Hydrological Summary for Great Britain

JANUARY 1997

Rainfall

January was cold - notably so early in the month - and remarkably dry in almost all regions. Light drizzle and fog were common in some areas but substantial frontal precipitation was rare. Many localities registered more than 25 days without significant rainfall - continuing a dry spell which began in mid-December. Coming at what, on average, is one of the wettest periods of the year, this produced a sharp deterioration in the water resources outlook. Many raingauges recorded new minimum January totals and for a significant minority - including Plynlimon (central Wales) - it was the driest month on record. Scotland aside, all regions recorded <25% of the January average; much of Wales and the North-West registered below 10%. For Britain as a whole, it was the driest January in a 138-year series; only in 1850 and 1880 have rainfall totals been similarly meagre for England and Wales in the last 200 years. As significantly, the combined Dec.- Jan. total was the second lowest in the last 116 years. This intensification of the drought has increased the already very large longer term rainfall deficiencies. In the Mar.-Jan. timeframe both 1995/96 and 1996/97 rainfall totals rank amongst the four driest such sequences for E&W in more than 140 years; the April 95 - January 97 rainfall total is the lowest for *any* 22-month accumulation since the 1850s. Extreme drought conditions characterise parts of the NW England where the accumulated shortfall is the equivalent of more than seven month's rainfall. Severe long term drought conditions extend across most regions of E&W apart from the South-West.

River Flow

Early January saw a continuation of the recessions which became well established over the second half of December. Frozen catchments produced exceptionally depressed runoff rates which were commonly maintained throughout the month. Snowmelt provided a minor but useful contribution to runoff in some rivers (eg the River Lud) but a majority of the larger index rivers established new January minimum flows - most notably the Thames, Severn, Welsh Dee and Tay in flow records of 115, 76, 60 and 45 years respectively. In almost all regions January runoff totals were typical of an average August and some (especially in Wales and NW England) fell well below the late summer average. Preliminary analyses suggest that the January outflow from Britain was the lowest this century (closely approached only by 1963 and 1964). Accumulated runoff totals, particularly in the 10-22 month timeframes, are now close to or below previous minima. In the 20-month timespan a few southern rivers (including the Gt Stour and Sussex Ouse) reported unprecedented totals for *any* start month. In the English lowlands the protracted decline in baseflows and the associated failure of winterbournes has focused concern on the potential contraction of the headwater stream network - and the consequential loss of aquatic habitat - over the coming summer.

Groundwater

On average, infiltration rates peak in January but this year has seen very little replenishment to any major aquifer. After modest recoveries in late 1996, recessions have recommenced throughout most of the Permo-Triassic sandstones outcrop areas and January levels were commonly the lowest on record. With 1996/97 recharge (thus far) to the Chalk less than 20% of average over wide areas groundwater levels are also very depressed - especially in the northern outcrops. To the south, levels are generally close to the seasonal minimum but a little healthier in the west. Only rarely - most recently in 1992 - have water-tables been so depressed in late winter across so many aquifers. Modest - but seasonally high - early February soil moisture deficits in the English lowlands underline the narrowing window of opportunity for further recharge before evaporation rates accelerate in the spring. A notably wet late spring is needed to extend the recharge season and delay the onset of the 1997 summer recessions.

General

Severe and protracted drought conditions now extend across most of England and Wales. Overall reservoir stocks declined appreciably in January and are very substantially below average for the late winter (but still a little healthier than early in 1996). Given above average late winter/spring rainfall there is still time for overall surface water stocks to approach capacity in most areas. Prospects for groundwater are less encouraging. However, groundwater resources have demonstrated their resilience in a number of recent drought years and much will depend on summer rainfall and demand patterns. A repetition of the weather conditions experienced during the spring and summer of 1990 or 1995 would result in extremely low river flows and groundwater levels requiring very careful management to reconcile water supply demands with the competing needs of the aquatic environment.

Institute of Hydrology

British Geological Survey

Data for this report have been provided principally by the regional divisions of the newly formed Environment Agency (England and Wales) and the Scottish Environment Protection Agency. For reasons of consistency and to provide greater spatial discrimination, the original regional divisions of the precursor organisations have been retained for use in the Hydrological Summaries. The majority of the areal rainfall figures have been provided by the Meteorological Office. Figure 3 is based on weather data collected by the Institute of Hydrology at Wallingford, Balquhidder (Central Region, Scotland) and Plynlimon. Reservoir contents information has been supplied by the Water Services Companies, the Environment Agency and, in Scotland, West of Scotland Water Authority and East of Scotland Water.

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 4) 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, the Environment Agency, the Scottish Environment Protection Agency and the Office of Water Services (OFWAT).

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. The text of the monthly report, together with details of other National Water Archive facilities, is available on the World Wide Web: http://www.nwl.ac.uk:80/~nrfadata/nwa.html

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 raingauge sites.

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

Tel: 01344 856858 Fax: 01344 854024

Institute of Hydrology/British Geological Survey
Maclean Building
Crowmarsh Gifford
Wallingford
Oxfordshire
OX10 8BB

13 February 1997

TABLE 1 1996/97 RAINFALL AS A PERCENTAGE OF THE 1961-90 AVERAGE

Note: The monthly rainfall figures are the copyright of The Meteorological Office.
These data may not be published or passed on to any unauthorised person or organisation.

		Jan 1996	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan 1997
England and Wales	mm	63	83	43	51	57	30	40	79	32	89	126	49	16
	%	72	132	60	85	89	46	65	104	42	105	140	52	18
North West	mm	53	105	36	77	62	49	58	84	52	149	133	70	11
	%	44	135	38	108	83	60	68	79	45	116	108	57	9
Northumbrian	mm	46	89	31	63	53	22	52	76	30	68	108	85	18
	%	55	151	44	113	85	37	80	94	41	89	126	104	22
Severn Trent	mm	44	67	41	50	48	30	33	68	20	71	95	48	13
	%	63	124	67	91	81	51	62	101	31	111	134	63	18
Yorkshire	mm	46	78	31	41	52	35	41	74	31	57	112	95	15
	%	58	134	46	69	87	58	69	100	46	78	140	114	18
Anglian	mm	33	50	20	15	23	18	41	75	16	46	91	41	12
	%	66	135	43	33	48	35	84	136	33	90	157	74	24
Thames	mm	50	64	35	36	35	16	38	60	20	47	106	23	11
	%	78	142	63	72	63	29	78	103	34	76	163	32	17
Southern	mm	67	68	40	23	51	16	31	78	33	57	147	33	15
	%	84	126	63	43	94	30	65	137	48	71	173	40	19
Wessex	mm	76	85	68	58	60	29	27	86	31	83	145	31	13
	%	87	131	97	109	98	51	52	130	43	105	175	34	14
South West	mm	156	119	72	79	100	34	31	97	49	134	201	50	21
	%	113	118	73	114	139	49	45	115	53	116	161	36	15
Welsh	mm	102	127	73	87	106	47	46	100	58	173	171	53	13
	%	71	131	68	109	129	59	60	99	50	126	120	35	9
Scotland	mm	89	141	60	108	78	65	77	69	62	229	188	96	61
	%	59	138	48	142	91	76	82	59	44	147	125	63	40
Highland	mm	58	152	55	111	84	79	91	78	80	266	250	116	94
	%	31	120	34	122	91	81	86	61	47	134	123	59	50
North East	mm	69	114	59	63	67	33	66	64	32	139	110	84	25
	%	70	175	76	105	97	50	90	74	37	143	111	90	25
Tay	mm	136	116	76	103	67	44	52	64	50	195	142	72	43
	%	94	122	70	166	81	60	68	68	44	150	117	57	30
Forth	mm	72	86	53	86	68	44	55	62	46	186	139	71	43
	%	61	109	56	146	92	64	73	66	42	162	124	65	36
Tweed	mm	68	103	30	79	63	30	53	64	29	134	139	110	26
	%	68	154	38	139	89	46	73	73	33	141	149	118	26
Solway	mm	135	160	74	133	80	78	70	68	56	265	155	99	34
	%	87	158	63	173	94	93	78	57	39	169	108	67	22
Clyde	mm	119	180	62	142	90	88	97	65	79	282	215	87	74
	%	63	153	42	169	99	95	89	49	44	146	119	49	39

