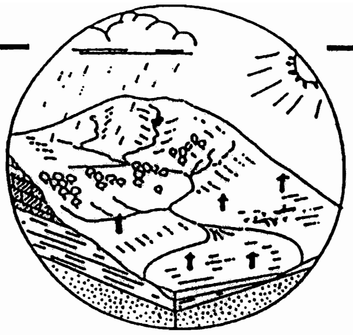
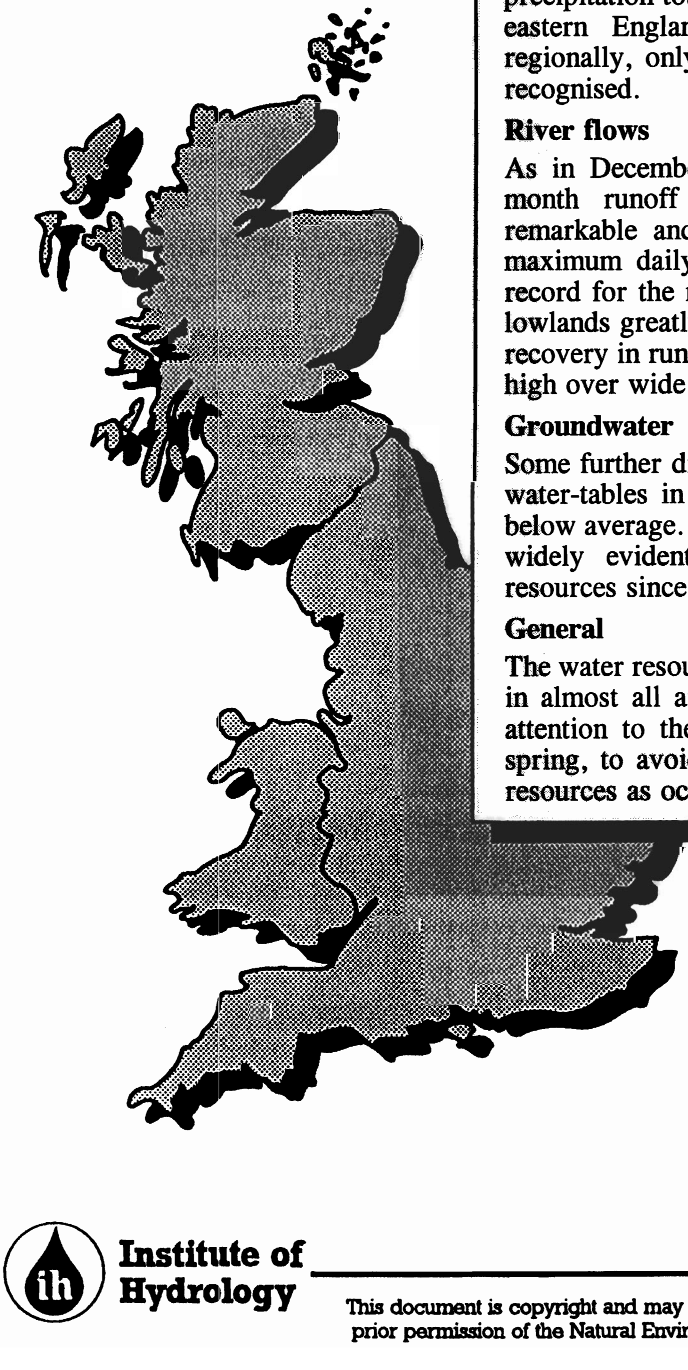
Hydrological Summary for Great Britain





JANUARY 1993

Rainfall

Around 150% of average for GB, the wettest month nationwide for almost three years. Provisional data indicate that Scotland registered its second highest monthly precipitation total in a record from 1869. A few districts in eastern England recorded below average rainfall but, regionally, only modest long term deficiencies can now be recognised.

River flows

As in December, flooding was widespread. Around mid-month runoff rates in large parts of Scotland were remarkable and floodplain inundation was extensive. The maximum daily mean flow on the Tay established a new record for the national River Flow Archive. In the English lowlands greatly increased baseflows helped to continue the recovery in runoff rates and winter runoff thus far is notably high over wide areas.

Groundwater

Some further dramatic recoveries occurred in the Chalk but water-tables in a few eastern localities remain appreciably below average. The benefits of late-1992 infiltration are now widely evident and the transformation in groundwater resources since last summer is very notable.

General

The water resources outlook in late January was very healthy in almost all areas. The subsequent dry spell has directed attention to the need for sufficient rainfall, well into the spring, to avoid the early onset of a steep deterioration in resources as occurred in 1990.

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HYDROLOGICAL SUMMARY FOR GREAT BRITAIN - January 1993

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 Lothians Regional Council. The most recent areal rainfall figures are derived from a restricted network of raingauges (particularly in Scotland) 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.

Rainfall

January was generally mild and notably unsettled particularly in Scotland where severe gales and blizzard conditions punctuated the month. The boisterous weather extended into southern Britain in mid-month and many areas recorded fewer than six rainless days in January. In eastern England individual daily rainfall totals were often modest but a series of vigorous Atlantic frontal systems brought widespread and heavy rainfall across Scotland which experienced a remarkably wet month with extensive flooding.

The provisional January rainfall total for Britain is around 150% of the 1941-70 average but the spatial distribution demonstrated a marked accentuation in the normal NW/SE rainfall gradient. Based on a very limited network of raingauges the monthly precipitation total for Scotland - more than twice the long term average nationwide with some central areas exceeding 300% - ranks January 1993 as the second wettest month on record for Scotland (marginally eclipsed by February 1990) in a general rainfall series from 1869. For England and Wales, January rainfall totals were generally above average in the west and close to the 1941-70 mean in eastern areas. Importantly however, rainfall in a few districts where full terminations to the drought are awaited (e.g. parts of northern Kent, Lincolnshire and the lower Trent Valley), fell a little below average, parts of the north-eastern seaboard were also relatively dry.

On a regional basis, accumulated rainfall totals are above, to well above, average within the twelve-month timeframe and, over wide areas, notably high over the period beginning in the summer of 1992. England and Wales experienced its second wettest July-January period since 1961 and in the Thames Valley the seven-month total is the third highest in over 50 years; other parts of eastern England received less abundant precipitation and a few moderate long term deficiencies remain. For Scotland, the August-January period is the second wettest six-month sequence (for ANY start month) on record and accumulated totals over longer timespans are also remarkable - the 60-month rainfall total (beginning in February 1988), for example, is unprecedented and appreciably greater than any recorded 60-month sequence prior to 1980.

Rainfall over the last eleven months has served to end the meteorological drought in regional terms; a full termination is still awaited in a few districts in the eastern lowlands. The recent persistence of high pressure over the English lowlands provides a timely reminder that - as over the first third of 1990 - transformations in the water resources outlook can occur relatively rapidly in the late winter and spring. Average rainfall is needed through into April to consolidate the very substantial improvements in water resources since the summer of 1992.

Runoff

With evaporation rates very moderate and catchments saturated for much of the month, the January precipitation was especially hydrologically effective. Rivers were in spate over wide areas, and in the fortnight beginning around the 9th, flooding occurred from the Thames Valley to the Scottish Highlands.

