Hydrological Summary for Great Britain

DECEMBER 1994

Rainfall

December was generally a mild, wet month punctuated by some very boisterous weather, several notably cold interludes and, in contrast, a couple of balmy spells. Hydrologically, the most significant factor was the persistence of a south-westerly or westerly airflow which produced heavy and sustained rainfall over parts of northern and western Britain especially. The arrival, decidedly late, of the winter's first significant snowfall in the southern Grampians on the 6th heralded a very wet spell. A warm front trending SW/NE became almost stationary across west-central Scotland and large areas, including many low-lying districts, registered >100 mm of rain for the three-day period ending on the 11th. Paisley recorded 165 mm on the 10th and return periods for two-day rainfall totals are thought to have exceeded 500 years for East Kilbride and other lowland sites. Very unsettled conditions returned after Christmas, active fronts on a south-westerly airstream produced exceptional 2- and 3-day rainfall totals in Wales and the South-West; some localities reported continuous rainfall over 48 hours. Treherbert (Rhondda Valley) reported a remarkable 236 mm total for the 26-28th and return periods of over 30 years were associated with 3- and 4-day totals in the Cambrian mountains. Subsequently conditions became colder and blizzards contributed to the first substantial winter snowfall in parts of northern England on the 29th. Regional precipitation totals for December were well above average throughout Britain - in the west especially; Glasgow recorded its wettest December on record. However, some localities - mostly close to the eastern seaboard - were relatively dry. Persistent rain-shadow effects have contributed to the below average rainfall totals for 1994 in such areas but apart from the NERPB area all regions recorded above average totals for the year and 21-month totals are exceptional in southern and western areas, the South-West especially.

River Flow

The recovery of runoff rates through the autumn was generally erratic but by early December flows in most rivers exceeded the average and near saturated catchments in the west and north were vulnerable to further precipitation. Spate conditions were common around the 8th, in Wales especially and floodplain inundation was widespread over the ensuing week. On the 9th-11th existing peak flows were widely eclipsed - often by large margins - throughout west-central Scotland as sustained heavy rainfall produced devastating flooding in parts of the Strathclyde Region. The heaviest rainfall affected all rivers converging on the Glasgow area and caused unprecedented damage - inundating housing in six main areas of the city. The economic cost may reach £100 million and three lives were lost. Blocked culverts and breached floodbanks were exacerbating factors and floodwaters reached depths of 2 m in some localities. Many of those worst affected lived in poorer communities, often having no insurance. Transport disruption was massive - and long term in the case of the Glasgow Underground. The estimated peak flow at Killermont on the Kelvin is about double the previous maximum in a 45-year record - a tentative return period of 250 years has been assessed. Scour holes and soil stripping illustrate the extreme geomorphic power of this flood event. Ten days later less severe but widespread flooding occurred in Wales and the South-West but peak flows were mostly in the 3-10 year return period range; the highest flows were, however, notable for their durations with Red Alerts operational for relatively extended periods. Inundation of agricultural land was widespread. Many western and northern rivers including the Clyde and South Tyne established new monthly runoff records for December and generally runoff totals for 1994 are exceptionally high. However, monthly flow rates remain below average, in parts of eastern Britain.

Groundwater

In the western aquifers groundwater level recoveries were brisk in December but recharge rates throughout much of the Chalk outcrop areas remained below average - in the eastern aquifer especially. Lingering soil moisture deficiencies prevented recoveries in such areas gathering momentum and in some deep wells (e.g. Therfield) water-tables continued to decline through December. Generally however, levels are rising although the late 1994 trough for some boreholes was considerably below average (e.g. Dalton Holme). With the exception of such sites levels remain close to or above average; the slow recovery in the confined Permo-Triassic sandstones of the Midlands since the drought has now returned levels to the normal range.

General

Reservoir stocks climbed steeply through December and the resources outlook is generally very good - but a more cautious view of prospects is appropriate in a few eastern areas.

Institute of Hydrology

British Geological Survey

Data for this report have been provided principally by the regional divisions of the National Rivers Authority* in England and Wales, the River Purification Boards in Scotland and by the Meteorological Office. Reservoir contents information has been supplied by the Water Services Companies, the NRA or, in Scotland, the Lothian and Strathclyde Regional Councils. The most recent areal rainfall figures are derived from a restricted network of raingauges and a proportion of the river flow data is of a provisional nature.

A map (Figure 3) is provided to assist in the location of the principal monitoring sites.

Financial support towards the production of the Hydrological Summaries is given by the Department of the Environment and the National Rivers Authority.

The Hydrological Summaries are available on annual subscription at a current cost of £48 per year - enquiries should be directed to the National Water Archive Office at the address below. No charge is made to those organisations providing data for the Summaries.

Note: A summary of significant hydrological events in the UK during 1994 is currently being compiled. Copies - free on application - will be available through the National Water Archive Office from the 23rd January.

* For reasons of consistency and to provide greater spatial discrimination, the original ten regional divisions of the NRA have been retained for use in the Hydrological Summaries.

MORECS

Most of the recent monthly regional rainfall data featured in the Hydrological Summaries are MORECS assessments. MORECS is the generic name for The Meteorological Office services involving the calculation of evaporation and soil moisture routinely for Great Britain. Products include a weekly issue of maps and tables of potential and actual evaporation, soil moisture deficits, effective rainfall and the hydrometeorological variables used to calculate them. The data are used to provide values for 40 km squares - or larger areas - and various sets of maps and tables are available according to user requirements. Options include a day-by-day retrospective calculation of soil moisture at any of 4000 rain-gauge sites.

Further information about MORECS services may be obtained from: The Meteorological Office, Sutton House, London Road, Bracknell, RG12 2SY

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TABLE 1 1993/94 RAINFALL AS A PERCENTAGE OF THE 1961-90 AVERAGE

		Dec 1993	Jan 1994	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
England and Wales	mm	167	123	82	96	74	62	36	46	70	105	95	84	123
	%	178	140	130	133	123	97	55	74	92	136	112	93	131
NRA REGIONS														
North West	mm	247	159	71	165	107	35	70	67	104	108	113	124	197
	%	199	131	91	174	151	47	86	79	97	94	88	101	159
Northumbrian	mm	136	107	71	84	63	26	39	39	81	76	71	95	110
	%	168	127	120	120	113	42	65	60	100	104	93	110	135
Severn Trent	mm	139	95	71	75	57	54	24	43	53	127	66	74	112
	%	181	136	131	123	104	92	41	81	79	198	103	104	145
Yorkshire	mm	136	116	68	71	61	46	28	52	58	100	72	89	120
	%	164	147	117	104	103	77	47	88	78	147	99	111	144
Anglian	mm	85	73	45	53	51	51	25	41	56	90	69	32	58
	%	155	146	122	113	111	106	49	84	102	184	135	55	105
Thames	mm	105	97	59	51	57	79	25	21	50	75	84	53	85
	%	150	152	131	91	114	141	45	43	86	127	135	82	122
Southern	mm	154	124	64	57	77	91	39	29	69	91	119	68	114
	%	188	155	119	90	145	169	72	60	121	132	149	80	139
Wessex	mm	167	126	100	80	62	92	24	34	68	99	113	98	131
	%	180	145	154	114	117	151	42	65	103	138	143	118	141
South West	mm	263	186	174	125	94	99	32	48	101	132	140	127	183
	%	189	135	172	126	136	138	46	70	120	142	121	102	131
Welsh	mm	275	182	131	184	116	69	57	64	88	132	137	133	241
	%	180	127	135	172	145	84	72	83	87	115	100	94	158
Scotland	mm	234	215	96	250	133	29	110	66	101	103	109	150	236
	%	155	142	94	200	175	34	128	70	86	73	70	99	156
RIVER PURIFICATION BOARDS														
Highland	mm	275	248	74	341	185	36	148	62	112	153	117	162	285
	%	140	132	58	210	203	39	151	58	88	89	59	80	145
North East	mm	115	131	110	106	77	16	55	39	48	92	82	85	76
	%	124	132	169	136	128	23	83	53	55	106	85	86	82
Tay	mm	175	206	117	219	96	22	89	47	81	56	113	151	187
	%	138	143	123	201	155	27	122	61	86	49	87	125	147
Forth	mm	189	161	88	210	84	21	75	55	78	57	90	127	191
	%	172	136	111	223	142	28	109	73	83	52	78	113	174
Tweed	mm	176	141	86	124	72	19	52	42	70	58	74	120	165
	%	189	141	128	157	126	27	80	58	80	65	78	129	177
Solway	mm	269	204	116	195	124	29	79	102	121	77	116	177	246
	%	182	131	115	167	161	34	94	113	102	54	74	123	166
Clyde	mm	306	268	110	301	149	38	143	99	143	98	129	186	342
	%	171	142	93	205	177	42	154	91	107	55	67	103	191