Note: The monthly regional rainfall figures for England and Wales for December 1996 & January 1997 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, especially when snow is a significant component in the precipitation total. The figures for the Scottish regions (and also for Scotland) for December 1996 & January 1997 were derived by IH in collaboration with the SEPA regions. 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 ACCUMULATIONS AND RETURN PERIOD ESTIMATES

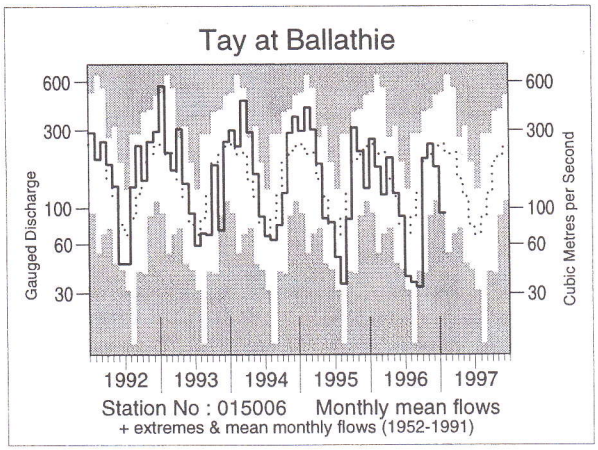
		Oct 96-Jan 97		Jun 96-Jan 97		Mar 96-Jan 97		Apr 95-Jan 97	
			Est Return Period, years		Est Return Period, years		Est Return Period, years		Est Return Period, years
England and Wales	mm	280		461		612		1245	
	% LTA	78	5-10	72	25-40	73	35-50	75	>200
North West	mm	364		607		782		1475	
	% LTA	73	5-10	69	35-50	69	60-90	66	>>200
Northumbria	mm	279		459		606		1268	
	% LTA	85	2-5	76	10-20	76	20-30	80	35-50
Severn Trent	mm	227		378		517		1033	
	% LTA	81	2-5	72	15-25	74	20-35	74	110-150
Yorkshire	mm	278		459		583		1099	
	% LTA	88	2-5	80	5-10	76	15-25	73	>200
Anglian	mm	190		340		398		812	
	% LTA	89	2-5	81	5-10	71	35-50	73	120-170
Thames	mm	186		320		426		957	
	% LTA	71	5-10	66	25-40	66	50-80	75	50-80
Southern	mm	252		410		524		1089	
	% LTA	77	5-10	74	10-15	72	20-35	76	40-60
Wessex	mm	272		445		631		1370	
	% LTA	79	2-5	76	5-15	82	5-10	89	5-10
South West	mm	405		616		867		1829	
	% LTA	78	5-10	74	10-20	81	5-15	85	10-15
Welsh	mm	410		661		927		1856	
	% LTA	71	5-10	70	25-40	76	15-25	77	70-100
Scotland	mm	573		846		1092		2243	
	% LTA	94	2-5	81	10-20	82	15-25	85	30-50
Highland	mm	726		1054		1304		2598	
	% LTA	92	2-5	82	10-15	80	20-30	80	70-100
North East	mm	358		553		742		1768	
	% LTA	92	2-5	79	10-20	82	10-20	98	2-5
Tay	mm	452		662		908		2000	
	% LTA	87	2-5	75	10-20	80	10-20	89	5-10
Forth	mm	439		646		853		1718	
	% LTA	96	2-5	80	5-15	83	5-15	84	20-35
Tweed	mm	409		585		757		1548	
	% LTA	107	2-5	84	5-10	84	5-10	86	10-20
Solway	mm	553		825		1112		2193	
	% LTA	91	2-5	79	10-15	84	5-10	84	20-30
Clyde	mm	658		987		1281		2566	
	% LTA	89	2-5	79	10-20	81	10-20	82	35-50

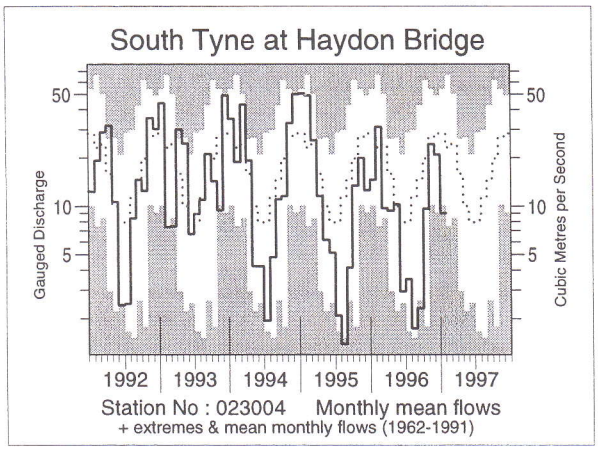
LTA refers to the period 1961-90.

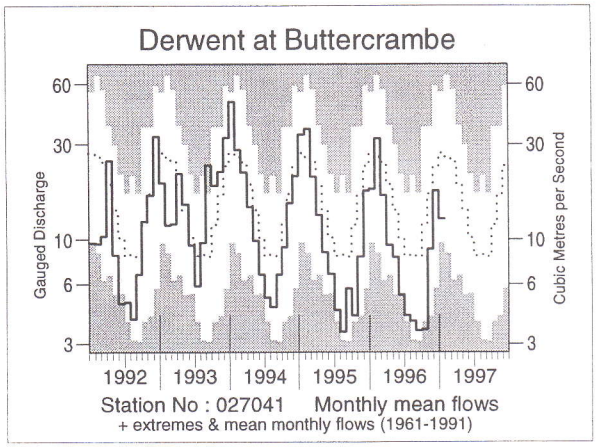
Return period assessments are based on tables provided by the Meteorological Office*. The tables reflect rainfall totals over the period 1911-70 only and the estimate assumes a sensibly stable climate. They assume a start in a specified month; return periods for a start in any month may be expected to be an order of magnitude less - for the longest durations the return period estimates converge. "Wet" return periods underlined. The ranking of accumulated rainfall totals for England & Wales and for Scotland can be affected by artifacts in the historical series - on balance these tend to exaggerate the relative wetness of the recent past.