Widespread floodplain inundation was heralded by the passage of a particularly intense depression (the central pressure fell below 920 millibars) on the 10/11th - subsequently overbank flows were common in western Scotland and Wales. Thereafter, flood alerts extended across into the English lowlands and blizzards in northern Britain produced substantial snow accumulations. On the 16/17th the passage of a warm front resulted in a rapid thaw in Scotland and the snowmelt, together with significant rainfall, produced exceptional runoff rates in many rivers; flows were particularly remarkable in rivers draining from the Highlands. Many gauging stations in the Tay basin registered new maximum flows around mid-month - by which time the January precipitation total for Lochearnhead had exceeded 400 mm. On the River Tay itself (at Ballathie) a peak flow assessed at around 2200 m^3s^{-1} was recorded on the 17th; this is the second highest flow registered on the national River Flow Archive (surpassed only by the Findhorn flood of August 1970), the daily mean flow at Ballathie, which closely approached 2000 m^3s^{-1}, established a new record. As with the February 1990 event, the flood peak on the Tay was attenuated by upstream spillage over the flood banks but the flood damage in Perth was considerable; historical data indicate that the water level was the highest since 1814. Many eastward-draining Scottish rivers recorded unprecedented flow rates. The Earn (at Kinkell Bridge, Perthshire) exceeded its previous maximum by a very wide margin, the River Teith, Central Region, also surpassed its previous maximum flow and a return period exceeding 50 years was ascribed to the peak on the Allan Water (at Bridge of Allan, Central Region). Floodplain inundation was very extensive and transport disruption was severe.

Monthly runoff totals for January were close to or above average in almost all index catchments. Relatively low average flows were registered in north-eastern England (on, for example, the Yorkshire Derwent and the Leven) but the high flows elsewhere were more notable. Rivers registering record January runoff totals showed a very wide distribution, examples include the Luss which flows into Loch Lomond, Earn (Tayside), Kennet and Hampshire Avon. Even in those parts of eastern England where rainfall was moderate the recovery in permeable catchments continued as the benefit of the wet weather late in 1992 became evident as increasing baseflows. The transformation since the early autumn of last year is well illustrated on the Lee where runoff over the last four months exceeds that for the preceding 18. Table 3 confirms that notably high three-month runoff accumulations coexist with some significant long term deficiencies in parts of the English lowlands. Nonetheless the substantial increases in groundwater levels (see below) imply that - given average spring rainfall - no repetition of the depressed runoff rates experienced in 1989 and 1990 in permeable catchments may be expected this summer.

Reservoir contents are at, or near, capacity throughout Britain. Flood drawdown releases were common in the west during January whereas in the English lowlands stocks in the major pumped storage reservoirs stood at over 90% - a comparison between the early February 1993 contents at Rutland, Bewl and the London Group of reservoirs and those of a year ago provide a measure of the improved water resources outlook.

Groundwater

The benefit of the early commencement of infiltration, in the autumn of 1992, and substantial rainfall over much of the last four months, is clearly evident in the groundwater level traces for the index boreholes – in the Chalk especially. Over most of Britain, groundwater levels have shown a very substantial rise through the winter and water-tables (with a few significant exceptions) range from well within to well above the normal range. At several Chalk sites the recent transformation has been dramatic with recharge over the last three months exceeding that over the preceding 30. The water-table at Redlands Hall (Cambridgeshire), for example, has risen from a period-of-record minimum to close to the seasonal maximum since early November. Exceptionally brisk recoveries characterise most of the Chalk and even at slow responding boreholes like Washpit Farm (Norfolk) levels, though still well below average, are at their highest for two and a half years and some further increase may be anticipated as winter infiltration reaches the depressed water-table. An appreciable recovery is also underway at the deep Therfield Rectory well which dried up a year ago for the first time in 70 years.

In the more quickly responding, fissured aquifers to the west of the Chalk outcrop, a modest decline in groundwater levels occurred in some areas during January. Nonetheless, levels remain well within the normal range. A notable recent recovery has occurred in the Permo-Triassic sandstones of the South-West but at Llanfair DC in north Wales, the water-table remains close to the seasonal minimum. Recoveries are also still awaited in, for example, parts of the deeper Nottinghamshire aquifers and the Weeford Flats borehole (where levels are heavily influenced by pumping) remains dry.

In general terms, it is probable that groundwater levels throughout the country will recover at least to mean levels by the normal onset of the summer recession, typically late March or early April. Given average rainfall, the recession should certainly start from a much higher level than was the case in 1992. Compared to mid-1992, the overall water resources outlook is very encouraging. Some caution is necessary, however. Dramatic recoveries in water-tables over the winter of 1989/90 were followed by equally steep recessions through the exceptionally dry spring. At least average rainfall in areas is required through into April to continue the recovery in some eastern lowland areas (and a few other districts) and delay the onset of the seasonal decline in groundwater levels.

Institute of Hydrology/British Geological Survey
11 February 1993

TABLE 1 1992/93 RAINFALL AS A PERCENTAGE OF THE 1941-70 AVERAGE

		Jan 1992	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan 1993
England and	mm	48	47	85	75	49	45	87	126	103	90	135	75	98
Wales	%	56	72	144	129	73	74	119	140	124	108	139	84	114
NRA REGIONS														
North West	mm	57	100	142	89	62	31	72	137	114	128	163	107	135
	%	51	123	197	116	76	37	70	110	93	109	135	89	120
Northumbria	mm	33	45	107	103	31	19	61	104	108	84	99	69	78
	%	41	68	206	187	48	31	79	103	137	112	105	92	98
Severn-Trent	mm	59	31	67	50	59	55	87	117	72	73	111	60	77
	%	86	58	129	96	92	98	134	144	107	113	141	85	112
Yorkshire	mm	47	42	96	66	34	33	81	94	98	80	104	67	82
	%	61	66	170	118	56	57	116	104	136	115	116	90	107
Anglian	mm	45	17	63	43	48	34	89	82	92	72	86	40	54
	%	87	40	158	108	102	69	156	128	176	138	140	75	105
Thames	mm	28	25	52	65	60	39	77	107	89	76	112	57	82
	%	45	53	113	141	107	75	128	153	144	118	153	86	132
Southern	mm	18	33	59	84	30	26	75	105	73	81	132	70	85
	%	24	58	113	175	55	52	127	144	102	103	141	87	112
Wessex	mm	36	39	57	81	24	49	64	127	94	50	149	82	120
	%	43	66	98	150	35	91	103	155	119	61	153	91	143
South West	mm%	44	69	75	100	31	23	83	171	100	96	197	104	152
		34	77	89	141	37	35	99	169	96	85	147	77	118
Welsh	mm	76	80	129	91	80	48	93	212	112	100	196	124	168
	%	56	83	148	107	88	59	98	178	89	77	137	85	123
Scotland	mm	139	167	208	123	80	52	103	217	187	148	196	141	291
	%	101	161	226	137	88	57	92	168	136	99	138	90	212
RIVER PURIFICATION BOARDS														
Highland	mm	197	229	248	138	105	46	97	250	177	144	241	190	407
	%	120	172	218	121	102	42	76	169	112	78	143	101	248
North-East	mm	67	52	113	68	57	50	48	128	113	107	97	90	200
	%	74	70	182	111	74	71	52	120	130	110	94	88	220
Tay	mm	117	111	172	90	57	30	78	197	152	92	165	106	324
	%	99	121	210	120	60	36	76	167	132	76	153	79	274
Forth	mm	110	111	164	76	45	25	67	174	156	80	167	81	236
	%	111	144	238	112	54	33	68	150	144	75	155	74	238
Tweed	mm	63	70	138	98	52	27	60	151	126	80	123	75	139
	%	68	101	238	161	68	40	67	132	135	91	118	83	149
Solway	mm	91	140	206	144	66	30	99	214	166	114	190	119	200
	%	65	151	226	164	72	33	90	165	110	79	131	79	143
Clyde	mm	170	231	267	144	93	41	123	270	195	135	272	142	332
	%	106	204	254	140	96	40	95	190	111	74	163	76	206

