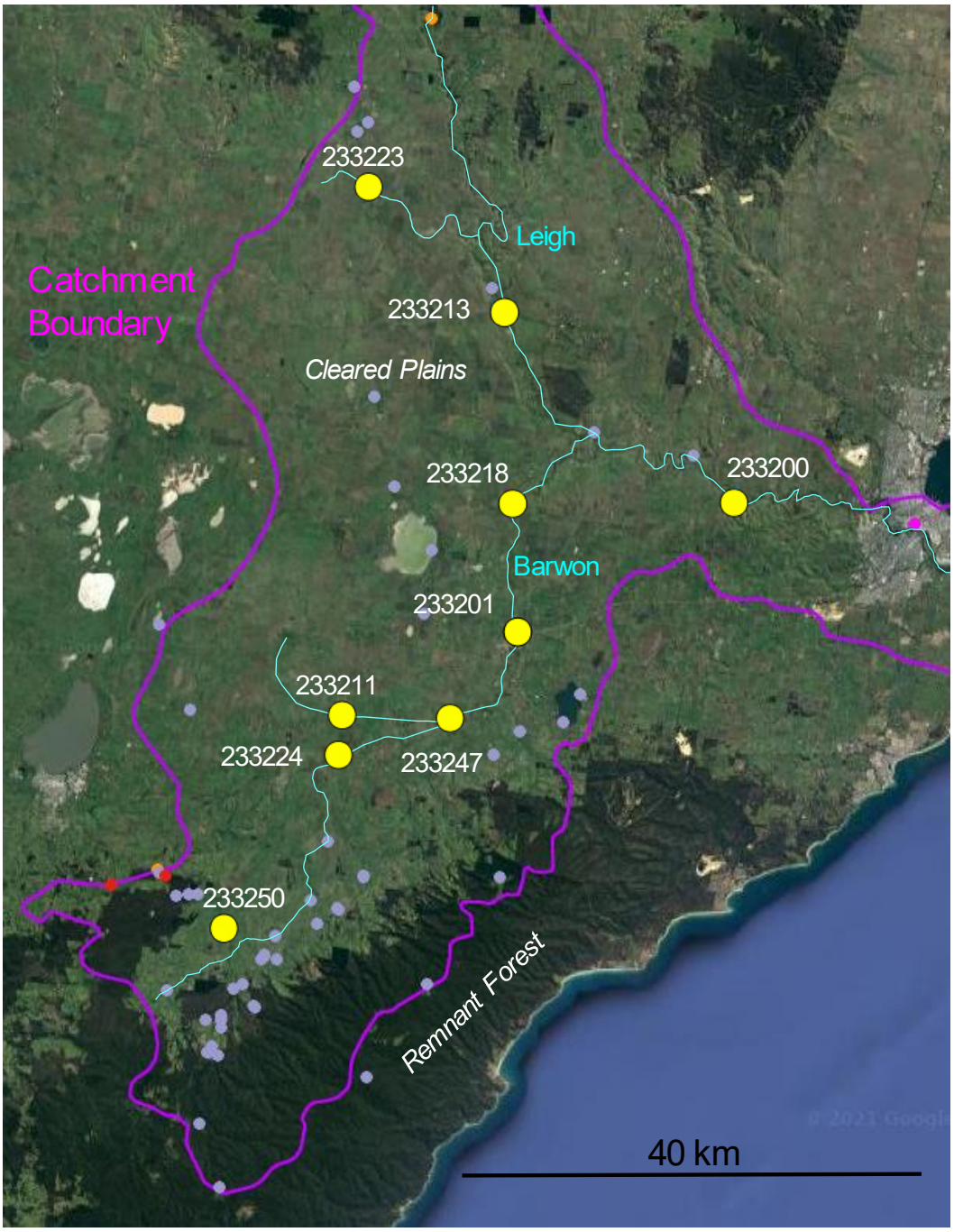


Fig. S1. Map of the Barwon catchment (modified from Department of Environment, Land, Water and Planning, 2021, background image ©Google Earth 2021). Numbered circles are the gauges analysed in this study (other gauges indicated by small un-numbered circles).

Corangamite catchment

Data are from four gauges: 234200 (Woady Yallock River at Cressy), 234201 (Woady Yallock River at Pitfield), 2344209 (Deans Creek), and 234212 (Browns Waterholes) (Fig. S2).