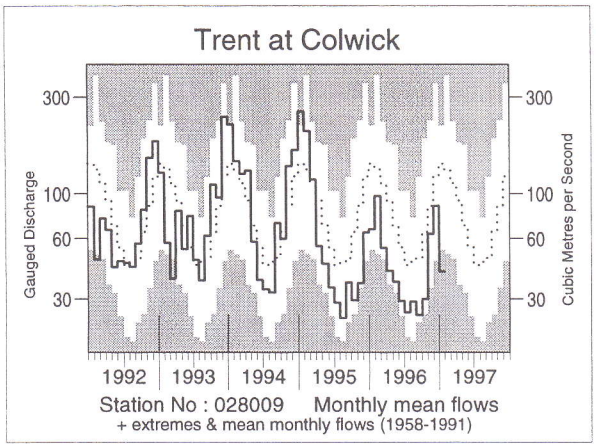
* Tabony, R.C., 1977, The Variability of long duration rainfall over Great Britain, Scientific Paper No. 37, Meteorological Office.

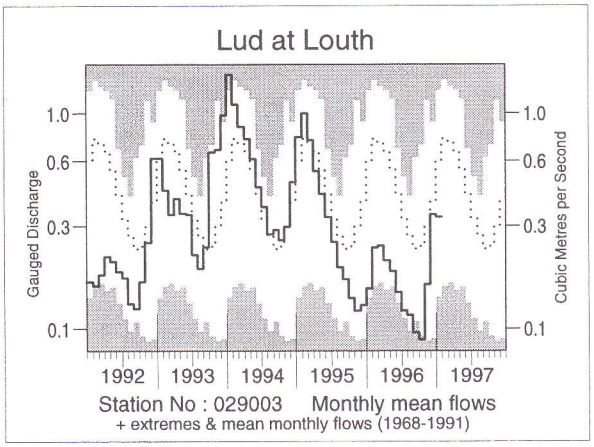
FIGURE 1 MONTHLY RIVER FLOW HYDROGRAPHS

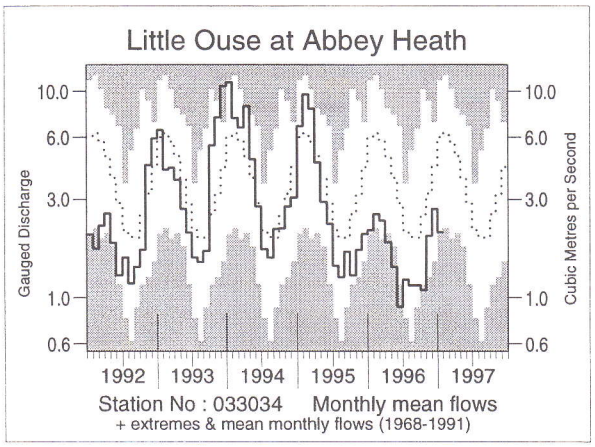


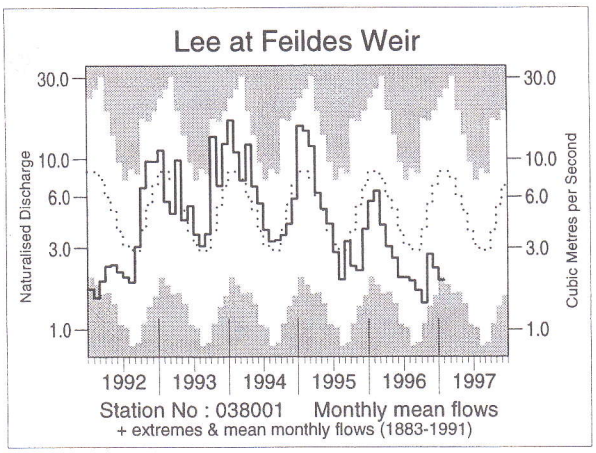


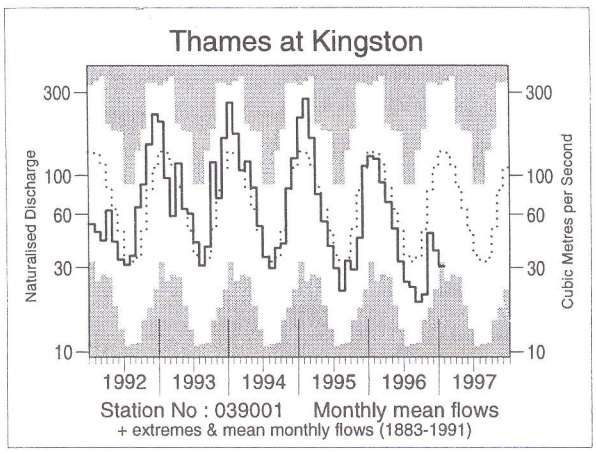


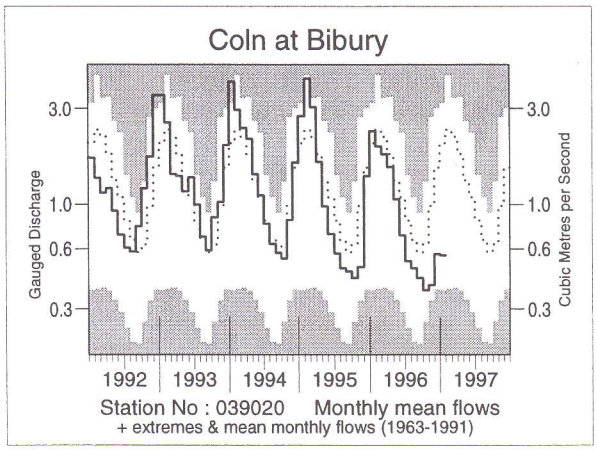


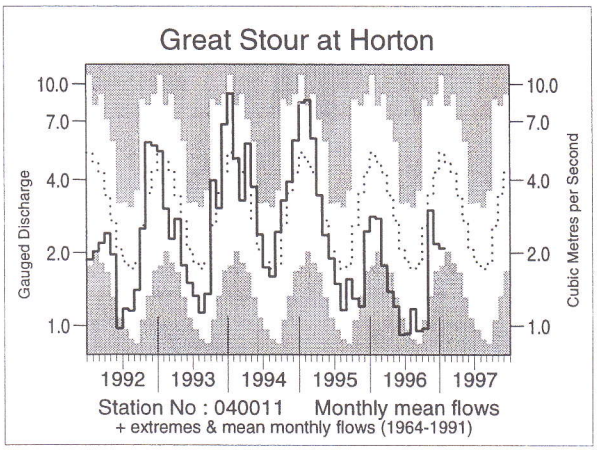


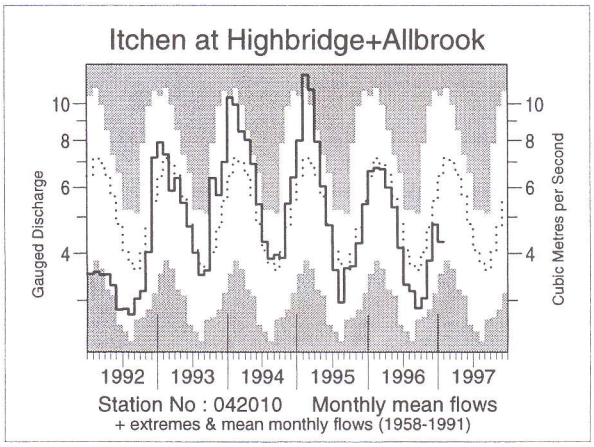


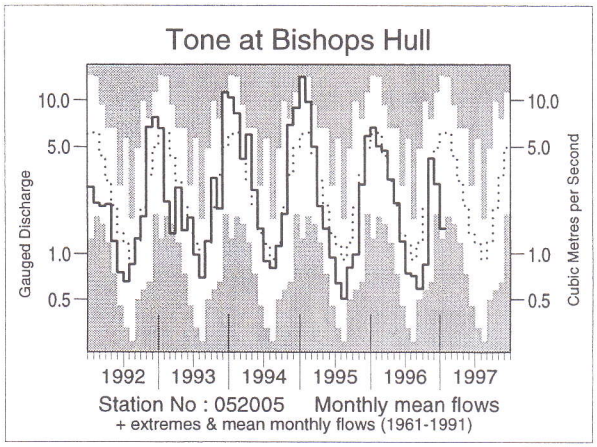


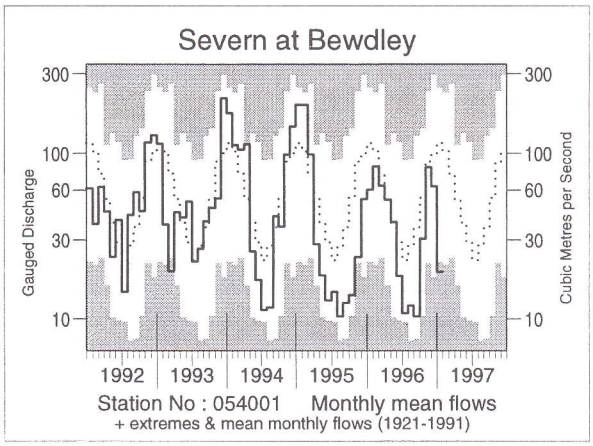


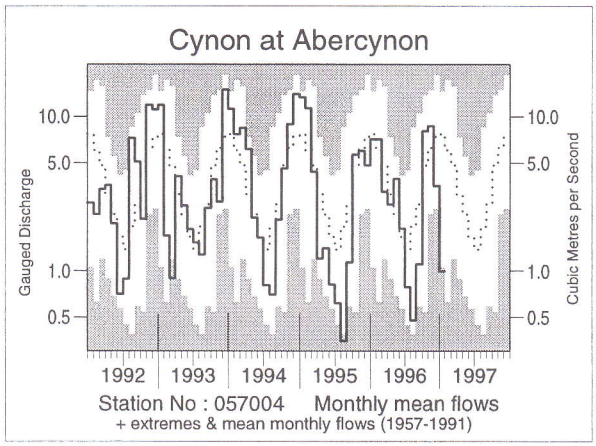

Coln at Bibury
Gauged Discharge
Cubic Metres per Second
3.0
1.0
0.6
0.3
1992
1993
1994
1995
1996
1997
Station No : 039020 Monthly mean flows
+ extremes & mean monthly flows (1963-1991)

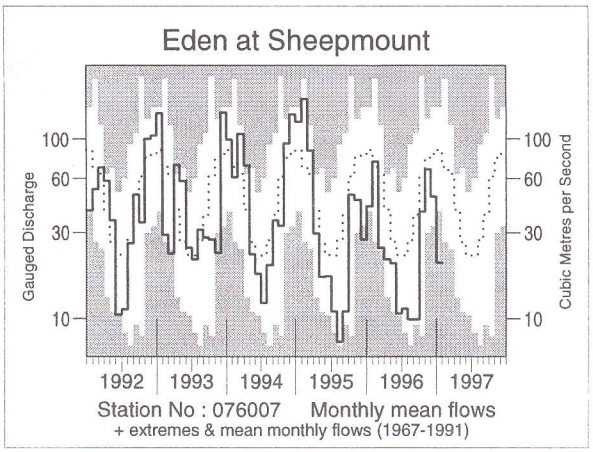

Great Stour at Horton
Gauged Discharge
Cubic Metres per Second
10.0
7.0
4.0
2.0
1.0
1992
1993
1994
1995
1996
1997
Station No : 040011 Monthly mean flows
+ extremes & mean monthly flows (1964-1991)


Itchen at Highbridge+Allbrook
Gauged Discharge