Note: The most recent monthly rainfall figures correspond to the MORECS areal assessments derived by the Meteorological Office. The regional areal rainfall figures are regularly updated (normally one or two months in arrears) using figures derived from a far denser raingauge network.

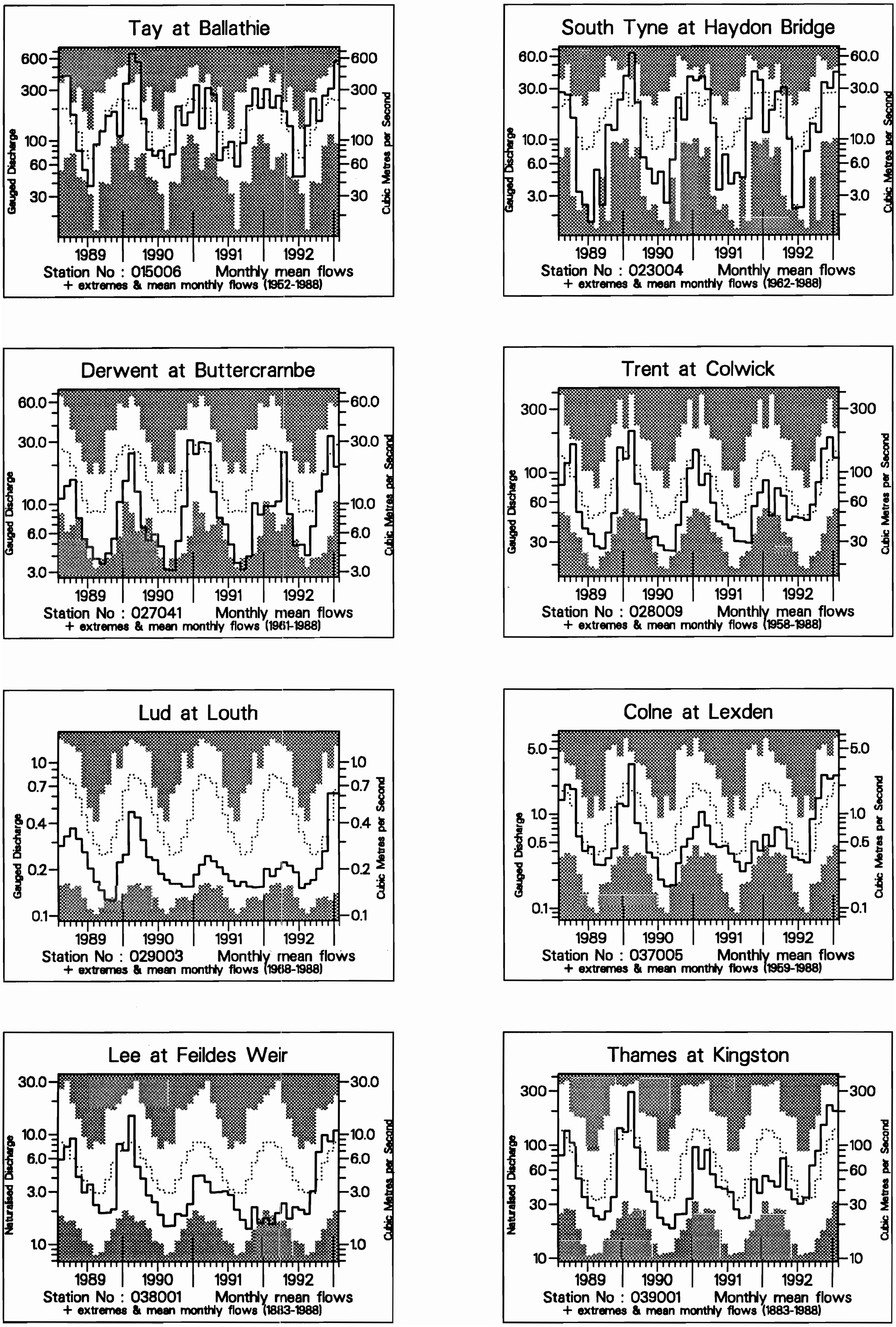
TABLE 2 RAINFALL FOR SELECTED PERIODS WITH CORRESPONDING RETURN PERIOD ESTIMATES

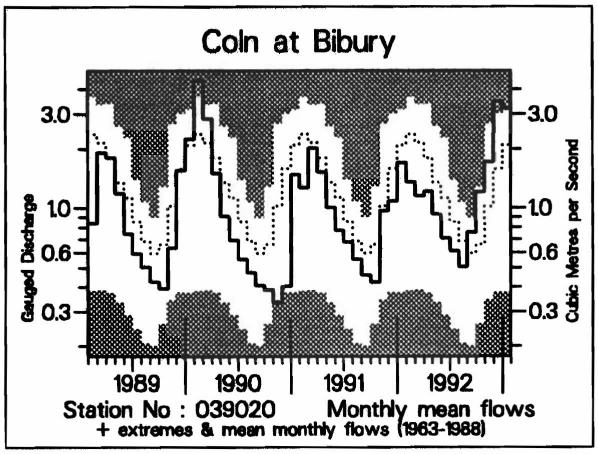
		Jul92-Jan93		Feb92-Jan93		Mar90-Jan93		Aug88-Jan93	
			Est Return Period, years		Est Return Period, years		Est Return Period, years		Est Return Period, years
England and	mm	712		1013		2420		3842	
Wales	% LTA	118	5-10	111	5	90	10	92	10
NRA REGIONS									
North West	mm	856		1280		3282		5308	
	% LTA	104	<5	105	<5	92	5-10	95	5
Northumbria	mm	604		909		2297		3513	
	% LTA	104	<5	103	<5	92	5-10	89	15-25
Severn-Trent	mm	596		858		1975		3164	
	% LTA	120	5-10	111	5	90	5-10	92	5-10
Yorkshire	mm	605		870		2072		3298	
	% LTA	112	<5	104	<5	88	10-20	88	20-25
Anglian	mm	514		719		1539		2396	
	% LTA	131	10-20	118	10	89	10	88	15-25
Thames	mm	600		841		1761		2821	
	% LTA	131	10-20	119	10	88	10	90	10
Southern	mm	621		854		1946		3097	
	% LTA	117	5	107	<5	87	10-20	87	15-25
Wessex	mm	685		935		2115		3492	
	% LTA	119	5-10	108	<5	86	10-20	90	10
South West	mm	904		1202		2975		4980	
	% LTA	113	<5	101	<5	89	10	93	5
Welsh	mm	1005		1433		3450		5707	
	% LTA	113	<5	107	<5	92	5	95	<5
Scotland	mm	1283		1913		4821		7601	
	% LTA	133	70-120	134	>>200	118	>200	118	>>200
RIVER PURIFICATION BOARDS									
Highland	mm	1506		2272		5862		9398	
	% LTA	131	30-50	132	>200	121	>>200	122	>>200
North-East	mm	782		1122		2833		4284	
	% LTA	115	5-10	110	5	98	<5	94	5-10
Tay	mm	1114		1574		3852		6216	
	% LTA	135	30-50	125	30-40	109	5-10	111	15-25
Forth	mm	961		1382		3486		5523	
	% LTA	129	20-30	124	30-50	110	10	110	15-25
Tweed	mm	753		1138		2873		4394	
	% LTA	112	<5	113	5-10	101	<5	98	<5
Solway	mm	1101		1695		4232		6811	
	% LTA	113	<5	119	10-20	105	<5	106	5-10
Clyde	mm	1469		2245		5736		9106	
	% LTA	128	30-40	135	>200	122	>>200	122	>>200