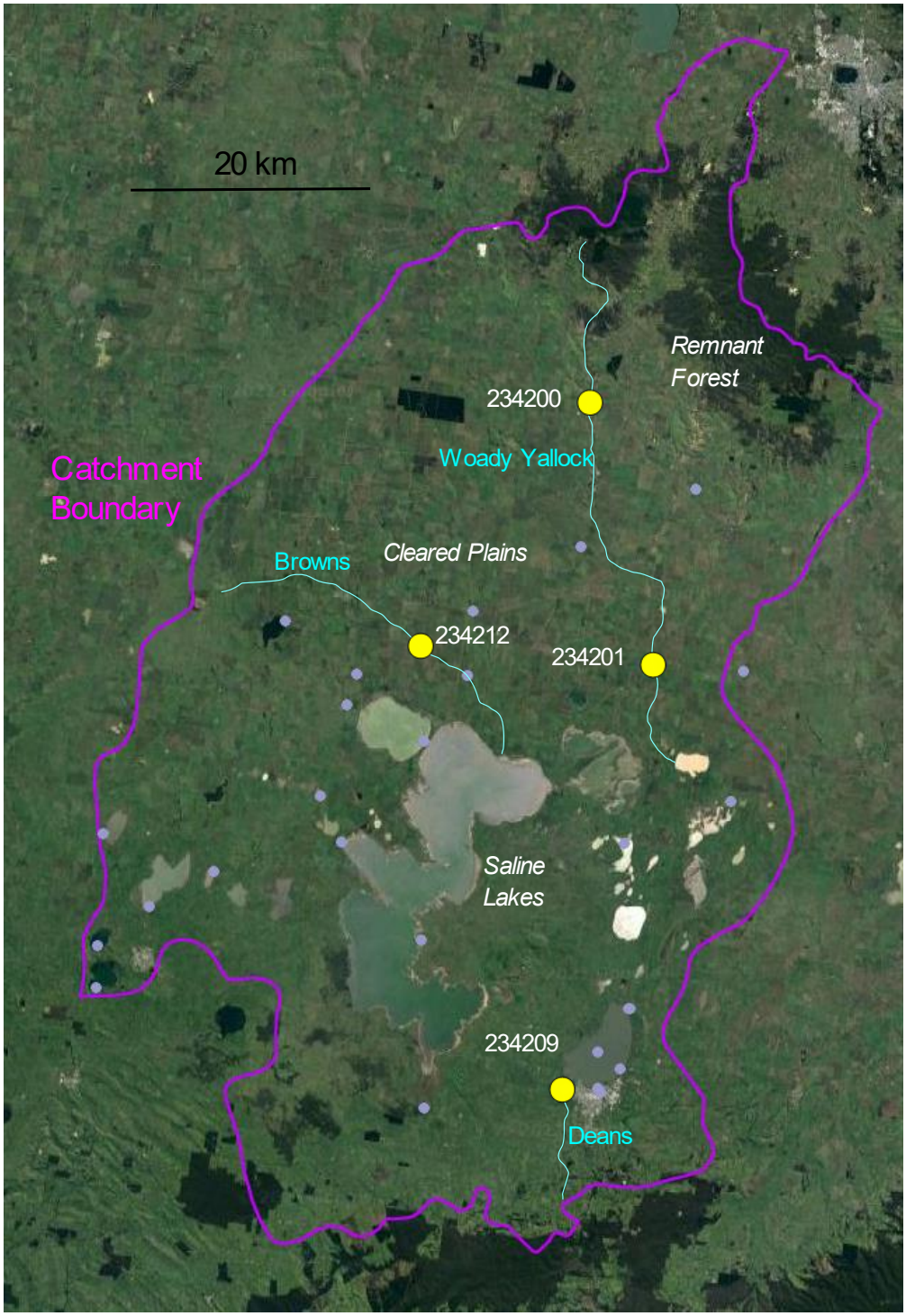


Fig. S2. Map of the Corangamite catchment (modified from Department of Environment, Land, Water and Planning, 2021, background image ©Google Earth 2021). Numbered circles are the gauges analysed in this study (other gauges indicated by small un-numbered circles).

Goulburn Catchment

Data are from four gauges from unregulated tributaries to the highly-regulated Goulburn River: 405212 (Sunday Creek), 405226 (Pranjip Creek), 405240 (Sugarloaf Creek), and 405246 (Castle Creek) (Fig. S3).

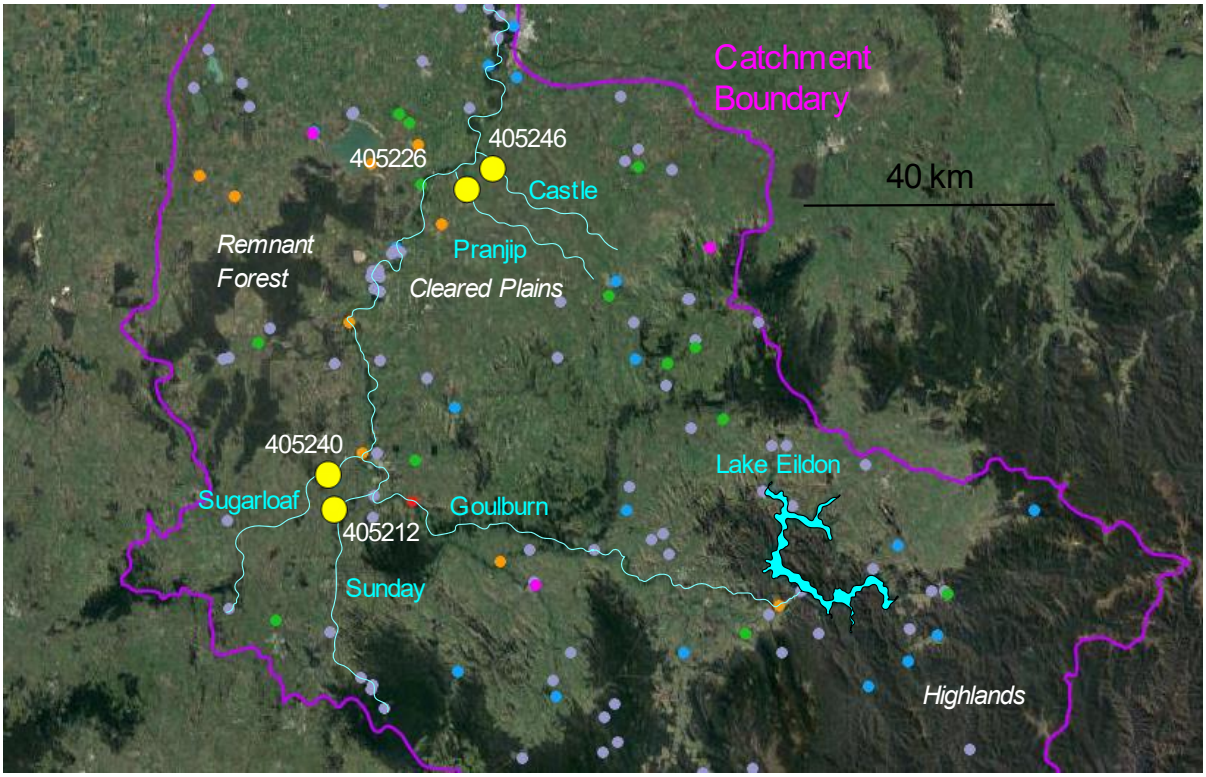


Fig. S3. Map of the Goulburn catchment (modified from Department of Environment, Land, Water and Planning, 2021, background image ©Google Earth 2021). Numbered circles are the gauges analysed in this study (other gauges indicated by small un-numbered circles).