Cubic Metres per Second
10
8
6
4
1992
1993
1994
1995
1996
1997
Station No : 042010 Monthly mean flows
+ extremes & mean monthly flows (1958-1991)


Tone at Bishops Hull
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1992
1993
1994
1995
1996
1997
Station No : 052005 Monthly mean flows
+ extremes & mean monthly flows (1961-1991)


Severn at Bewdley
Gauged Discharge
Cubic Metres per Second
300
100
60
30
10
1992
1993
1994
1995
1996
1997
Station No : 054001 Monthly mean flows
+ extremes & mean monthly flows (1921-1991)


Cynon at Abercynon
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1992
1993
1994
1995
1996
1997
Station No : 057004 Monthly mean flows
+ extremes & mean monthly flows (1957-1991)


Eden at Sheepmount
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1992
1993
1994
1995
1996
1997
Station No : 076007 Monthly mean flows
+ extremes & mean monthly flows (1967-1991)

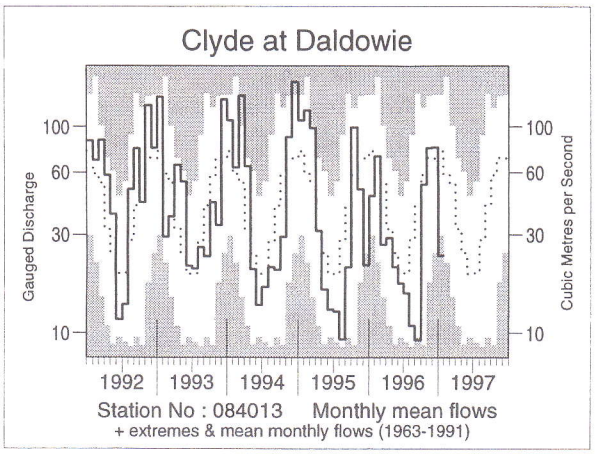

Clyde at Daldowie
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1992
1993
1994
1995
1996
1997
Station No : 084013 Monthly mean flows
+ extremes & mean monthly flows (1963-1991)