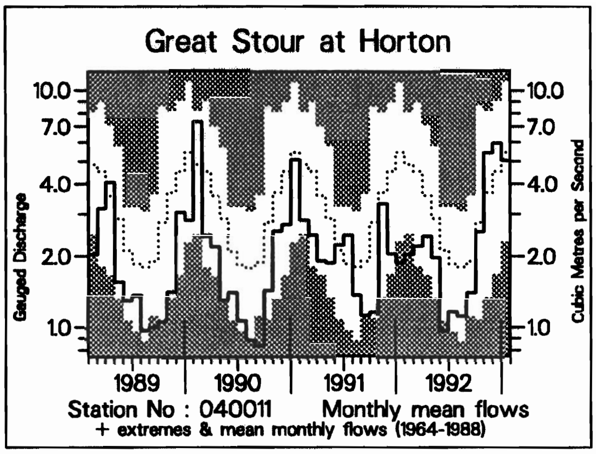
Return period assessments are based on tables provided by the Meteorological Office*. These assume a start in a specified month; return periods for a start in any month may be expected to be an order of magnitude less - for the longest durations the return period estimates converge. "Wet" return periods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

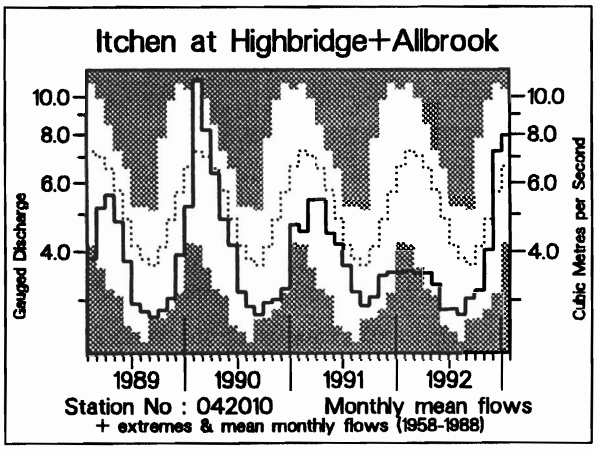
* Tabony, R.C., 1977, The Variability of long duration rainfall over Great Britain, Scientific Paper No. 37, Meteorological Office.

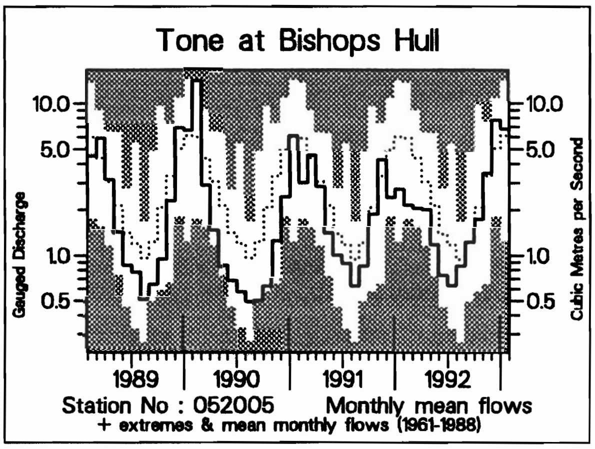
FIGURE 1 MONTHLY RIVER FLOW HYDROGRAPHS

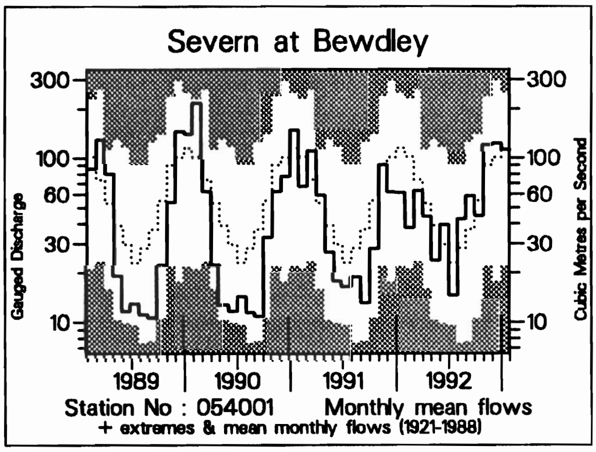


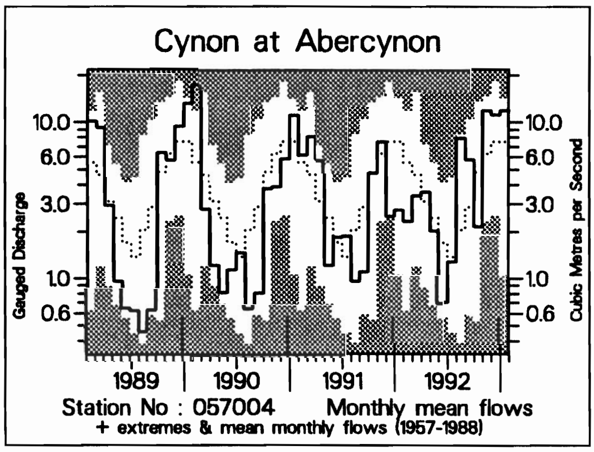

Coln at Bibury
3.0
1.0
0.6
0.3
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 039020 Monthly mean flows
+ extremes & mean monthly flows (1963-1988)