Note: The monthly rainfall figures for the NRA regions for December correspond to the MORECS areal assessments derived by the Meteorological Office. In northern England these initial assessments may have a particularly wide error band associated with them. The figures for the RPB regions for December 1994 were derived by IH in collaboration with the RPBs. The provisional figures for England and Wales and for Scotland are derived using a different raingauge network. Regional areal rainfall figures are regularly updated (normally one or two months in arrears) using figures derived from a far denser raingauge network.

TABLE 2 RAINFALL RETURN PERIOD ESTIMATES

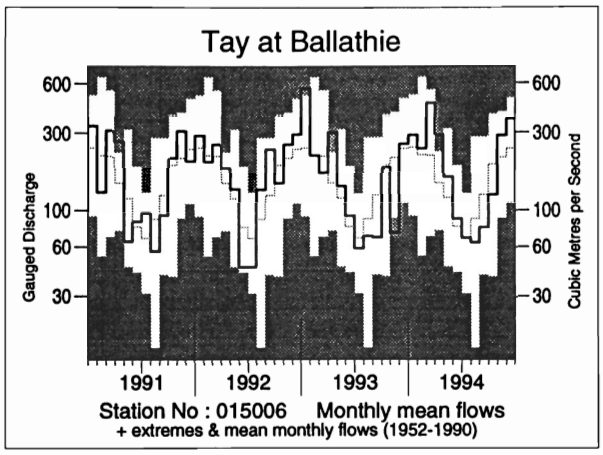
		Sep94-Dec94		May94-Dec94		Jan94-Dec94		Apr93-Dec94	
		Est Return Period, years		Est Return Period, years		Est Return Period, years		Est Return Period, years	
England and Wales	mm	407		621		996		1824	
	% LTA	118	2-5	101	2-5	111	5-10	116	15-25
NRA REGIONS									
North West	mm	542		818		1320		2267	
	% LTA	111	2-5	98	2-5	110	2-5	107	2-5
Northumbria	mm	352		537		862		1678	
	% LTA	111	2-5	92	2-5	101	2-5	112	5-10
Severn Trent	mm	379		553		851		1580	
	% LTA	137	10-20	108	2-5	113	5-10	119	20-30
Yorkshire	mm	381		565		881		1651	
	% LTA	125	5-10	101	2-5	107	2-5	115	10-15
Anglian	mm	249		422		644		1281	
	% LTA	117	2-5	101	2-5	108	2-5	121	30-45
Thames	mm	297		472		736		1391	
	% LTA	116	2-5	100	<2	107	2-5	115	5-10
Southern	mm	392		620		942		1715	
	% LTA	124	5-10	117	5-10	121	5-15	126	50-80
Wessex	mm	441		659		1027		1823	
	% LTA	135	5-15	117	5-10	123	10-20	125	40-60
South West	mm	582		862		1441		2601	
	% LTA	123	5-10	112	2-5	123	10-20	129	150-250
Welsh	mm	643		921		1534		2651	
	% LTA	118	2-5	104	2-5	117	5-10	116	10-20
Scotland	mm	598		904		1598		2591	
	% LTA	100	<2	92	2-5	111	5-10	104	2-5
RIVER PURIFICATION BOARDS									
Highland	mm	717		1075		1923		2946	
	% LTA	93	2-5	90	2-5	109	2-5	97	2-5
North East	mm	335		493		917		1721	
	% LTA	89	2-5	73	30-40	94	2-5	101	2-5
Tay	mm	507		746		1384		2334	
	% LTA	103	2-5	91	2-5	113	5-10	111	5-10
Forth	mm	465		694		1237		2120	
	% LTA	104	2-5	91	2-5	112	5-10	110	5-10
Tweed	mm	417		600		1023		1909	
	% LTA	113	2-5	90	2-5	105	2-5	113	5-10
Solway	mm	616		947		1586		2658	
	% LTA	104	2-5	98	2-5	112	5-10	108	2-5
Clyde	mm	755		1178		2006		3149	
	% LTA	103	2-5	102	2-5	118	10-20	107	2-5

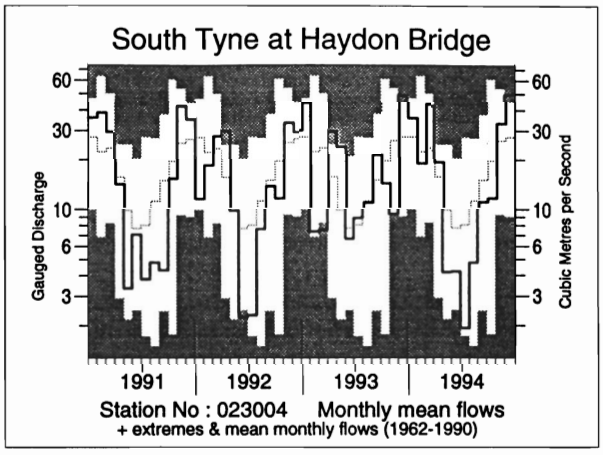
LTA refers to the period 1961-90.

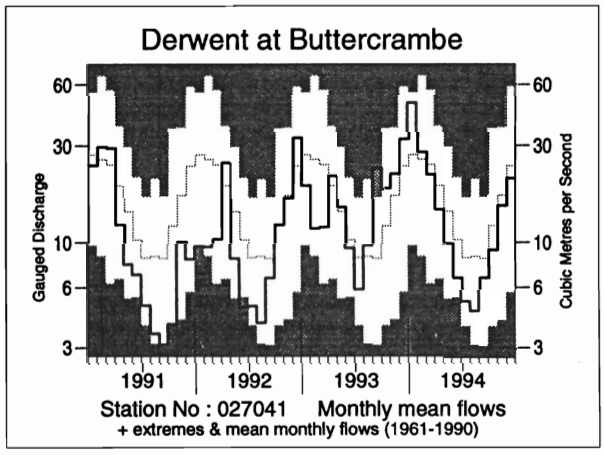
Return period assessments are based on tables provided by the Meteorological Office*. The tables reflect rainfall totals over the period 1911-70 only and the estimate assumes a sensibly stable climate. They assume a start in a specified month; return periods for a start in any month may be expected to be an order of magnitude less - for the longest durations the return period estimates converge. "Wet" return periods underlined.