Loddon Catchment

Data are from six gauges from unregulated tributaries to the regulated Loddon River: 407211 (Bet Bet Creek at Bet Bet), 407239 (Middle Creek), 407252 (Barr Creek), 407284 (Calivil Creek), 407288 (Bet Bet Creek at Lillicur), and 407289 (Nine Mile Creek) (Fig. S4).

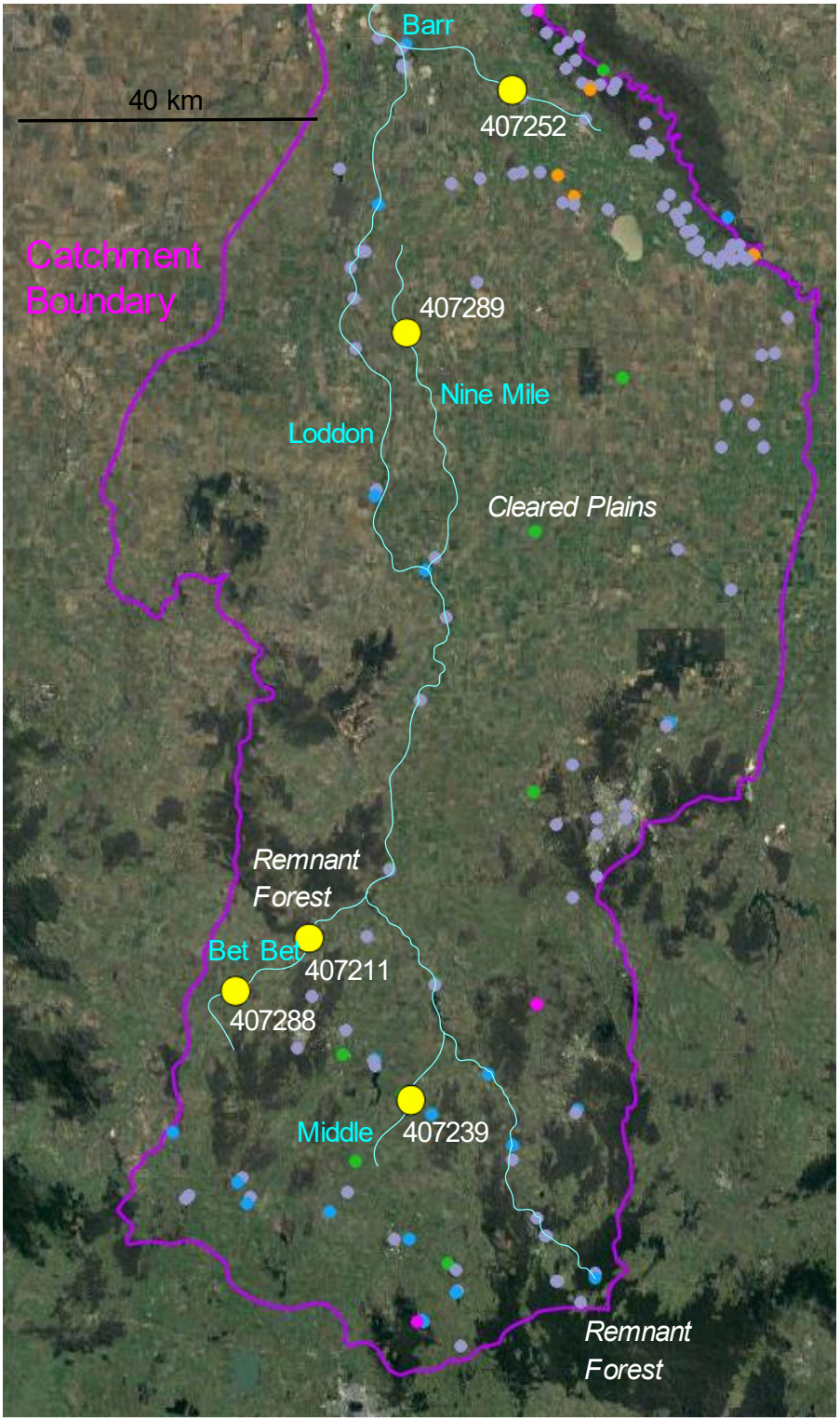


Fig. S4. Map of the Loddon catchment (modified from Department of Environment, Land, Water and Planning, 2021, background image ©Google Earth 2021). Numbered circles are the gauges analysed in this study (other gauges indicated by small un-numbered circles).

BFI from the CMB method

Figure S5. Variations in annual BFI and Discharge (Q in m^3/sec) for the Barwon Catchment calculated using the constant SC (squares) and variable SC (diamonds) method.