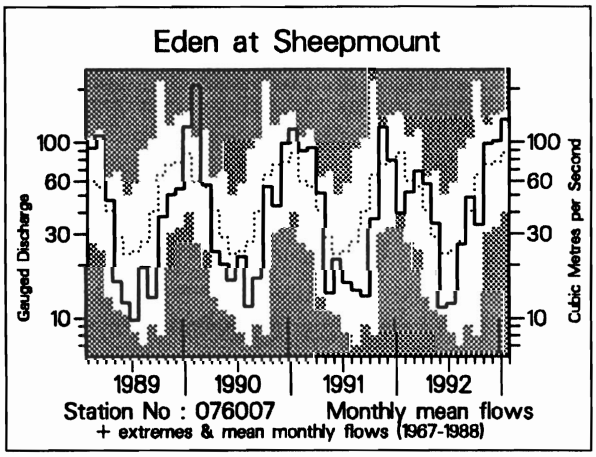

Great Stour at Horton
10.0
7.0
4.0
2.0
1.0
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 040011 Monthly mean flows
+ extremes & mean monthly flows (1964-1988)


Itchen at Highbridge+Allbrook
10.0
8.0
6.0
4.0
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 042010 Monthly mean flows
+ extremes & mean monthly flows (1958-1988)


Tone at Bishops Hull
10.0
5.0
1.0
0.5
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 052005 Monthly mean flows
+ extremes & mean monthly flows (1961-1988)


Severn at Bewdley
300
100
60
30
10
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 054001 Monthly mean flows
+ extremes & mean monthly flows (1921-1988)


Cynon at Abercynon
10.0
6.0
3.0
1.0
0.6
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 057004 Monthly mean flows
+ extremes & mean monthly flows (1957-1988)


Eden at Sheepmount
100
60
30
10
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 076007 Monthly mean flows
+ extremes & mean monthly flows (1967-1988)

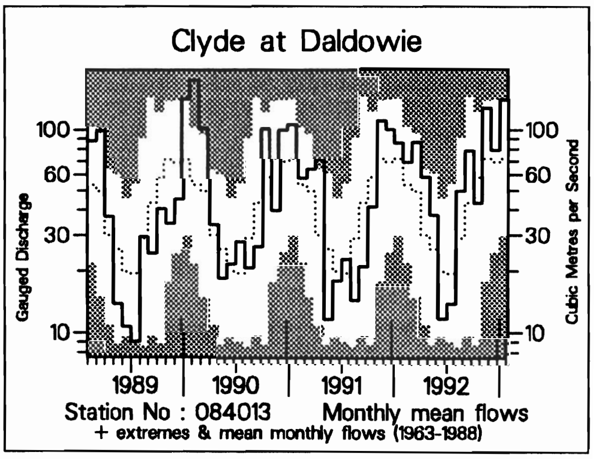

Clyde at Daldowie
100
60
30
10
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
1992
Station No : 084013 Monthly mean flows
+ extremes & mean monthly flows (1963-1988)

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	Sep	Oct	Nov	Dec	Jan		11/92 to 1/93		2/92 to 1/93		5/90 to 1/93		5/89 to 1/93	
	1992				1993									
	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	55	61	90	80	155	20	325	17	761	11	1938	6	2564	2
Park	137	76	118	93	172	/21	128	/21	98	/20	91	/18	87	/17
Tay at	139	88	148	179	327	41	654	40	1461	38	3396	30	4850	33
Ballathie	200	79	123	128	227	/41	159	/41	129	/40	111	/38	116	/37
Whiteadder Water at	19	32	48	46	53	11	147	12	385	12	987	9	1165	6
Hutton Castle	123	118	129	102	90	/24	104	/24	99	/23	94	/21	80	/20
South Tyne at	48	41	117	107	152	30	375	27	811	18	2031	12	2708	6
Haydon Bridge	95	59	127	108	154	/31	129	/31	107	/29	98	/25	94	/23
Wharfe at	41	40	98	112	132	30	342	32	710	17	1737	9	2324	3
Flint Mill Weir	93	63	123	116	134	/38	124	/38	99	/37	89	/35	86	/34
Derwent at	11	21	27	55	32	11	115	19	257	8	623	3	793	2
Buttercrambe	82	105	97	139	70	/32	103	/32	80	/31	71	/29	65	/28
Trent at	20	30	52	65	46	12	163	33	341	18	749	3	1052	3
Colwick	121	130	173	149	92	/35	131	/35	97	/34	79	/32	81	/31
Soar at	25	26	46	49	40	12	135	22	259	14	510	4	736	4
Littlethorpe	332	206	265	151	103	/22	149	/22	106	/20	78	/16	82	/14
Lud at	8	10	12	30	30	13	72	17	152	6	337	2	480	1
Louth	72	84	85	159	102	/25	117	/25	61	/24	52	/22	53	/21
Colne at	9	16	28	25	29	25	83	31	144	22	245	3	353	2
Lexden	216	193	232	159	128	/34	161	/34	106	/33	70	/31	73	/30
Lee at	8	18	24	22	28	83	75	85	134	35	262	8	406	9
Feildes Weir (natr.)	111	182	178	122	129	/108	140	/108	83	/106	61	/103	68	/101
Thames at	17	24	39	60	53	89	153	104	275	72	500	14	743	21
Kingston (natr.)	191	180	182	201	143	/111	173	/110	112	/110	77	/108	83	/107
Kennet at	16	17	31	61	60	32	152	32	272	11	564	1	850	2
Theale	122	110	161	239	179	/32	190	/32	94	/31	73	/29	80	/28
Coln at	18	30	42	83	80	29	209	30	416	19	861	8	1273	9
Bibury	128	189	176	230	158	/30	181	/30	107	/29	84	/27	89	/26
Great Stour at	11	20	41	46	39	15	126	23	246	7	565	4	764	2
Horton	81	99	154	133	97	/29	125	/28	85	/26	72	/23	71	/21
Itchen at	22	24	29	54	59	31	142	28	350	4	928	1	1346	1
Highbridge+Allbrook	84	80	86	132	123	/35	116	/35	77	/34	76	/32	80	/31
Exe at	61	63	169	158	223	36	550	36	942	26	2053	11	2800	10
Thorverton	161	85	175	121	170	/37	152	/37	114	/36	92	/35	91	/34
Tone at	16	23	45	102	90	19	236	26	400	7	923	1	1426	3
Bishops Hull	106	87	107	156	113	/32	126	/32	85	/32	74	/30	82	/29
Severn at	35	28	72	76	69	35	217	54	440	36	1019	12	1454	13
Bewdley	163	84	135	122	97	/72	116	/72	98	/71	84	/70	87	/69
Cynon at	140	55	291	280	299	29	870	35	1590	30	3416	15	4859	16
Abercynon	213	45	191	151	154	/35	162	/35	126	/33	100	/29	104	/27
Dee at	156	123	302	232	275	16	809	18	1861	13	4434	4	6111	2
New Inn	120	62	124	95	115	/24	111	/24	103	/23	89	/21	89	/20
Eden at	55	40	110	118	157	22	386	20	780	14	1919	9	2625	8
Sheepmount	132	55	131	131	151	/23	138	/22	113	/21	102	/17	103	/15
Clyde at	107	61	174	111	197	28	482	28	1098	29	2591	27	3492	26
Daldowie	189	74	181	112	184	/30	156	/30	141	/29	122	/27	121	/26

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 as rank 1.
(iii) %LT means percentage of long term average from the start of the record to 1991. For the long periods (at the right of this table), the end date for the long term is 1992.