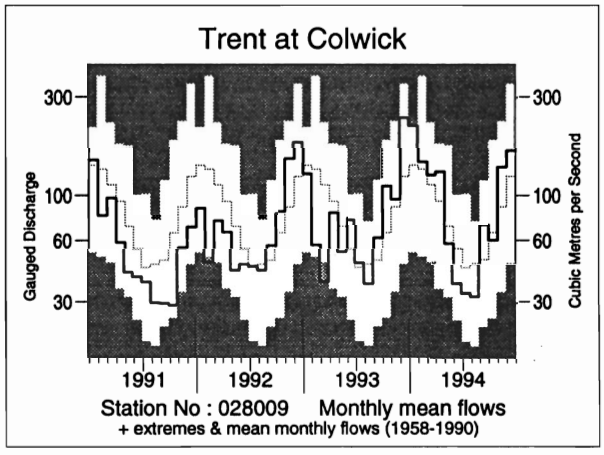
* Tabony, R.C., 1977, The Variability of long duration rainfall over Great Britain, Scientific Paper No. 37, Meteorological Office.

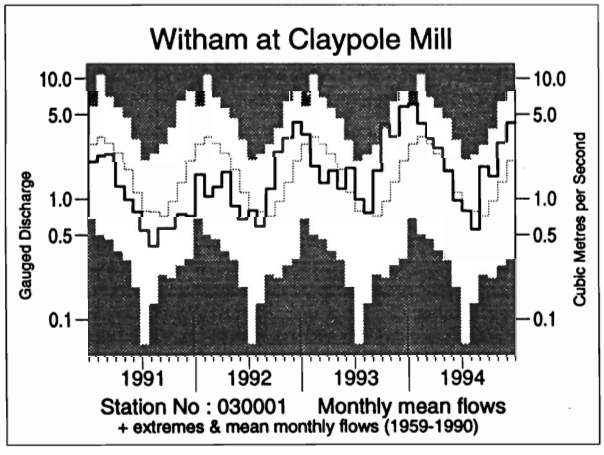
FIGURE 1 MONTHLY RIVER FLOW HYDROGRAPHS

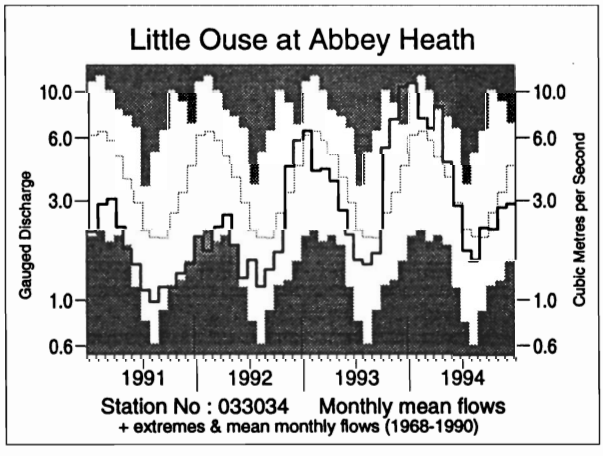


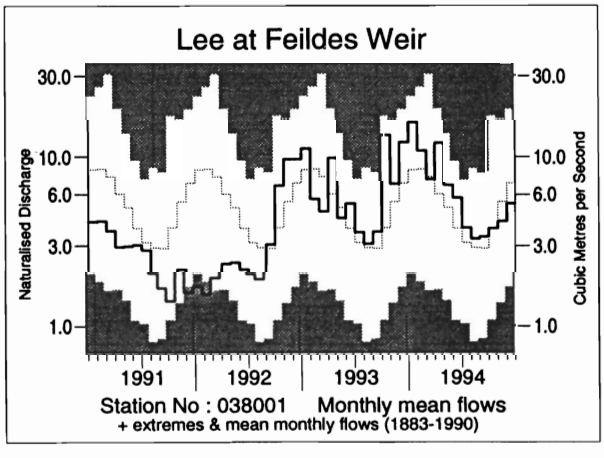


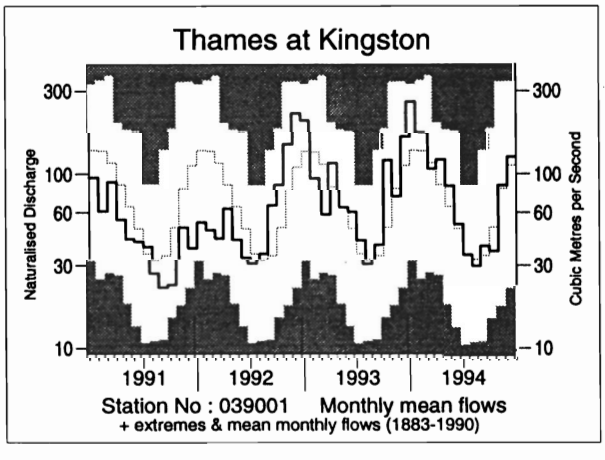


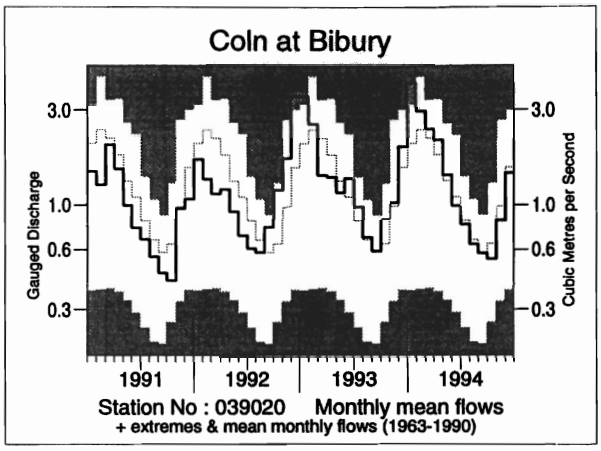


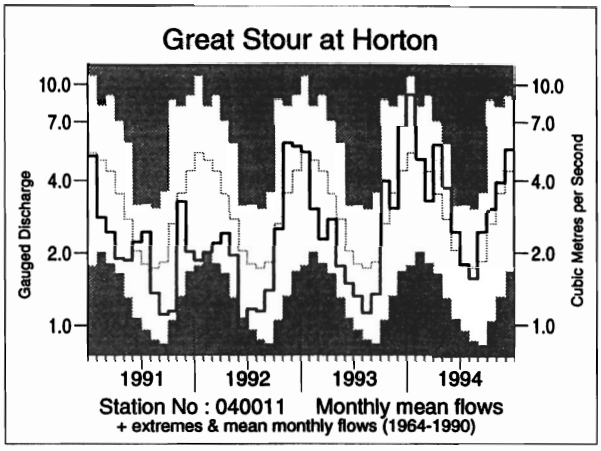


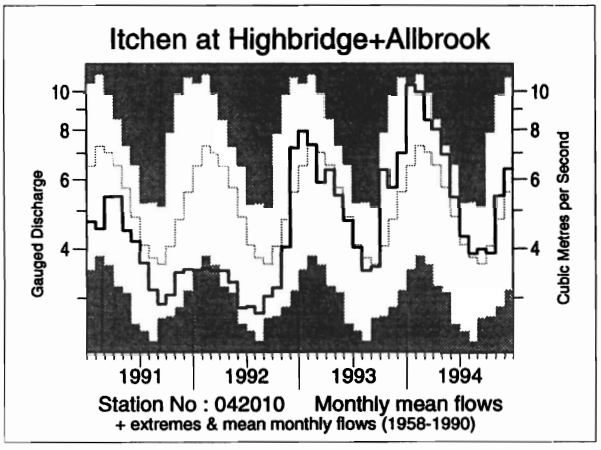


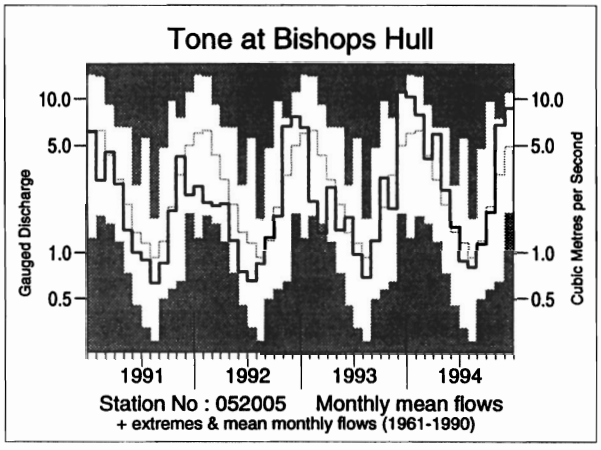


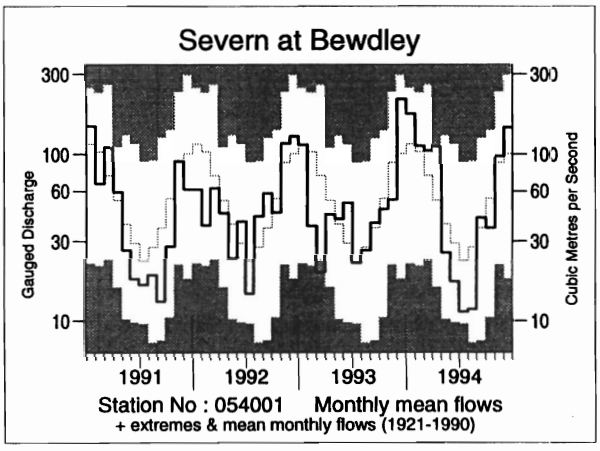


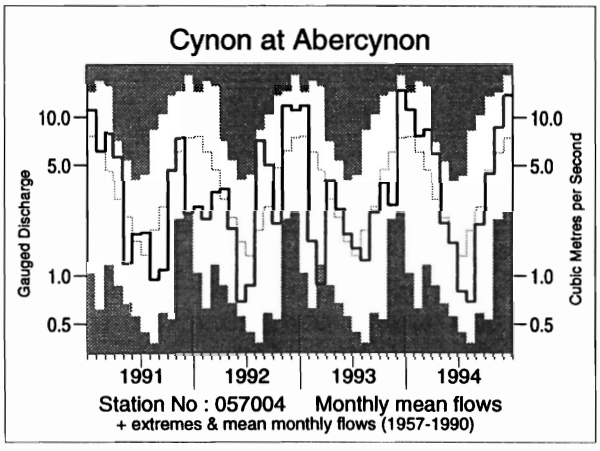

Coln at Bibury
Gauged Discharge
Cubic Metres per Second
3.0
1.0
0.6
0.3
1991
1992
1993
1994
Station No : 039020 Monthly mean flows
+ extremes & mean monthly flows (1963-1990)

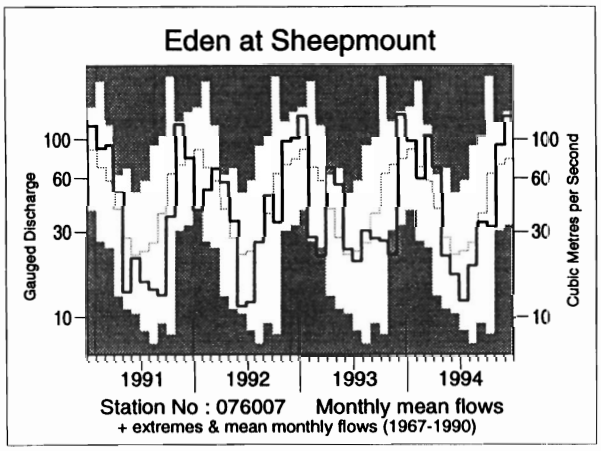

Great Stour at Horton
Gauged Discharge
Cubic Metres per Second
10.0
7.0
4.0
2.0
1.0
1991
1992
1993
1994
Station No : 040011 Monthly mean flows
+ extremes & mean monthly flows (1964-1990)


Itchen at Highbridge+Allbrook