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 1996	Oct	Nov	Dec	Jan 1997		10/96 to 1/97		8/96 to 1/97		3/96 to 1/97		5/95 to 1/97	
	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	58	63	77	39	1	238	3	263	3	544	3	1337	10
Park	27	70	82	91	42	/25	70	/24	64	/24	76	/24	100	/23
Tay at	19	118	139	105	54	1	415	7	454	3	784	4	1617	4
Ballathie	27	105	115	74	36	/45	80	/45	70	/44	77	/44	83	/43
Tweed at	11	67	103	126	42	2	337	14	362	9	527	5	1044	4
Boleside	23	93	118	127	39	/37	92	/36	81	/36	78	/36	80	/35
Whiteadder Water at	6	8	29	102	47	10	185	16	197	13	303	11	564	9
Hutton Castle	38	27	79	217	78	/28	108	/28	99	/27	90	/27	88	/26
South Tyne at	8	34	84	75	32	1	225	3	240	2	366	1	751	1
Haydon Bridge	16	50	91	72	31	/35	62	/35	52	/33	53	/33	57	/31
Wharfe at	18	39	79	77	28	2	223	3	263	3	361	2	570	1
Flint Mill Weir	41	64	102	79	27	/42	67	/42	63	/41	57	/41	47	/40
Derwent at	6	6	15	30	21	6	72	5	84	4	157	2	336	2
Buttercrambe	41	30	54	74	47	/36	55	/36	53	/35	56	/35	63	/34
Trent at	9	11	22	31	15	1	79	3	98	3	164	1	326	1
Colwick	51	46	71	69	29	/39	53	/39	55	/38	53	/38	55	/37
Lud at	5	4	8	17	16	8	44	8	54	6	98	2	200	3
Louth	42	35	53	83	53	/29	59	/29	56	/29	46	/28	50	/27
Witham at	3	4	6	9	9	6	27	6	33	5	75	2	150	1
Claypole Mill	39	37	47	43	34	/38	40	/38	41	/38	47	/37	50	/37
Little Ouse at	4	4	7	10	8	3	30	5	39	4	68	2	140	2
Abbey Heath	60	42	60	61	34	/29	49	/29	51	/29	47	/28	51	/28
Colne at	2	3	7	7	5	3	22	6	27	6	50	2	113	3
Lexden	56	33	58	40	22	/38	37	/37	40	/36	43	/36	52	/34
Lee at	4	4	7	6	5	2	21	4	31	8	66	8	161	12
Feildes Weir (natr.)	58	36	51	33	23	/112	34	/112	39	/111	46	/110	59	/109
Thames at	5	6	12	10	8	1	36	6	48	6	119	8	283	17
Kingston (natr.)	55	42	57	33	22	/115	36	/114	40	/114	56	/114	70	/113
Coln at	10	9	10	14	14	2	47	2	70	2	208	3	448	4
Bibury	74	58	40	35	26	/34	36	/34	43	/33	62	/33	70	/32
Great Stour at	7	8	23	17	16	3	63	3	80	2	127	1	272	1
Horton	53	37	85	49	39	/33	52	/32	54	/32	50	/30	56	/29
Itchen at	21	23	28	36	32	5	118	7	162	6	349	7	698	9
Highbridge+Allbrook	79	75	81	85	66	/39	77	/39	79	/38	85	/38	90	/37
Stour at	6	8	33	30	18	2	88	3	102	3	226	5	507	4
Throop Mill	54	36	98	52	27	/25	50	/24	52	/24	68	/24	78	/23
Exe at	9	53	133	71	18	1	274	5	296	4	485	3	976	1
Thorverton	24	72	135	52	13	/41	63	/41	59	/41	67	/40	69	/40
Taw at	4	28	134	62	14	1	239	4	248	4	383	3	740	1
Umberleigh	18	46	146	52	12	/39	61	/39	58	/38	64	/38	62	/37
Tone at	8	11	54	38	19	2	122	5	139	3	295	6	629	5
Bishops Hull	50	43	123	54	23	/36	55	/36	56	/36	73	/36	80	/35
Severn at	6	19	49	39	12	1	119	5	133	4	245	4	429	2
Bewdley	29	58	93	62	17	/76	54	/76	52	/76	63	/75	56	/75
Teme at	2	3	23	28	11	1	65	2	71	2	194	3	391	1
Knightsford Bridge	25	17	68	50	16	/27	38	/27	38	/27	63	/26	66	/26
Cynon at	27	203	211	90	25	1	529	10	568	7	880	9	1743	4
Abercynon	41	170	135	46	13	/39	79	/39	71	/37	78	/37	80	/35
Dee at	69	255	282	94	25	1	655	3	765	3	1089	4	1907	1
New Inn	55	138	121	37	10	/28	72	/28	68	/28	68	/27	61	/26
Eden at	11	46	77	56	24	1	203	2	225	2	328	1	674	1
Sheepmount	27	68	88	56	23	/30	58	/30	54	/29	53	/29	56	/28
Clyde at	13	74	107	112	33	1	326	9	354	5	506	5	1003	4
Daldowie	23	91	111	107	29	/34	83	/34	73	/33	72	/33	74	/32
Carron at	112	371	362	162	164	6	1059	8	1254	4	1675	2	2903	1
New Kelso	45	148	130	49	50	/19	90	/18	80	/18	73	/18	66	/17
Ewe at	59	272	314	167	127	5	881	7	1001	5	1478	3	2690	1
Poolewe	32	124	121	61	46	/27	86	/26	76	/26	77	/26	72	/25

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 1995. For the long periods (at the right of this table), the end date for the long term is 1997.

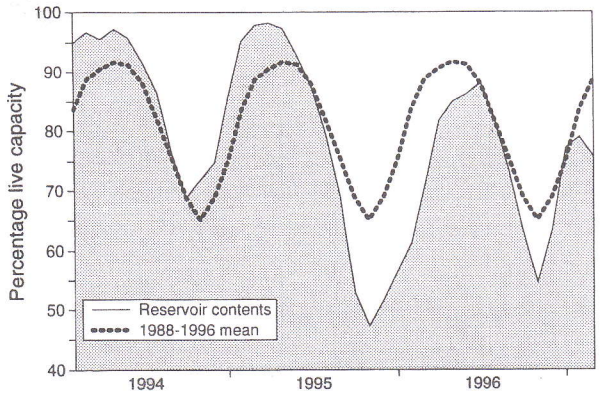
TABLE 4 START-MONTH RESERVOIR STORAGES UP TO FEBRUARY 1997