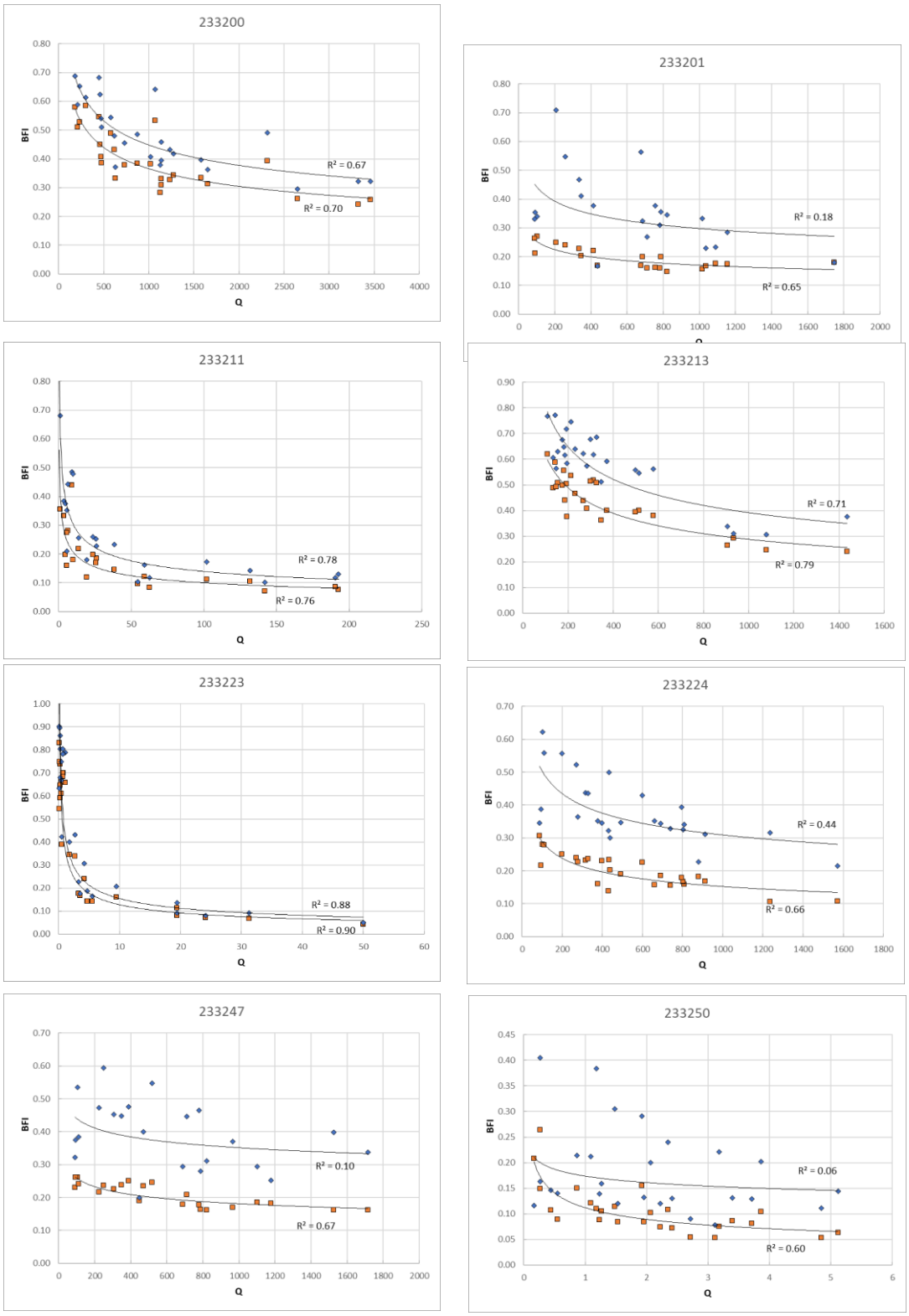


Figure S6. Variations in annual BFI and Discharge (Q in m^3/sec) for the Corangamite Catchment calculated using the constant SC (squares) and variable SC (diamonds) method.

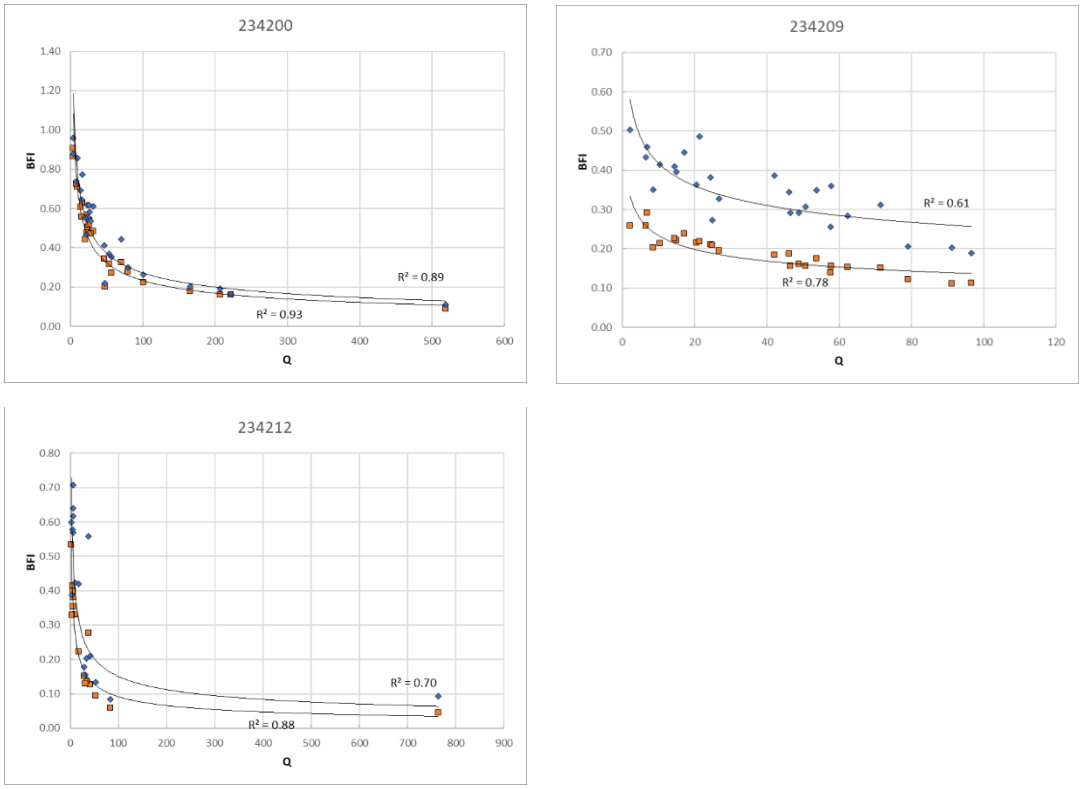


Figure S7. Variations in annual BFI and Discharge (Q in m^3/sec) for the Goulburn Catchment calculated using the constant SC (squares) and variable SC (diamonds) method.