TABLE 4 START-MONTH RESERVOIR STORAGES UP TO FEBRUARY 1993

				1992				1993		1992
Area	Reservoir (R)/ Group (G)		Capacity● (Ml)	Sep	Oct	Nov	Dec	Jan	Feb	Feb
North West	Northern Command Zone[1]	(G)	133375	60	66	64	79	88	98	70
	Vyrnwy	(R)	55146	96	93	81	88	89	86	86
Northumbria	Teesdale[2]	(G)	87936	63	68	79	95	90	98	88
	Kielder	(R)	199175*	84*	89*	87*	77*	74*	90*	91*
Severn-Trent	Clywedog	(R)	44922	87	92	86	92	84	96	88
	Derwent Valley[3]	(G)	39525	66	62	79	95	88	99	94
Yorkshire	Washburn[4]	(G)	22035	64	64	70	89	95	99	77
	Bradford supply[5]	(G)	41407	56	65	65	83	94	100	90
Anglian	Grafham	(R)	58707	94	94	95	94	94	96	90
	Rutland	(R)	130061	86	93	95	96	95	93	67
Thames	London[6]	(G)	206232	89	94	96	96	96	96	81
	Farmoor[7]	(G)	13843	99	99	99	95	96	92	99
Southern	Bewl	(R)	28170	60	68	69	72	82	91	58
	Ardingly	(R)	4685	71	79	81	100	100	100	92
Wessex	Clatworthy	(R)	5364*	35*	40*	49*	70	100	100	88*
	Bristol WW[8]	(G)	38666*	58*	65*	61*	63*	94*	97*	58*
South West	Colliford	(R)	28540	63	65	67	73	82	88	82
	Roadford	(R)	34500	70	72	76	85	90	92	85
	Wimbleball[9]	(R)	21320	48	50	55	71	90	100	76
	Stithians	(R)	5205	53	63	69	82	100	100	38
Welsh	Celyn + Brenig	(G)	131155	89	93	96	98	96	100	93
	Brianne	(R)	62140	90	99	100	100	99	100	97
	Big Five[10]	(G)	69762	83	86	87	91	94	99	93
	Elan Valley[11]	(G)	99106	100	100	100	100	98	100	91
Lothian	Edinburgh/Mid Lothian	(G)	97639	86	92	90	100	98	100	92
	West Lothian	(G)	5613	60	82	84	95	98	99	82
	East Lothian	(G)	10206	68	78	82	91	100	100	98

● Live or usable capacity (unless indicated otherwise)

* Gross storage/percentage of gross storage

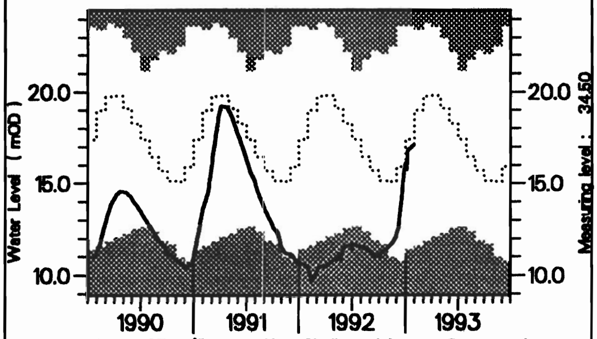
☐ Kielder drawn down for ecological management

1. Includes Haweswater, Thirlmere, Stocks and Barnacre.
2. Cow Green, Selset, Grassholme, Balderhead, Blackton and Hury.
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. Shared between South West (river regulation for abstraction) and Wessex (direct supply).
10. Usk, Talybont, Llandegfedd (pumped storage), Taf Fechan, Taf Fawr.
11. Claerwen, Caban Coch, Pen y Garreg and Craig Goch.

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.

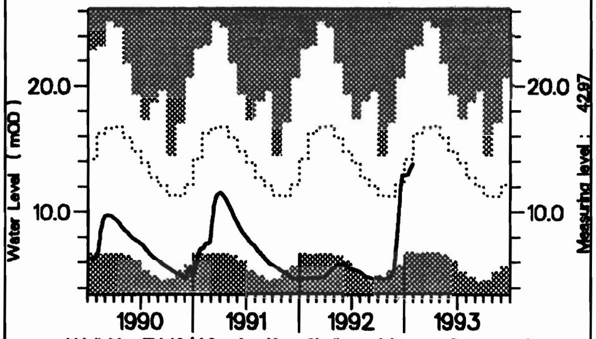
FIGURE 2 GROUNDWATER LEVEL HYDROGRAPHS

Dalton Holme



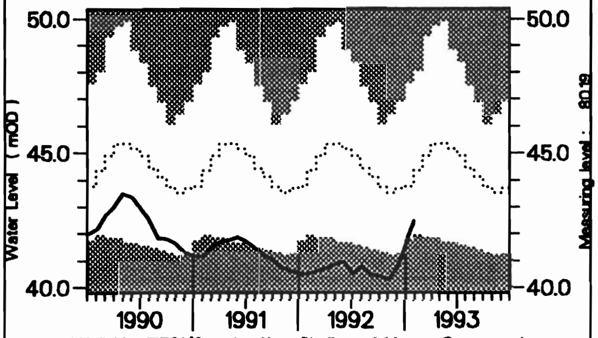
Well No: SE94/5 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1889-1989)

Little Brocklesby



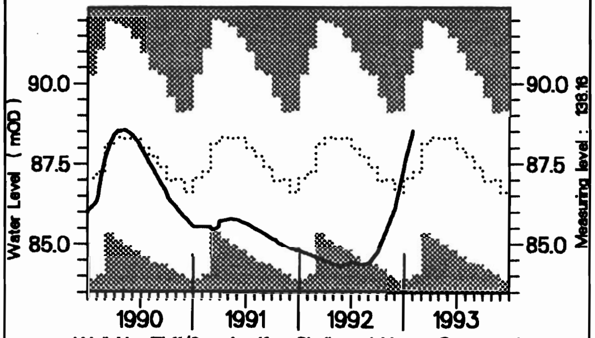
Well No: TA10/40 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1926-1989)

Washpit Farm



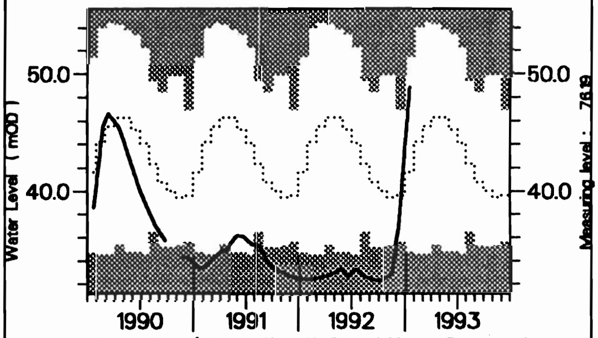
Well No: TF81/2 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1950-1989)