Gauged Discharge
Cubic Metres per Second
10
8
6
4
1991
1992
1993
1994
Station No : 042010 Monthly mean flows
+ extremes & mean monthly flows (1958-1990)


Tone at Bishops Hull
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1991
1992
1993
1994
Station No : 052005 Monthly mean flows
+ extremes & mean monthly flows (1961-1990)


Severn at Bewdley
Gauged Discharge
Cubic Metres per Second
300
100
60
30
10
1991
1992
1993
1994
Station No : 054001 Monthly mean flows
+ extremes & mean monthly flows (1921-1990)


Cynon at Abercynon
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1991
1992
1993
1994
Station No : 057004 Monthly mean flows
+ extremes & mean monthly flows (1957-1990)


Eden at Sheepmount
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1991
1992
1993
1994
Station No : 076007 Monthly mean flows
+ extremes & mean monthly flows (1967-1990)

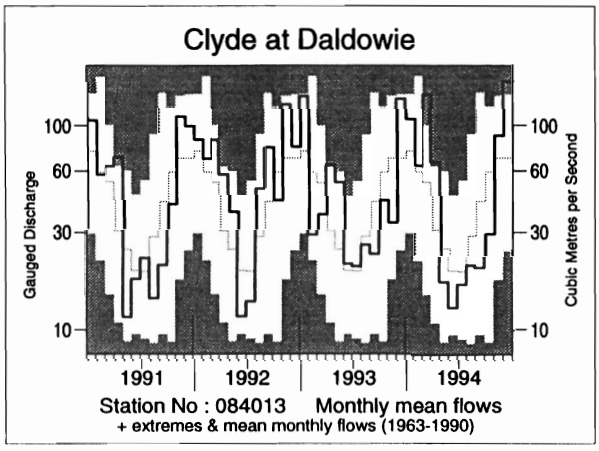

Clyde at Daldowie
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1991
1992
1993
1994
Station No : 084013 Monthly mean flows
+ extremes & mean monthly flows (1963-1990)