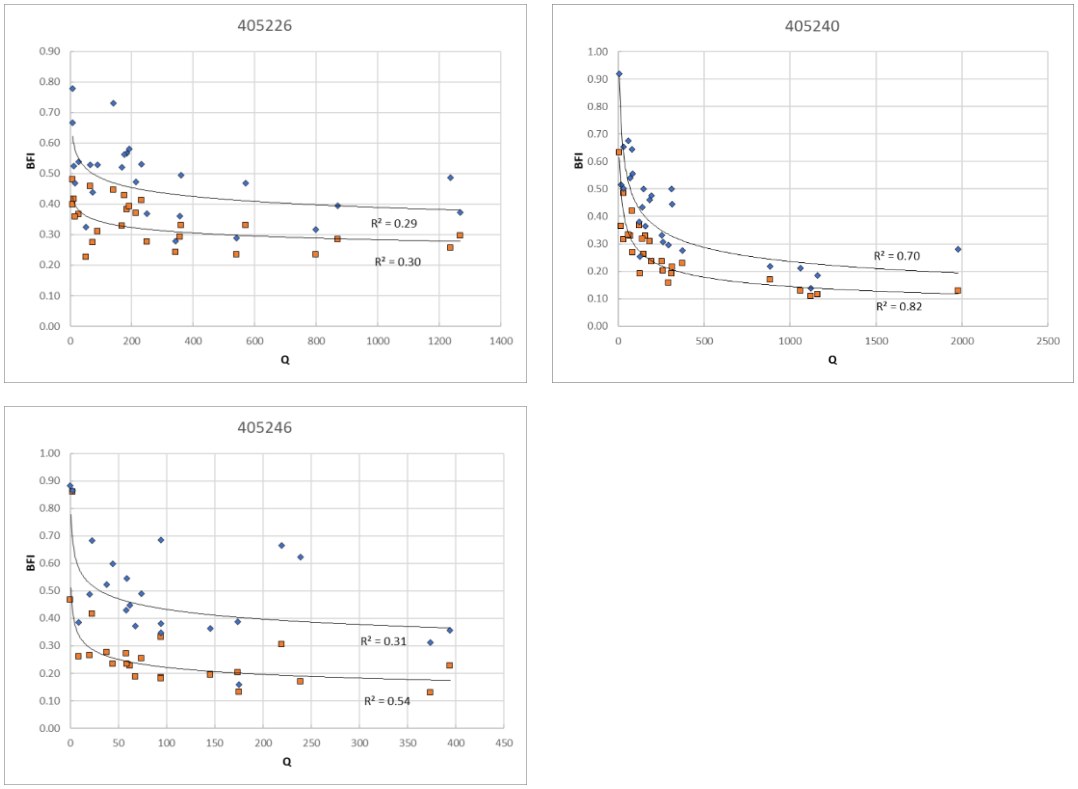
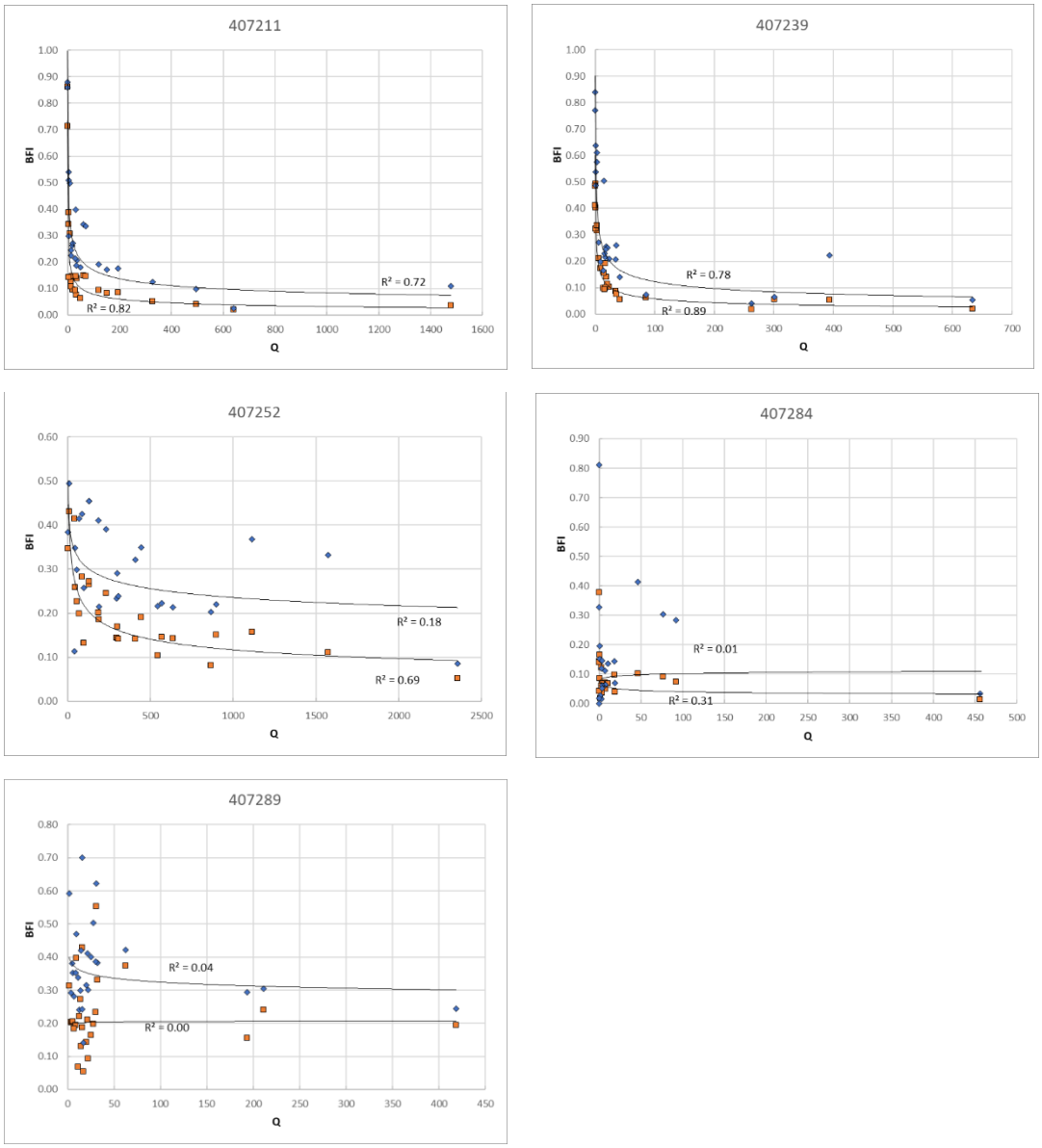