The Holt



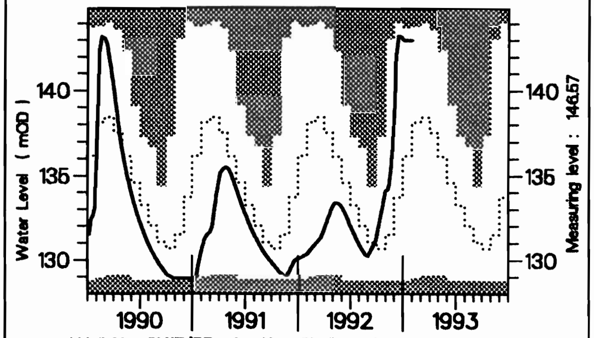
Well No: TL11/9 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1964-1989)

Redlands Hall



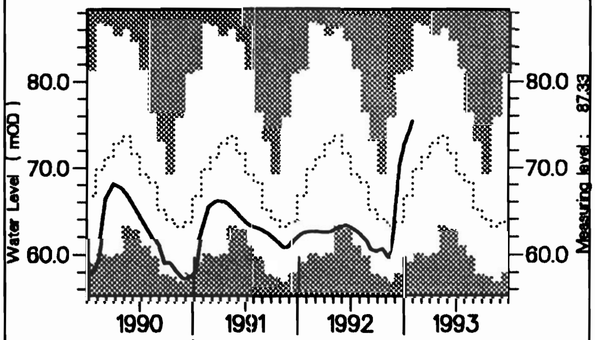
Well No: TL44/12 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1963-1989)

Rockley



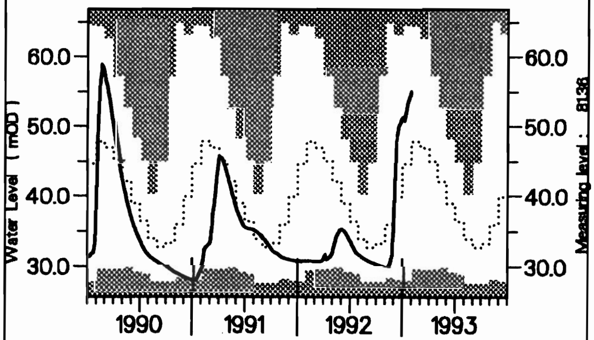
Well No: SU17/57 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1933-1989)

Little Bucket Farm

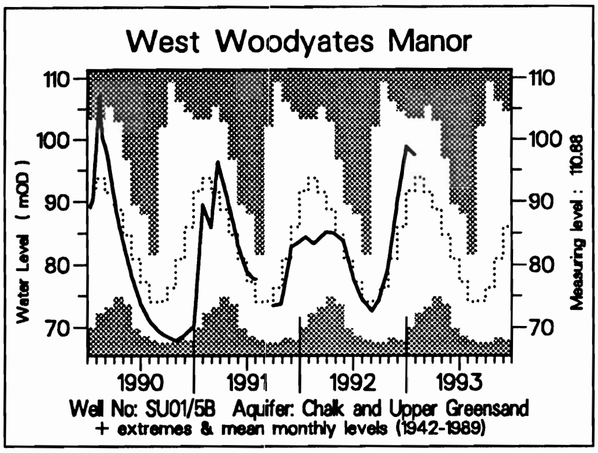


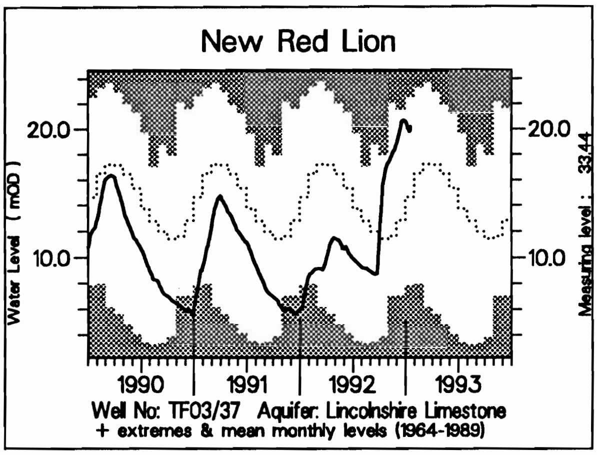
Well No: TR14/9 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1971-1989)

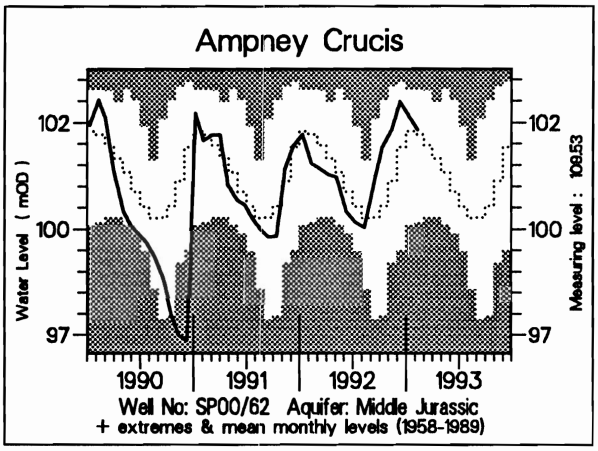
Compton House

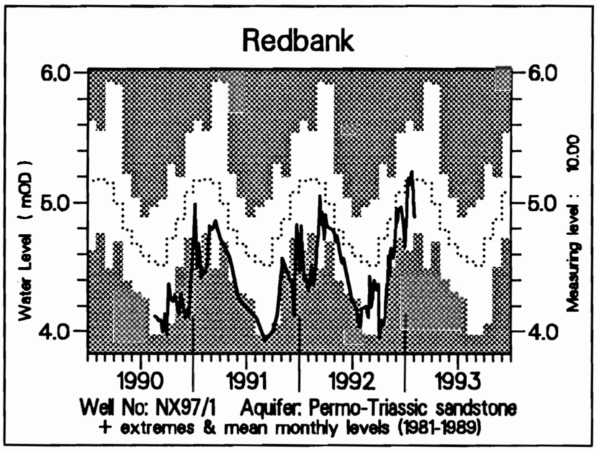


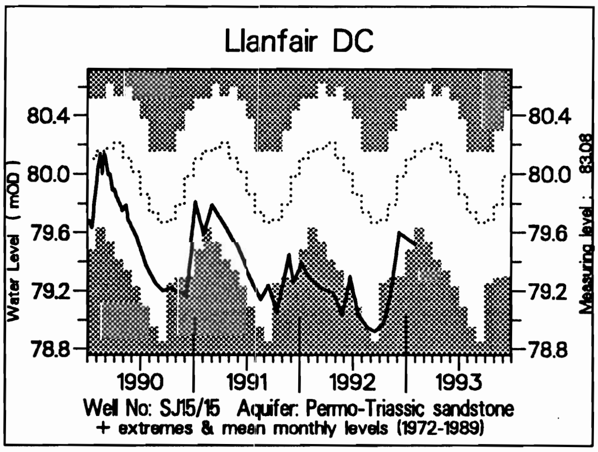
Well No: SU71/23 Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1894-1989)