TABLE 3 RUNOFF AS MM. AND AS A PERCENTAGE OF THE PERIOD OF RECORD AVERAGE WITH SELECTED PERIODS RANKED IN THE RECORD

River/ Station name	Aug	Sep	Oct	Nov	Dec 1994		10/94 to 12/94		5/94 to 12/94		1/94 to 12/94		9/92 to 12/94	
	mm %LT	mm %LT	mm %LT	mm %LT	mm %LT	rank /yrs	mm %LT	rank /yrs	mm %LT	rank /yrs	mm %LT	rank /yrs	mm %LT	rank /yrs
Dee at	12	29	41	86	71	9	198	6	327	4	775	10	1953	12
Park	38	70	52	112	83	/23	81	/22	74	/22	99	/22	104	/20
Tay at	37	45	72	163	212	39	448	39	713	33	1442	41	3245	38
Ballathie	72	63	65	135	151	/43	120	/43	109	/42	127	/42	119	/40
Tweed at	21	25	33	114	214	34	361	32	475	21	950	33	2196	32
Boleside	55	49	46	130	223	/34	139	/34	107	/34	125	/34	120	/32
Whiteadder Water at	6	6	8	29	39	9	76	8	118	4	362	11	953	13
Hutton Castle	43	41	28	78	86	/26	68	/26	60	/25	92	/25	104	/24
South Tyne at	17	38	41	114	179	33	334	30	426	15	835	24	1976	19
Haydon Bridge	45	76	60	123	180	/33	127	/33	96	/31	110	/31	106	/27
Wharfe at	20	44	48	113	136	33	297	33	402	20	810	29	1798	23
Flint Mill Weir	51	99	76	141	140	/40	123	/40	97	/39	112	/39	104	/37
Derwent at	8	11	15	25	35	19	76	11	131	7	316	15	764	18
Buttercrambe	56	82	77	90	88	/34	86	/34	77	/33	98	/33	102	/31
Trent at	12	25	22	47	59	30	128	31	210	23	424	32	953	30
Colwick	71	148	92	155	132	/37	127	/37	109	/36	119	/36	116	/34
Lud at	13	13	12	14	18	15	44	15	142	16	345	21	660	18
Louth	101	122	105	101	94	/27	94	/27	112	/26	135	/26	119	/25
Witham at	5	16	14	26	38	32	78	31	130	32	272	32	621	33
Claypole Mill	73	257	157	212	202	/36	181	/36	146	/36	145	/35	149	/34
Little Ouse at	6	8	8	10	11	8	30	9	79	12	205	21	450	22
Abbey Heath	80	114	87	85	67	/27	74	/27	91	/27	121	/26	119	/25
Lee at	9	8	10	10	14	46	34	53	93	66	209	91	497	96
Feildes Weir (natr.)	114	117	99	77	76	/110	81	/110	107	/109	128	/108	133	/105
Mimram at	12	11	10	10	11	30	32	33	104	39	199	42	392	40
Panshanger Park	139	135	128	119	114	/43	117	/42	136	/42	158	/42	138	/40
Thames at	8	10	10	23	34	69	66	62	130	67	303	89	728	100
Kingston (natr.)	92	113	73	104	112	/112	101	/112	106	/112	123	/112	129	/110
Coln at	16	14	13	20	36	12	70	14	179	12	461	24	1069	27
Bibury	96	98	82	83	91	/32	86	/32	94	/31	118	/31	121	/29
Great Stour at	12	18	24	30	42	22	95	22	187	24	361	25	739	16
Horton	92	136	118	109	125	/30	115	/30	118	/29	124	/28	110	/25
Itchen at	29	29	29	39	47	27	116	27	296	26	561	34	1184	30
Highbridge+Allbrook	104	110	97	116	115	/37	109	/37	111	/36	122	/36	113	/34
Piddle at	16	16	19	48	61	24	129	25	251	26	577	30	1197	26
Baggs Mill	102	104	94	168	146	/32	136	/32	127	/31	142	/30	130	/27
Exe at	11	43	81	165	200	35	446	38	566	32	1182	37	2451	35
Thorverton	37	111	110	167	152	/39	144	/39	124	/39	142	/38	122	/37
Taw at	5	32	65	143	181	33	388	35	467	28	1008	35	2167	34
Umberleigh	26	133	106	153	156	/37	140	/37	122	/36	145	/36	129	/34
Tone at	11	15	24	89	118	31	231	31	321	31	687	33	1374	31
Bishops Hull	88	96	92	205	177	/34	163	/34	141	/34	144	/33	125	/32
Severn at	7	25	22	58	89	64	170	49	235	37	538	60	1181	53
Bewdley	42	116	68	108	143	/74	113	/74	97	/74	119	/73	110	/72
Teme at	2	17	11	47	88	22	147	20	184	13	421	17	938	18
Knightsford Bridge	22	195	57	143	164	/25	133	/25	109	/25	115	/24	111	/23
Cynon at	18	52	116	218	351	33	685	34	872	27	1693	35	3689	29
Abercynon	34	78	97	139	187	/37	145	/37	119	/35	134	/35	121	/31
Dee at	51	126	158	219	447	25	824	21	1130	14	2121	23	4537	15
New Inn	55	96	81	89	183	/26	119	/26	101	/25	117	/25	103	/24
Eden at	23	39	38	105	157	22	299	20	420	15	799	20	1816	16
Sheepmount	76	91	52	123	171	/25	120	/25	106	/24	115	/24	111	/20
Clyde at	29	27	41	122	233	32	396	29	518	24	1040	30	2367	29
Daldowie	72	47	51	123	234	/32	139	/32	110	/31	133	/31	124	/29
Carron at	80	186	129	229	420	12	778	5	1319	4	2520	9	5962	5
New Kelso	47	68	49	76	122	/16	89	/16	83	/16	99	/16	94	/14
Ewe at	58	132	217	214	336	16	767	12	1267	11	2275	18	5591	16
Poolewe	52	67	98	79	120	/25	101	/24	96	/24	107	/24	106	/22

Notes:
(i) Values based on gauged flow data unless flagged (natr.), when naturalised data have been used.
(ii) Values are ranked so that lowest runoff is rank 1.
(iii) %LT means percentage of long term average from the start of the record to 1992. For the long periods (at the right of this table), the end date for the long term is 1993.

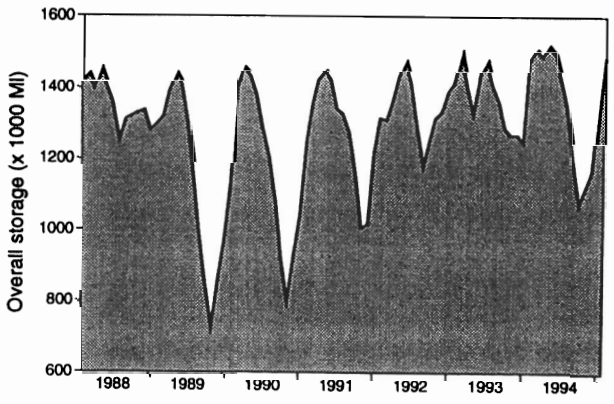
TABLE 4 START-MONTH RESERVOIR STORAGES UP TO JANUARY 1995

Area	Reservoir (R)/ Group (G)		Capacity• (Ml)	1994 Aug	Sept	Oct	Nov	Dec	1995 Jan	1994 Jan
North West	N.Command Zone[1]	(G)	133375	59	52	55	50	67	91	80
	Vyrnwy	(R)	55146	66	61	69	65	83	100	100
Northumbria	Teesdale[2]	(G)	87936	54	46	51	53	80	97	99
	Kielder	(R)	199175*	89*	92*	89*	90*	91*	100*	99*
Severn-Trent	Clywedog	(R)	44922	77	61	70	82	83	100	100
	Derwent Valley[3]	(G)	39525	60	43	53	64	89	100	100
Yorkshire	Washburn[4]	(G)	22035	53	40	42	52	73	92	92
	Bradford supply[5]	(G)	41407	49	38	48	57	74	88	97
Anglian	Grafham	(R)	58707	88	83	88	89	95	93	89
	Rutland	(R)	130061	89	86	87	86	93	95	95
Thames	London[6]	(G)	207569	83	77	83	85	89	92	87
	Farmoor [7]	(G)	13843	98	96	97	99	96	95	98
Southern	Bewl	(R)	28170	92	88	86	83	85	89	97
	Ardingly	(R)	4685	93	85	82	80	90	93	100
Wessex	Clatworthy	(R)	5364	68	54	48	53	100	100	100
	Bristol W [8]	(G)	38666*	71*	61*	55*	52*	71*	88*	88*
South West	Colliford	(R)	28540	78	68	69	70	75	81	98
	Roadford[9]	(R)	34500	79	67	65	66	69	79	92
	Wimbleball[10]	(R)	21320	77	60	57	64	80	100	100
	Stithians	(R)	5205	69	57	50	50	66	77	100
Welsh	Celyn + Brenig	(G)	131155	78	66	71	75	86	100	100
	Brianne	(R)	62140	81	72	71	83	99	100	100
	Big Five[11]	(G)	69762	70	58	62	66	83	92	98
	Elan Valley[12]	(G)	99106	77	62	67	83	99	100	100
Lothian	Edin./Mid Lothian	(G)	97639	79	73	71	69	85	95	92
	East Lothian	(G)	10206	76	66	56	57	70	91	98
Strathclyde	Loch Katrine	(G)	111363	81	86	83	90	95	98	92
	Daer	(R)	22412	58	59	58	99	99	100	100
	Loch Thom	(G)	11840	77	76	80	83	94	99	99