Figure S8. Variations in annual BFI and Discharge (Q in m^3/sec) for the Goulburn Catchment calculated using the constant SC (squares) and variable SC (diamonds) method.



Comparison of BFI from CMB and hydrograph-based techniques

Figure S9. Comparison BFI calculated from the RDF and SM methods with the BFI from CMB using the variable and constant SC calculations for the Barwon Catchment (symbols as for Fig. 5).

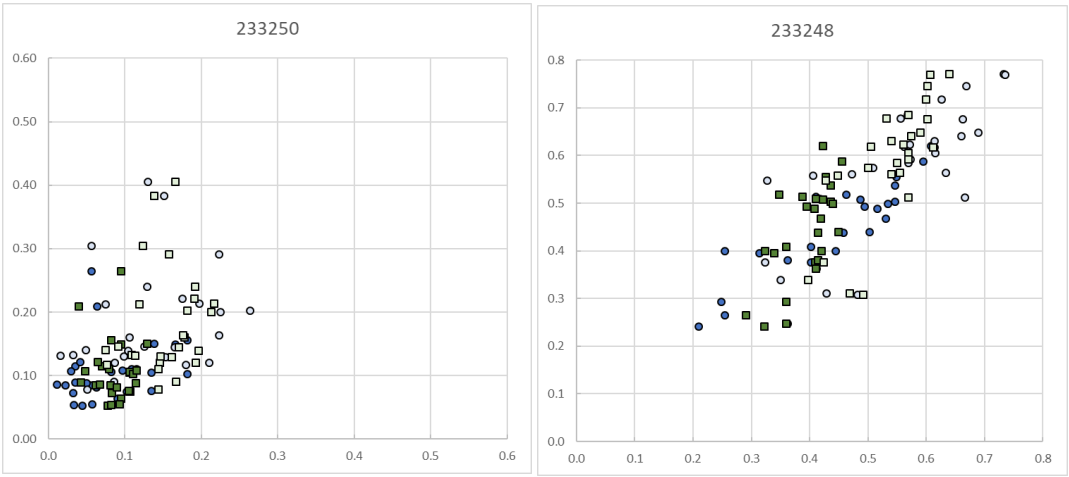


Figure S10. Comparison BFI calculated from the RDF and SM methods with the BFI from CMB using the variable and constant SC calculations for the Corangamite Catchment (symbols as for Fig. 5).