Area	Reservoir (R)/ Group (G)		Capacity● (Ml)	1996 Sep	Oct	Nov	Dec	1997 Jan	Feb	*1996 Feb*
North West	N.Command Zone[1]	(G)	133375	45	36	69	84	77	66	*63*
	Vyrnwy	(R)	55146	43	35	65	86	81	71	*45*
Northumbria	Teesdale[2]	(G)	87936	42	34	35	61	78	80	*51*
	Kielder	(R)	199175*	83	81	86	93	88	89	*93*
Severn-Trent	Clywedog	(R)	44922	67	46	66	80	81	76	*62*
	Derwent Valley[3]	(G)	39525	36	27	30	93	98	94	*15*
Yorkshire	Washburn[4]	(G)	22035	69	62	64	86	97	86	*34*
	Bradford supply[5]	(G)	41407	55	48	59	84	90	88	*33*
Anglian	Grafham	(R)	58707	78	71	67	68	69	68	*92*
	Rutland	(R)	130061	78	72	70	70	71	68	*72*
Thames	London[6]	(G)	206399	67	54	46	59	70	70	*89*
	Farmoor [7]	(G)	13843	97	91	92	100	99	93	*99*
Southern	Bewl	(R)	28170	65	58	52	59	60	65	*82*
	Ardingly	(R)	4685	47	37	33	55	64	68	*84*
Wessex	Clatworthy	(R)	5364	62	48	44	88	96	74	*91*
	Bristol W [8]	(G)	38666*	66	57	59	77	80	81	*73*
South West	Colliford	(R)	28540	52	43	42	50	53	52	*55*
	Roadford[9]	(R)	34500	42	38	40	51	54	52	*30*
	Wimbleball[10]	(R)	21320	53	43	42	60	64	59	*60*
	Stithians	(R)	5205	68	57	50	71	88	90	*100*
Welsh	Celyn + Brenig	(G)	131155	55	48	63	75	82	78	*61*
	Brianne	(R)	62140	77	63	87	100	93	84	*97*
	Big Five[11]	(G)	69762	54	46	64	77	75	67	*84*
	Elan Valley[12]	(G)	99106	67	57	82	99	92	85	*73*
East of Scotland	Edin./Mid Lothian[13]	(G)	97639	77	68	74	89	93	91	*96*
	East Lothian[14]	(G)	10206	76	67	63	79	100	100	*99*
West of Scotland	Loch Katrine	(G)	111363	62	56	90	97	89	85	*91*
	Daer	(R)	22412	66	53	89	100	98	91	*97*
	Loch Thom	(G)	11840	70	59	88	100	99	96	*100*

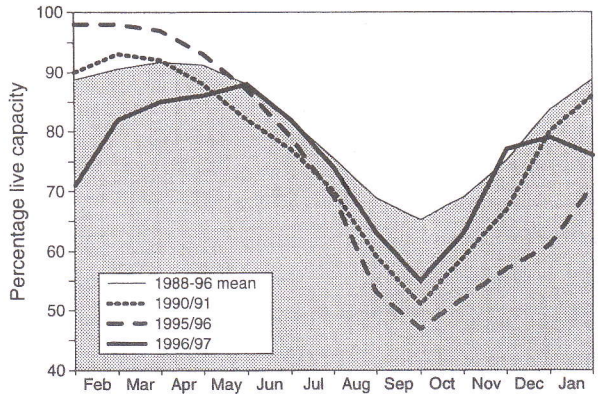
● Live or usable capacity (unless indicated otherwise) * Gross storage/percentage of gross storage

1. Includes Haweswater, Thirlmere, Stocks and Barnacre.
2. Cow Green, Selset, Grassholme, Balderhead, Blackton and 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. 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.
13. Megget, Talla, Fruid, Gladhouse, Torduff, Clubbiedean, Glencorse, Loganlea and Morton (upper and lower).
14. Thorters, Donolly, Stobshiel, Lammerloch, Hopes and Whiteadder

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



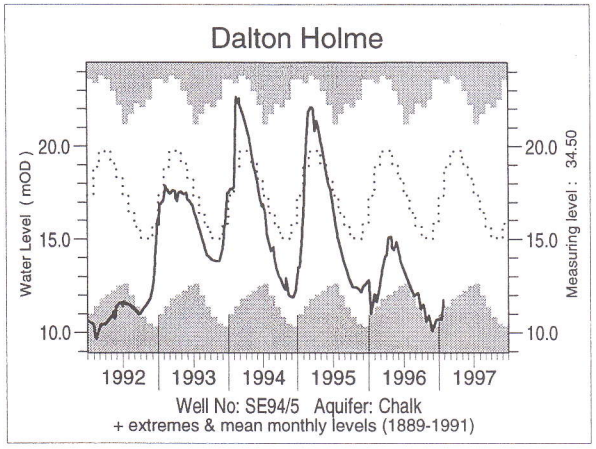
A COMPARISON BETWEEN OVERALL RESERVOIR STOCKS FOR ENGLAND AND WALES IN RECENT YEARS

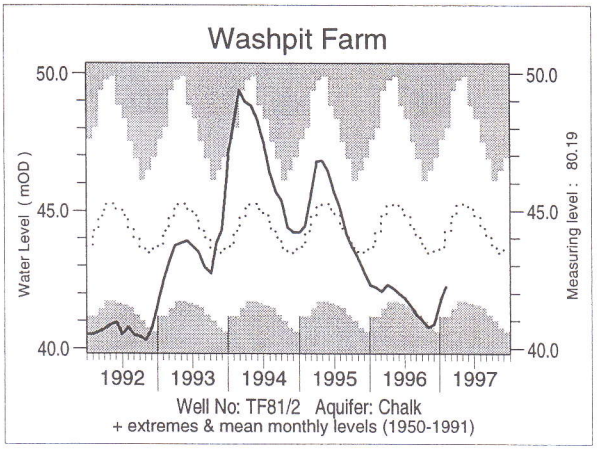


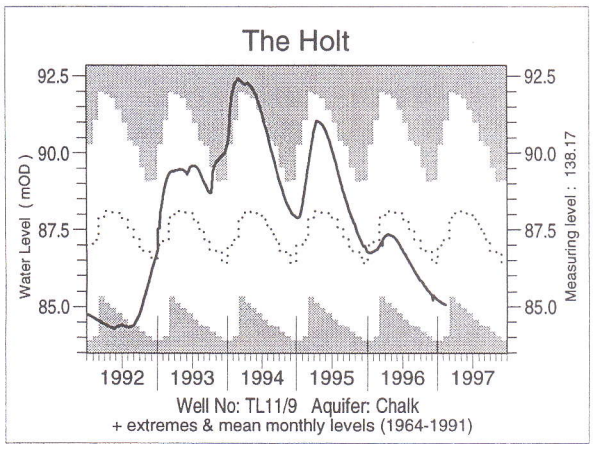
These plots are based on the reservoirs featured in Table 4 only