• Live or usable capacity (unless indicated otherwise) * Gross storage/percentage of gross storage

1. Includes Haweswater, Thirlmere, Stocks and Barnacre.
2. Cow Green, Selset, Grassholme, Balderhead, Blackton and Hurynn.
3. Howden, Derwent and Ladybower.
4. Swinsty, Fewston, Thruscross and Eccup.
5. The Nidd/Barden group (Scar House, Angram, Upper Barden,Lower Barden and Chelker) plus Grimwith.
6. Lower Thames (includes Queen Mother, Wraysbury, Queen Mary, King George VI and Queen Elizabeth II) and Lee Valley (includes King George and William Girling) groups -pumped storages.
7. Farmoor 1 and 2 - pumped storages.
8. Blagdon, Chew Valley and others.
9. Roadford began filling in November 1989.
10. Shared between South West (river regulation for abstraction) and Wessex (direct supply).
11. Usk, Talybont, Llandegfedd (pumped stroage), Taf Fechan, Taf Fawr.
12. Claerwen, Caban Coch, Pen y Garreg and Craig Goch.

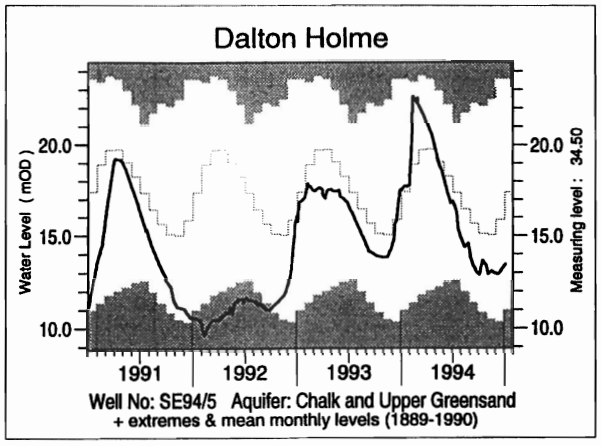
A GUIDE TO THE VARIATION IN OVERALL RESERVOIR STOCKS FOR ENGLAND AND WALES

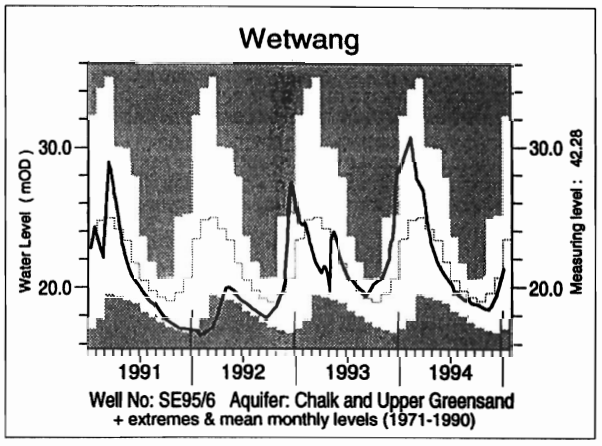


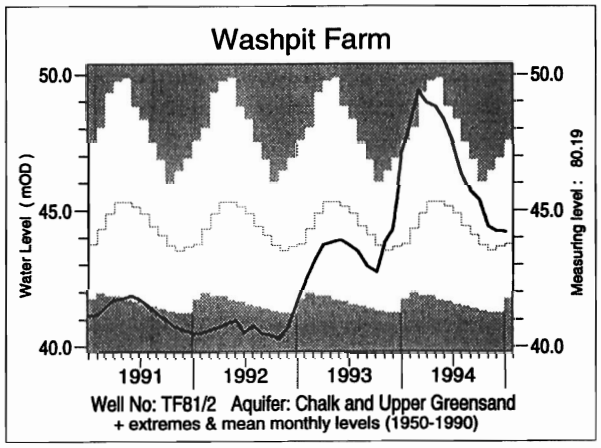
This plot is based on the reservoirs featured in Table 4 only.

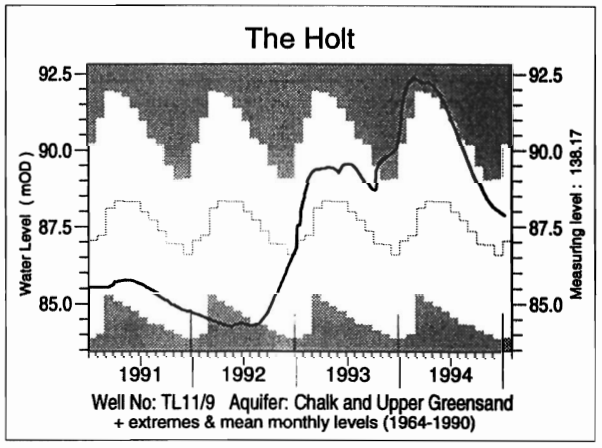
Note: Variations in storage depend on the balance between inputs (from catchment rainfall and any pumping) and outputs (to supply, compensation flow, HEP, amenity). There will be additional losses due to evaporation, especially in the summer months. Operational strategies for making the most efficient use of water stocks will further affect reservoir storages. Table 4 provides a link between the hydrological conditions described elsewhere in the report and the water resources situation.