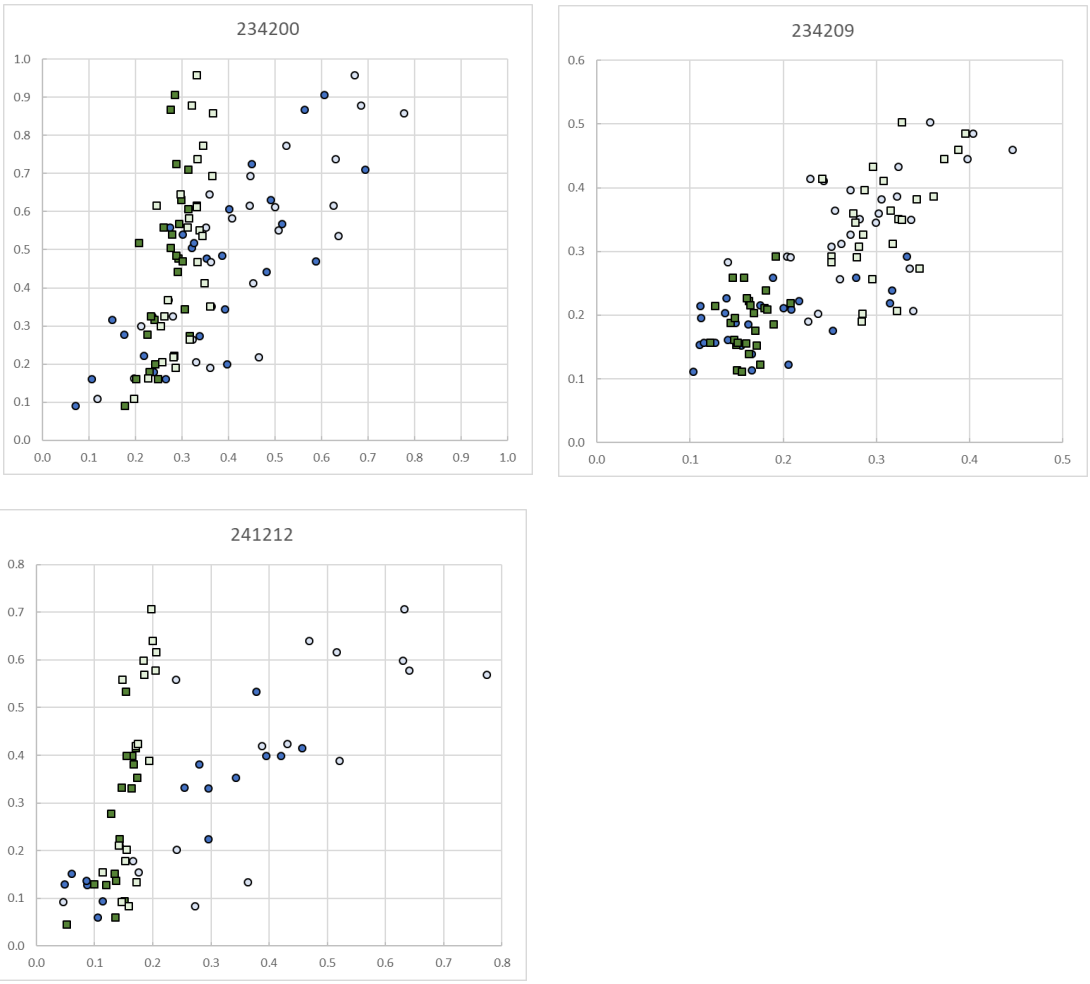


Figure S11. Comparison BFI calculated from the RDF and SM methods with the BFI from CMB using the variable and constant SC calculations for the Goulburn Catchment (symbols as for Fig. 5).

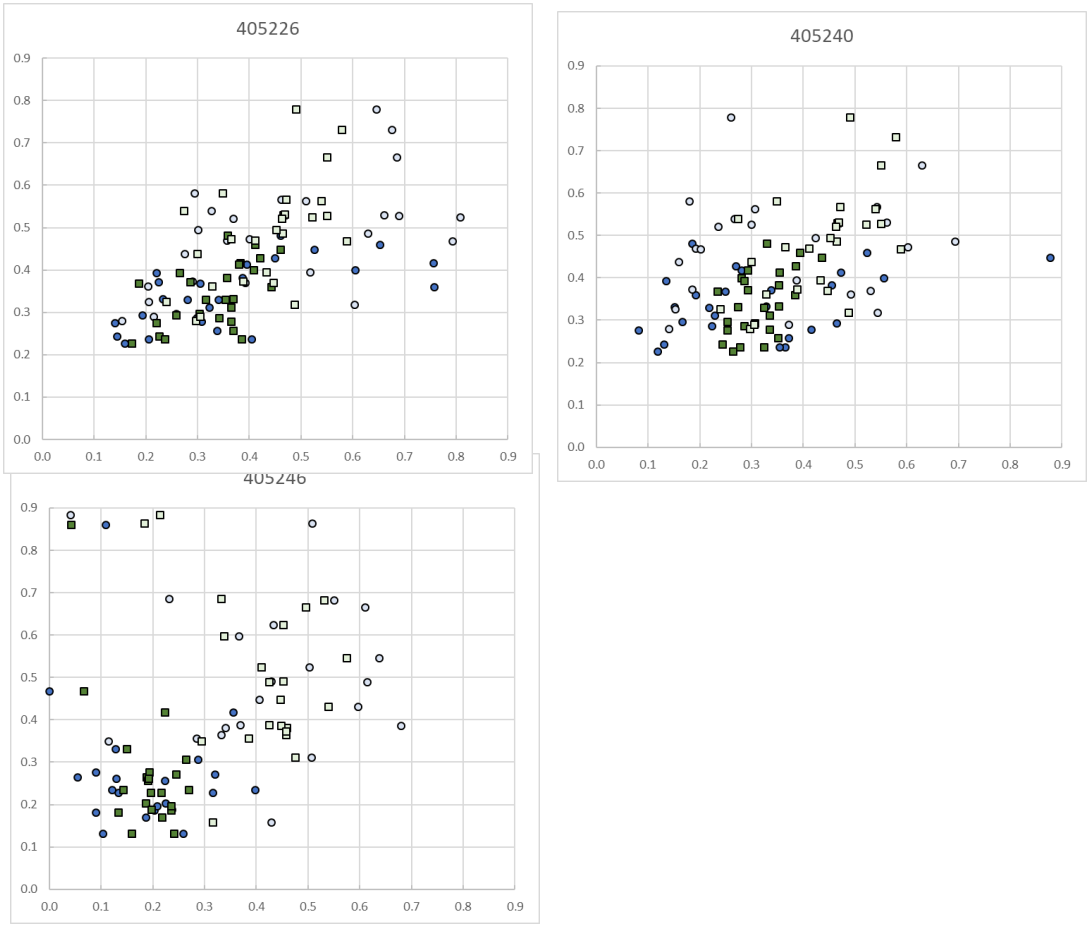
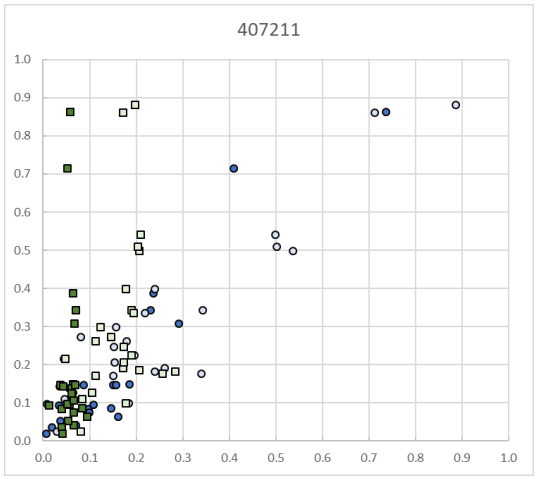
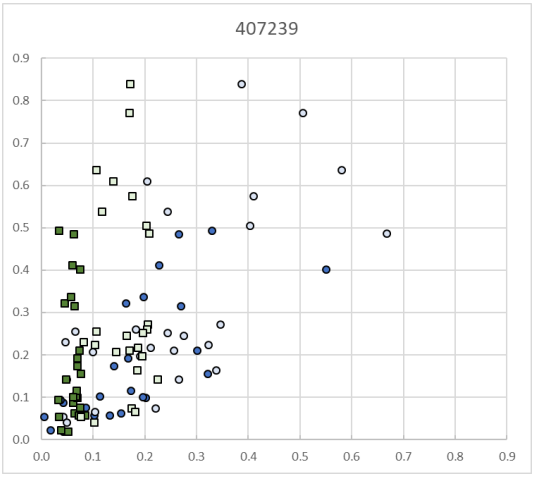
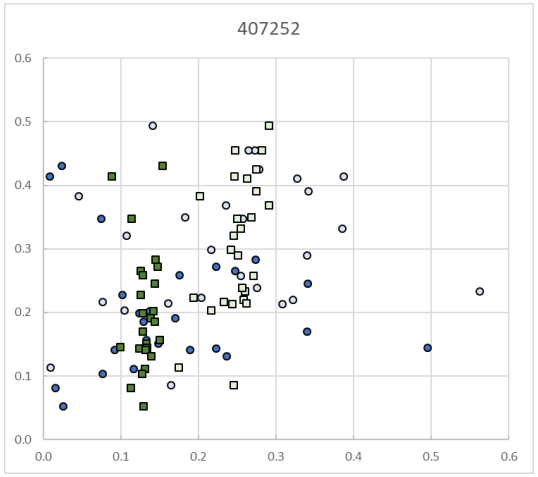
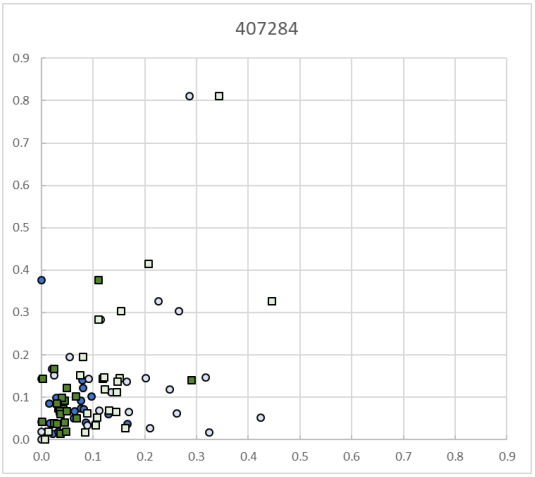