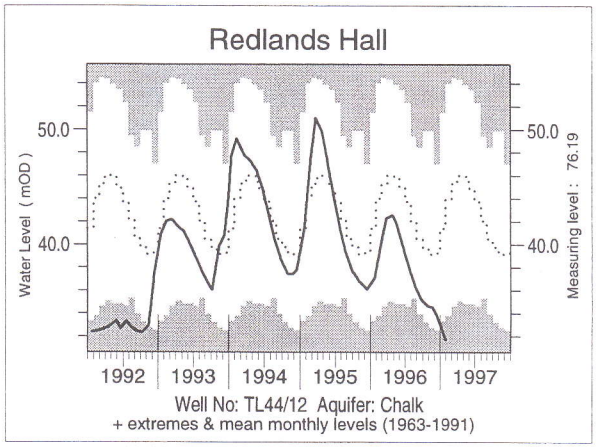
Note: Variations in storage depend on the balance between inputs (from catchment rainfall and any pumping) and outputs (to supply, compensation flow, HEP, amenity). There will be additional losses due to evaporation, especially in the summer months. Operational strategies for making the most efficient use of water stocks will further affect reservoir storages. Table 4 is intended to provide a link between the hydrological conditions described elsewhere in the report and the water resources situation. The reservoirs featured may not be representative of storage conditions across the individual regions; this can be particularly important during drought conditions (eg, in the Severn-Trent region during 1995/96).