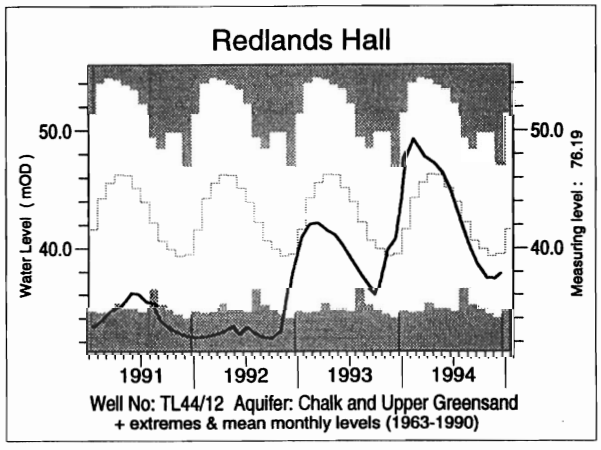
FIGURE 2 GROUNDWATER LEVEL HYDROGRAPHS

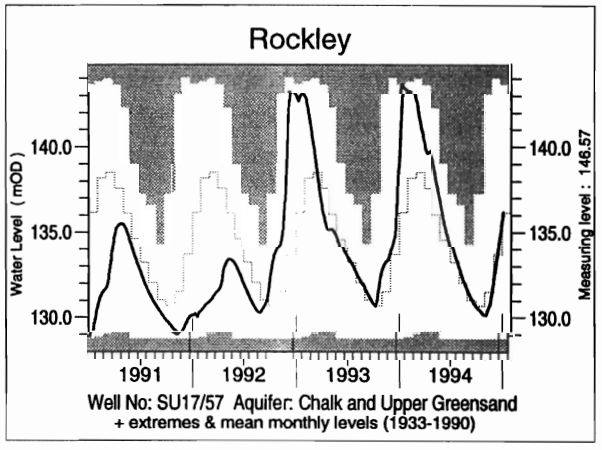


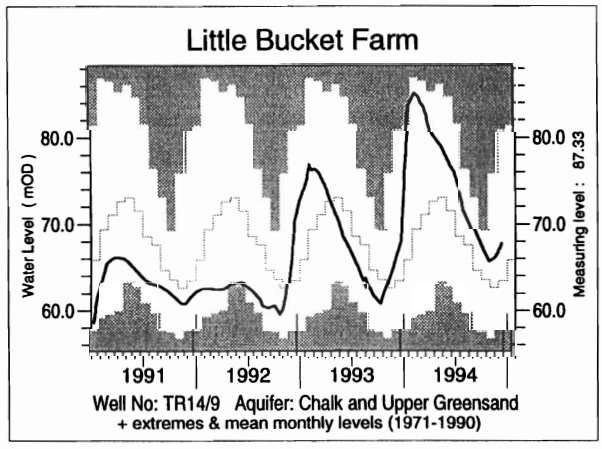


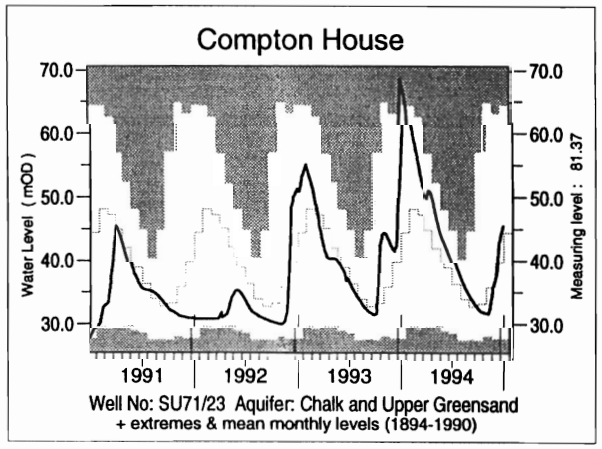


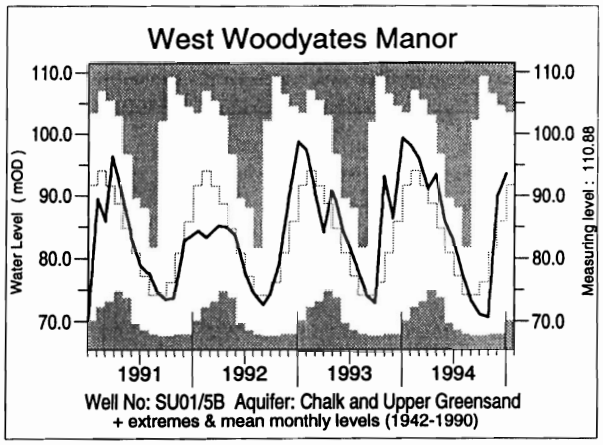


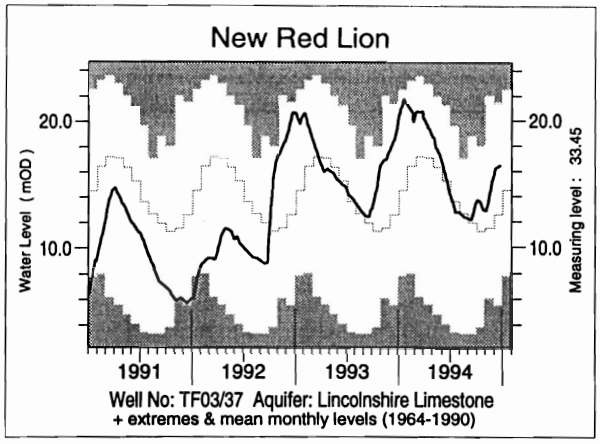


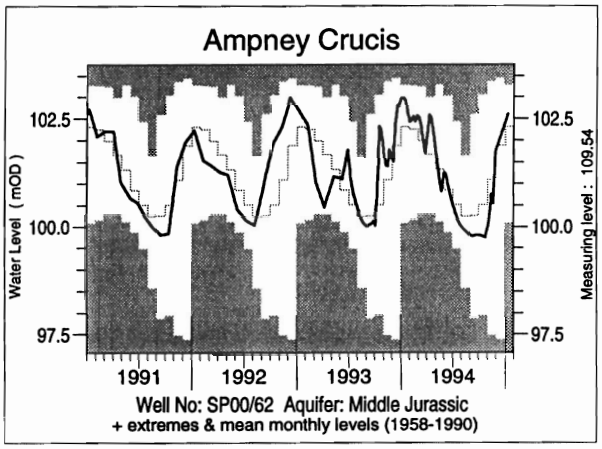


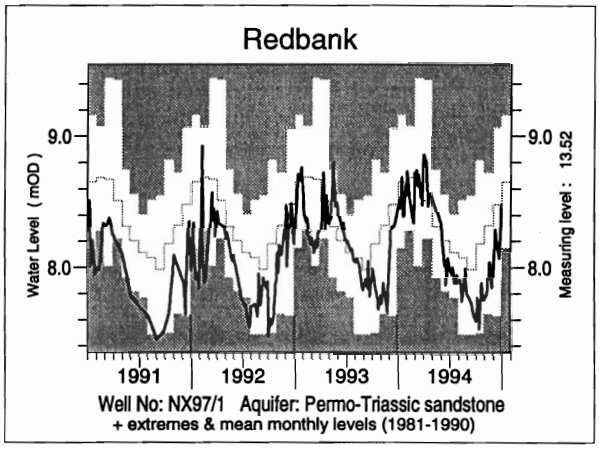


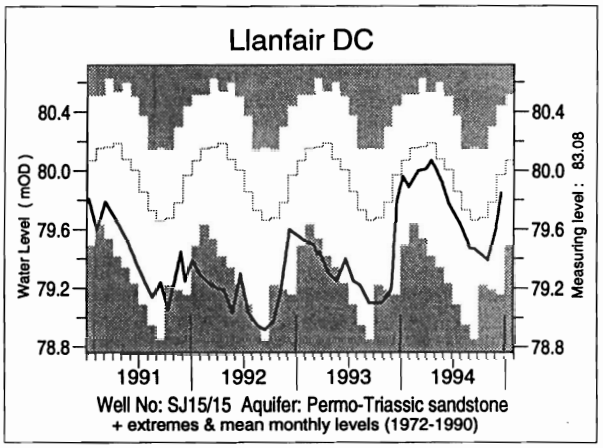


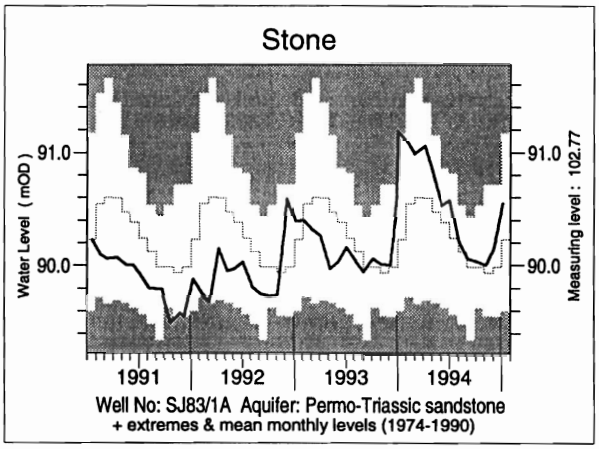

West Woodyates Manor
Water Level (mOD)
110.0
100.0
90.0
80.0
70.0
Measuring level : 110.88
1991
1992
1993
1994
Well No: SU01/5B Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1942-1990)