Figure S12. Comparison BFI calculated from the RDF and SM methods with the BFI from CMB using the variable and constant SC calculations for the Loddon Catchment (symbols as for Fig. 5).









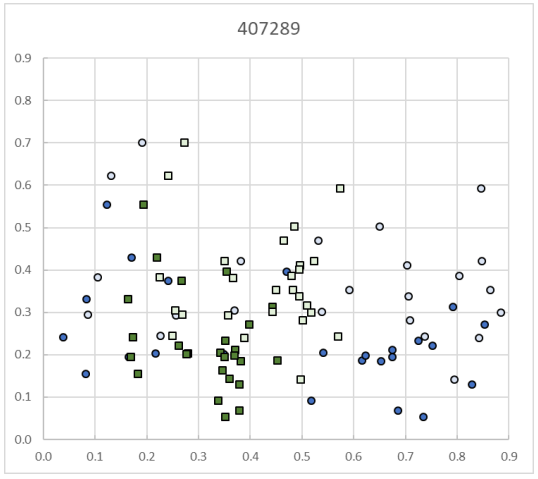


Table S1. Summary of parameters from the recursive digital filter and smoothed minimum methods

Station	Area	BFI[a]	BFI[a]	N[b]	N[c]	N[c]		A[d]	BFImax[e]	BFImax[e]
	km^2	CMBv	CMBc		CMBv	CMBc			CMBv	CMBc
Barwon Catchment										
233200	2713	0.42	0.34	4	7	9		0.93	0.51	0.39
233201	1052	0.32	0.17	3	8	12		0.94	0.40	0.19
233211	88	0.15	0.11	2	14	16		0.95	0.19	0.14
233213	839	0.50	0.37	3	6	8		0.94	0.46	0.43
233218	1269	0.20	0.10	3	15	21		0.92	0.22	0.09
233223	57	0.13	0.11	2	16	19		0.94	0.36	0.29
233224	593	0.34	0.17	3	7	16		0.94	0.43	0.18
233247	864	0.36	0.19	3	8	14		0.93	0.46	0.20
233250	5	0.16	0.09	1	14	24		0.95	0.28	0.15
Corangamite Catchment										
234200	324	0.26	0.22	3	9	12		0.92	0.37	0.32
234201	1158	0.21	0.17	3	11	15		0.93	0.23	0.17
234209	45	0.30	0.16	2	8	16		0.93	0.21	0.17
234212	231	0.15	0.08	2	16	26		0.92	0.41	0.19
Goulburn Catchment										
405212	337	0.37	0.15	3	5	14		0.94	0.48	0.16
405226	787	0.42	0.30	3	6	9		0.94	0.57	0.42
405240	609	0.28	0.26	3	7	11		0.95	0.40	0.18
405246	164	0.43	0.21	2	4	10		0.93	0.61	0.25
Loddon Catchment										
407211	1850	0.11	0.05	4	15	30		0.93	0.21	0.07
407239	137	0.14	0.05	2	14	32		0.92	0.22	0.08
407252	2850	0.25	0.13	4	8	16		0.93	0.26	0.13
407284	650	0.13	0.04	3	19	35		0.94	0.16	0.04
407288	124	0.18	0.13	2	12	16		0.94	0.40	0.25
407289	nm	0.31	0.24		5	8		0.95	0.54	0.38

a. BFI calculated using the CMB with the variable (CMBv) and constant (CMBc) baseflow SC values
b. Block size (N) calculated using catchment area (Askoy et al., 2008)
c. Block size required to produce agreement between the long-term BFI from the Sliding Minimum method and the Chemical Mass Balance method using variable (CMBv) and constant (CMBc) baseflow SC values
d. Recession parameter in the Recursive Digital Filter
e. BFI_{max} required to produce agreement between the long-term BFI from the Recursive Digital Filter and the Chemical Mass Balance method using variable (CMBv) and constant (CMBc) baseflow SC values

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