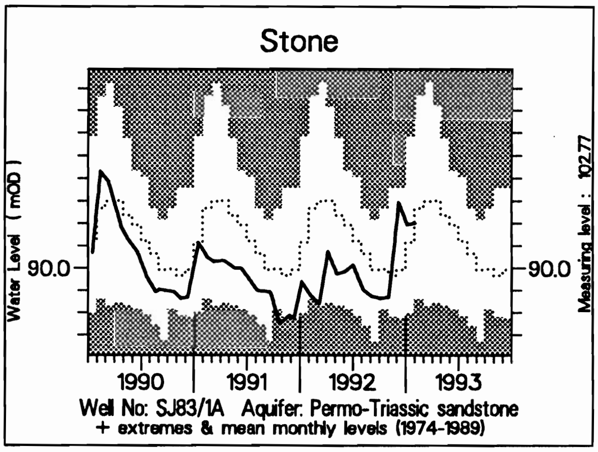

West Woodyates Manor
110
100
90
80
70
Water Level (mOD)
Measuring level : 110.88
1990
1991
1992
1993
Well No: SU01/5B Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1942-1989)

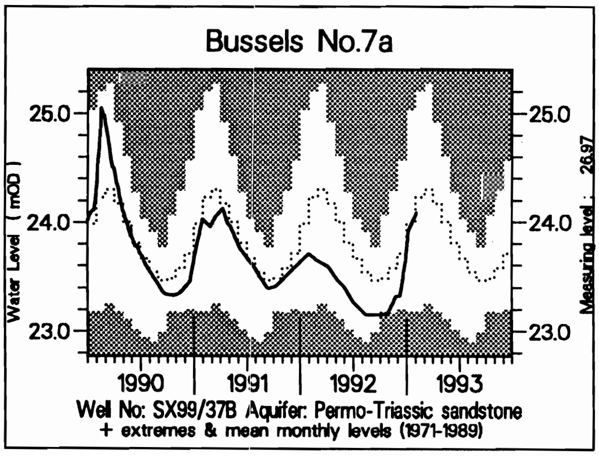

New Red Lion
20.0
10.0
Water Level (mOD)
Measuring level : 33.44
1990
1991
1992
1993
Well No: TF03/37 Aquifer: Lincolnshire Limestone
+ extremes & mean monthly levels (1964-1989)


Ampney Crucis
102
100
97
Water Level (mOD)
Measuring level : 109.53
1990
1991
1992
1993
Well No: SP00/62 Aquifer: Middle Jurassic
+ extremes & mean monthly levels (1958-1989)


Redbank
6.0
5.0
4.0
Water Level (mOD)
Measuring level : 10.00
1990
1991
1992
1993
Well No: NX97/1 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1981-1989)


Llanfair DC
80.4
80.0
79.6
79.2
78.8
Water Level (mOD)
Measuring level : 83.08
1990
1991
1992
1993
Well No: SJ15/15 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1972-1989)


Stone
90.0
Water Level (mOD)
Measuring level : 102.77
1990
1991
1992
1993
Well No: SJ83/1A Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1974-1989)


Bussels No.7a
25.0
24.0
23.0
Water Level (mOD)
Measuring level : 26.97
1990
1991
1992
1993
Well No: SX99/37B Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1989)

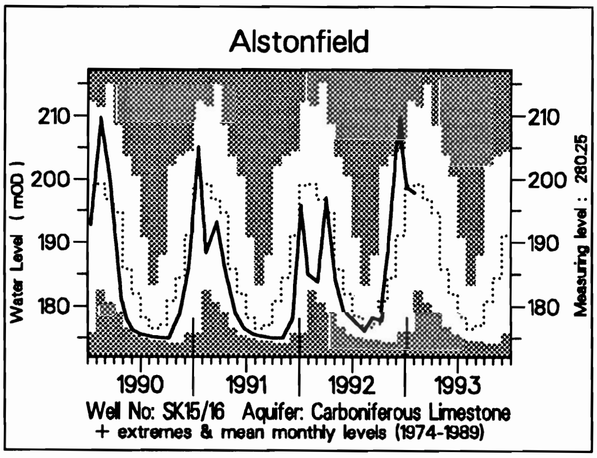

Alstonfield
210
200
190
180
Water Level (mOD)
Measuring level : 280.25
1990
1991
1992
1993
Well No: SK15/16 Aquifer: Carboniferous Limestone
+ extremes & mean monthly levels (1974-1989)

TABLE 5 A COMPARISON OF JANUARY GROUNDWATER LEVELS: 1992 AND 1993

Site	Aquifer	Records commence	Average January level	January-February 1992		January-February 1993		No of years January level <1993	Least pre-1993 level
				day	level	day	level		any month
Wetwang	C & UGS	1971	24.98	22/01	17.00	29/01	24.41	>10	16.66
Dalton Holme	C & UGS	1889	11.39	03/02	10.62	29/01	17.12	>10	9.64
Little Brocklesby	C & UGS	1926	13.76	22/01	4.64	27/01	13.82	>10	4.53
Washpit Farm	C & UGS	1950	43.98	03/02	40.51	10/02	42.47	8	41.24
The Holt	C & UGS	1964	87.01	03/02	84.65	31/01	88.53	>10	83.90
Therfield Rectory	C & UGS	1883	77.98	03/02	dry	03/02	78.92	>10	dry <71.6
Redlands Farm	C & UGS	1964	41.71	24/01	32.38	15/01	48.86	>10	34.04
Rockley	C & UGS	1933	136.30	03/02	130.39	31/01	143.01	>10	dry <128.9
Little Bucket Farm	C & UGS	1971	66.68	29/01	62.52	28/01	75.41	>10	56.77
Compton House	C & UGS	1894	44.87	29/01	30.86	29/01	55.08	>10	27.64
Chilgrove House	C & UGS	1836	54.75	29/01	40.31	29/01	68.30	>10	33.46
West Dean No 3	C & UGS	1940	2.17	31/01	1.38	29/01	2.36	>10	1.01
Lime Kiln Way	C & UGS	1969	125.09	29/01	124.16	28/01	124.25	1	123.70
Ashton Farm	C & UGS	1974	68.90	20/01	68.10	29/01	71.43	>10	63.10
West Woodyates	C & UGS	1942	91.07	20/01	84.40	29/01	97.35	>10	67.62
New Red Lion	LLst	1964	14.56	20/01	7.56	18/01	20.18	>10	3.29
Ampney Crucis	Mid Jur	1958	102.30	10/01	102.23	08/02	102.33	>10	97.38
Llanfair DC	PTS	1972	80.07	06/01	79.39	31/01	79.52	2	78.85
Morris Dancers	PTS	1969	32.62	16/01	32.07	13/01	31.84	1	30.87
Stone	PTS	1974	90.36	07/02	89.76	01/02	90.40	>10	89.34
Skirwith	PTS	1978	130.32	31/01	130.21	02/02	130.53	8	129.44
Bussels 7A	PTS	1972	24.03	30/01	23.71	03/02	24.09	>10	22.90
Rusheyford NE	MgLst	1967	76.08	13/01	74.71	20/01	74.90	>10	64.77
Peggy Ellerton	MgLst	1968	34.43	14/01	32.38	07/01	32.15	1	31.10
Alstonfield	CLst	1974	198.56	07/01	195.82	01/02	197.86	8	174.22

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