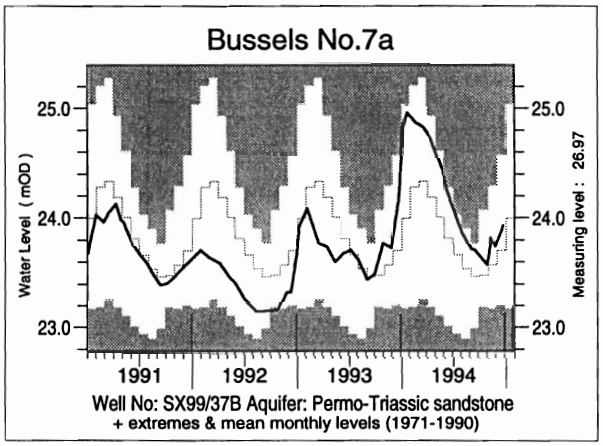

New Red Lion
Water Level (mOD)
20.0
10.0
Measuring level : 33.45
1991
1992
1993
1994
Well No: TF03/37 Aquifer: Lincolnshire Limestone
+ extremes & mean monthly levels (1964-1990)


Ampney Crucis
Water Level (mOD)
102.5
100.0
97.5
Measuring level : 109.54
1991
1992
1993
1994
Well No: SP00/62 Aquifer: Middle Jurassic
+ extremes & mean monthly levels (1958-1990)


Redbank
Water Level (mOD)
9.0
8.0
Measuring level : 13.52
1991
1992
1993
1994
Well No: NX97/1 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1981-1990)


Llanfair DC
Water Level (mOD)
80.4
80.0
79.6
79.2
78.8
Measuring level : 83.08
1991
1992
1993
1994
Well No: SJ15/15 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1972-1990)


Stone
Water Level (mOD)
91.0
90.0
Measuring level : 102.77
1991
1992
1993
1994
Well No: SJ83/1A Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1974-1990)


Bussels No.7a
Water Level (mOD)
25.0
24.0
23.0
Measuring level : 26.97
1991
1992
1993
1994
Well No: SX99/37B Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1990)

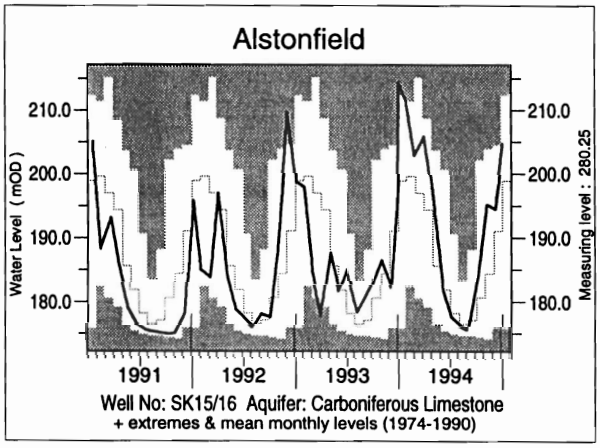

Alstonfield
Water Level (mOD)
210.0
200.0
190.0
180.0
Measuring level : 280.25
1991
1992
1993
1994
Well No: SK15/16 Aquifer: Carboniferous Limestone
+ extremes & mean monthly levels (1974-1990)

TABLE 5 A COMPARISON OF DECEMBER GROUNDWATER LEVELS: 1993 AND 1994

Site	Aquifer	Records commence	Minimum Dec	Average Dec	Maximum Dec	December 1993		Dec/Jan 1994/5	
			<1994	<1994	<1994	day	level	day	level
Dalton Holme	C & UGS	1889	10.34	15.71	23.64	30/12	17.55	03/01	13.47
Wetwang	C & UGS	1971	16.84	21.18	28.63	31/12	28.31	03/01	21.31
Washpit Farm	C & UGS	1950	40.61	43.28	46.94	31/12	46.68	03/01	44.21
The Holt	C & UGS	1964	83.90	86.80	90.11	26/12	90.11	06/01	87.88
Therfield Rectory	C & UGS	1883	dry <71.6	77.78	96.32	29/12	78.69	03/01	77.67
Redlands Hall	C & UGS	1964	32.46	38.92	46.97	31/12	44.22	16/12	37.83
Rockley	C & UGS	1933	dry <128.94	133.75	144.11	26/12	137.80	05/01	136.20
Little Bucket Farm	C & UGS	1971	57.63	63.94	80.94	22/12	68.05	12/12	67.77
Compton House	C & UGS	1984	27.92	41.18	63.20	30/12	54.31	28/12	45.49
Chilgrove House	C & UGS	1836	33.46	51.81	77.11	30/12	69.80	04/01	65.32
Westdean No.3	C & UGS	1940	1.16	1.96	4.92	30/12	2.97	30/12	2.66
Lime Kiln Way	C & UGS	1969	123.75	124.82	125.39	29/12	124.75	29/12	125.55
Ashton Farm	C & UGS	1974	63.20	67.31	71.48	31/12	71.48	31/12	70.70
West Woodyates Manor	C & UGS	1942	67.95	86.36	104.53	31/12	99.34	31/12	93.56
Killyglen (NI)	C & UGS	1985	114.06	115.91	119.27	31/12	117.21	12/12	116.83
New Red Lion	LLst	1964	5.49	12.58	21.51	30/12	20.32	22/12	16.47
Ampney Crucis	Mid Jur	1958	97.38	101.85	103.45	26/12	102.79	09/01	102.60
Yew Tree Farm	PTS	1973	12.19	13.46	13.97	29/12	13.97	30/12	13.87
Llanfair D.C	PTS	1972	79.16	79.81	80.44	15/12	79.78	16/12	79.85
Morris Dancers	PTS	1969	31.75	32.52	33.52	14/12	32.05	12/12	32.49
Weeford Flats	PTS	1966	dry <88.61	89.76	91.17	08/12	88.92	05/01	89.74
Stone	PTS	1974	89.55	90.07	90.72	31/12	90.60	04/01	90.55
Skirwith	PTS	1978	129.54	130.21	131.00	30/12	130.21	20/12	130.44
Redbank	PTS	1981	7.63	8.38	9.07	30/12	8.45	30/12	8.48
Bussels No.7A	PTS	1972	23.20	23.72	24.58	21/12	24.19	21/12	23.93
Rushyford NE	MgLst	1967	76.65	72.11	64.77	31/12	76.58	15/12	76.16
Peggy Ellerton	MgLst	1968	31.86	33.91	36.40	31/12	32.99	19/12	33.79
Alstonfield	CLst	1974	175.96	191.87	209.62	31/12	198.31	05/01	204.77

groundwater levels are in metres above Ordnance Datum

C & UGS	Chalk and Upper Greensand	Mid Jur	Middle Jurassic limestones
LLst	Lincolnshire Limestone	MgLst	Magnesian Limestone
PTS	Permo-Triassic sandstones	CLst	Carboniferous Limestone

FIGURE 3 LOCATION MAP OF GAUGING STATIONS AND GROUNDWATER INDEX WELLS