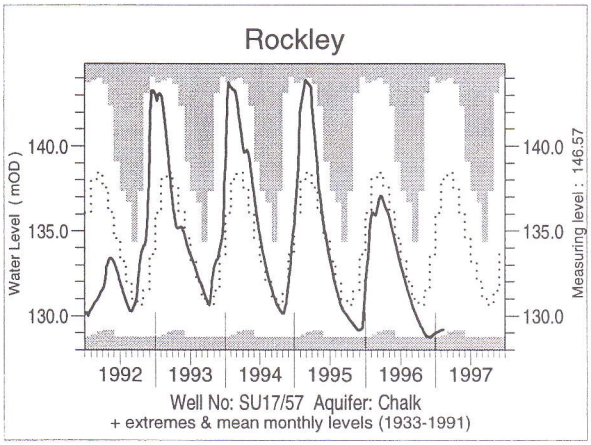
FIGURE 2 GROUNDWATER LEVEL HYDROGRAPHS

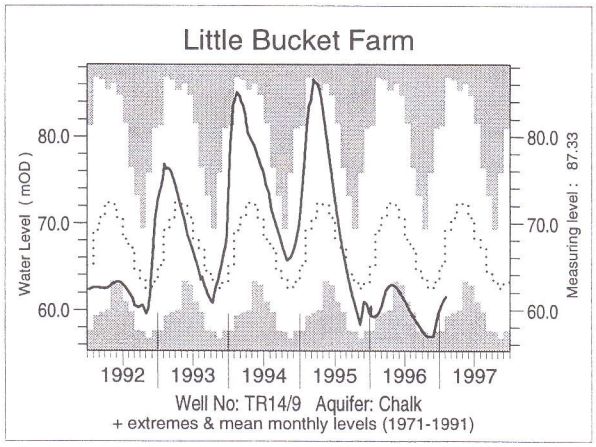


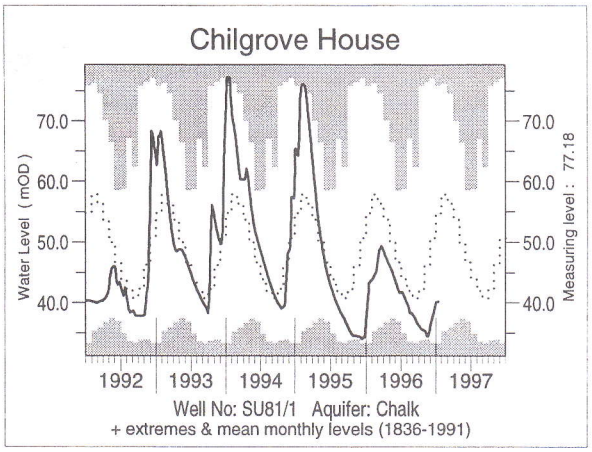


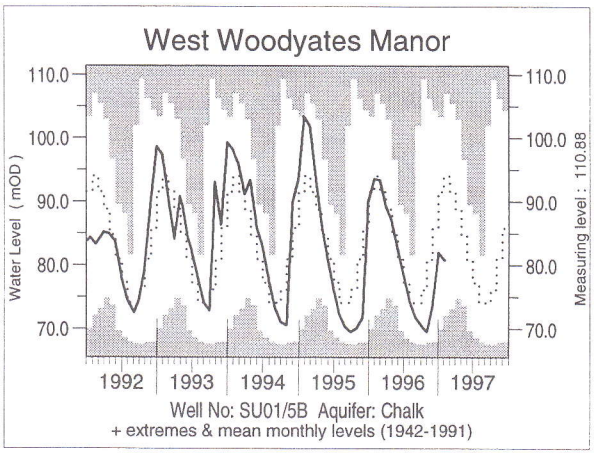


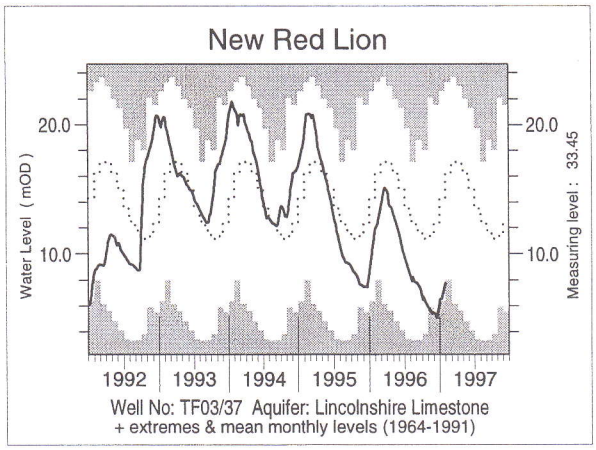


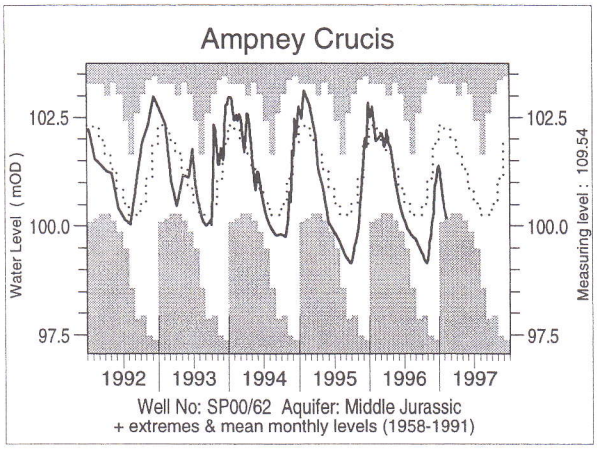


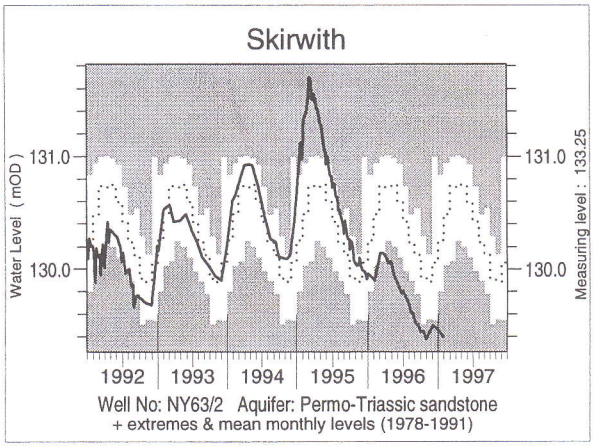


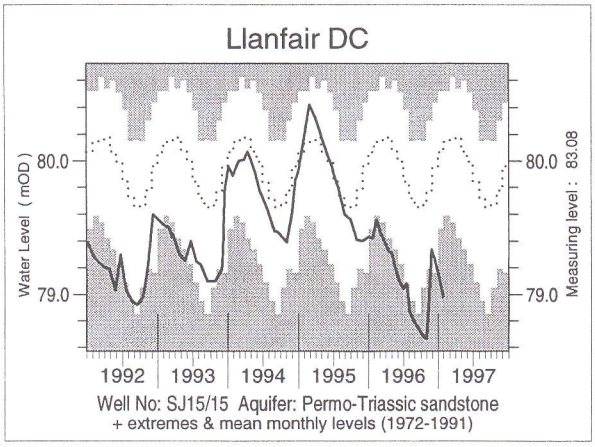


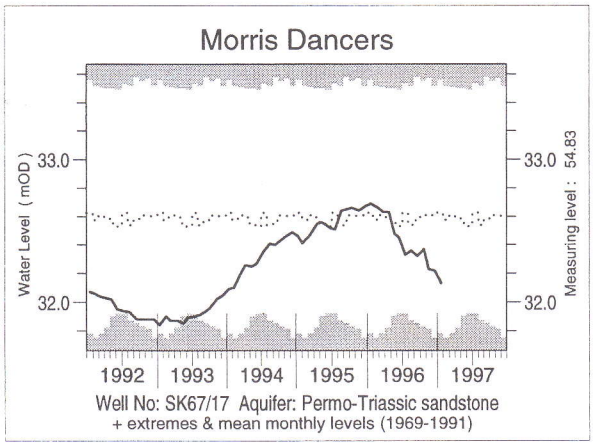


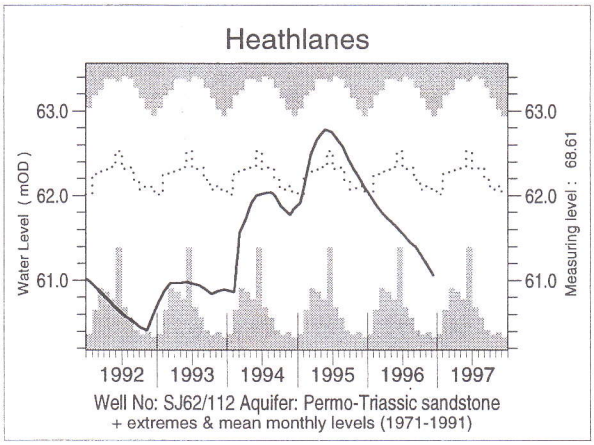

New Red Lion
Water Level (mOD)
20.0
10.0
Measuring level : 33.45
1992
1993
1994
1995
1996
1997
Well No: TF03/37 Aquifer: Lincolnshire Limestone
+ extremes & mean monthly levels (1964-1991)

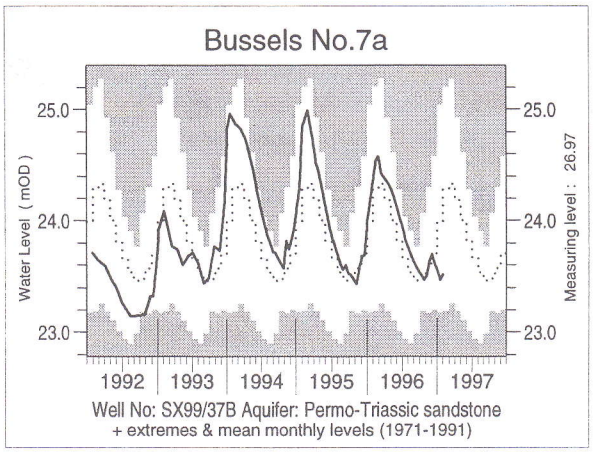

Ampney Crucis
Water Level (mOD)
102.5
100.0
97.5
Measuring level : 109.54
1992
1993
1994
1995
1996
1997
Well No: SP00/62 Aquifer: Middle Jurassic
+ extremes & mean monthly levels (1958-1991)


Skirwith
Water Level (mOD)
131.0
130.0
Measuring level : 133.25
1992
1993
1994
1995
1996
1997
Well No: NY63/2 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1978-1991)


Llanfair DC
Water Level (mOD)
80.0
79.0
Measuring level : 83.08
1992
1993
1994
1995
1996
1997
Well No: SJ15/15 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1972-1991)


Morris Dancers
Water Level (mOD)
33.0
32.0
Measuring level : 54.83
1992
1993
1994
1995
1996
1997
Well No: SK67/17 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1969-1991)


Heathlanes
Water Level (mOD)
63.0
62.0
61.0
Measuring level : 68.61
1992
1993
1994
1995
1996
1997
Well No: SJ62/112 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1991)


Bussels No.7a
Water Level (mOD)
25.0
24.0
23.0
Measuring level : 26.97
1992
1993
1994
1995
1996
1997
Well No: SX99/37B Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1991)

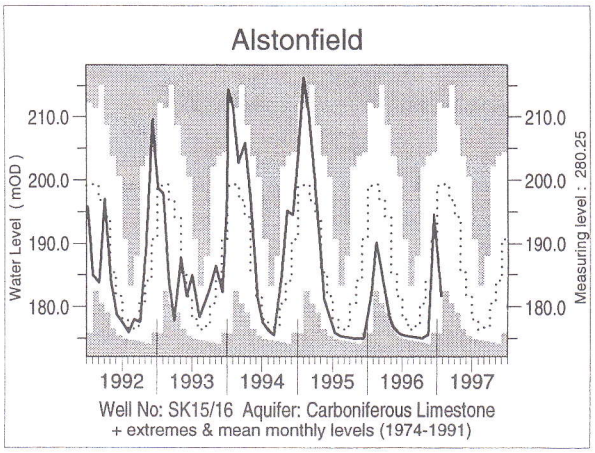

Alstonfield
Water Level (mOD)
210.0
200.0
190.0
180.0
Measuring level : 280.25
1992
1993
1994
1995
1996
1997
Well No: SK15/16 Aquifer: Carboniferous Limestone
+ extremes & mean monthly levels (1974-1991)

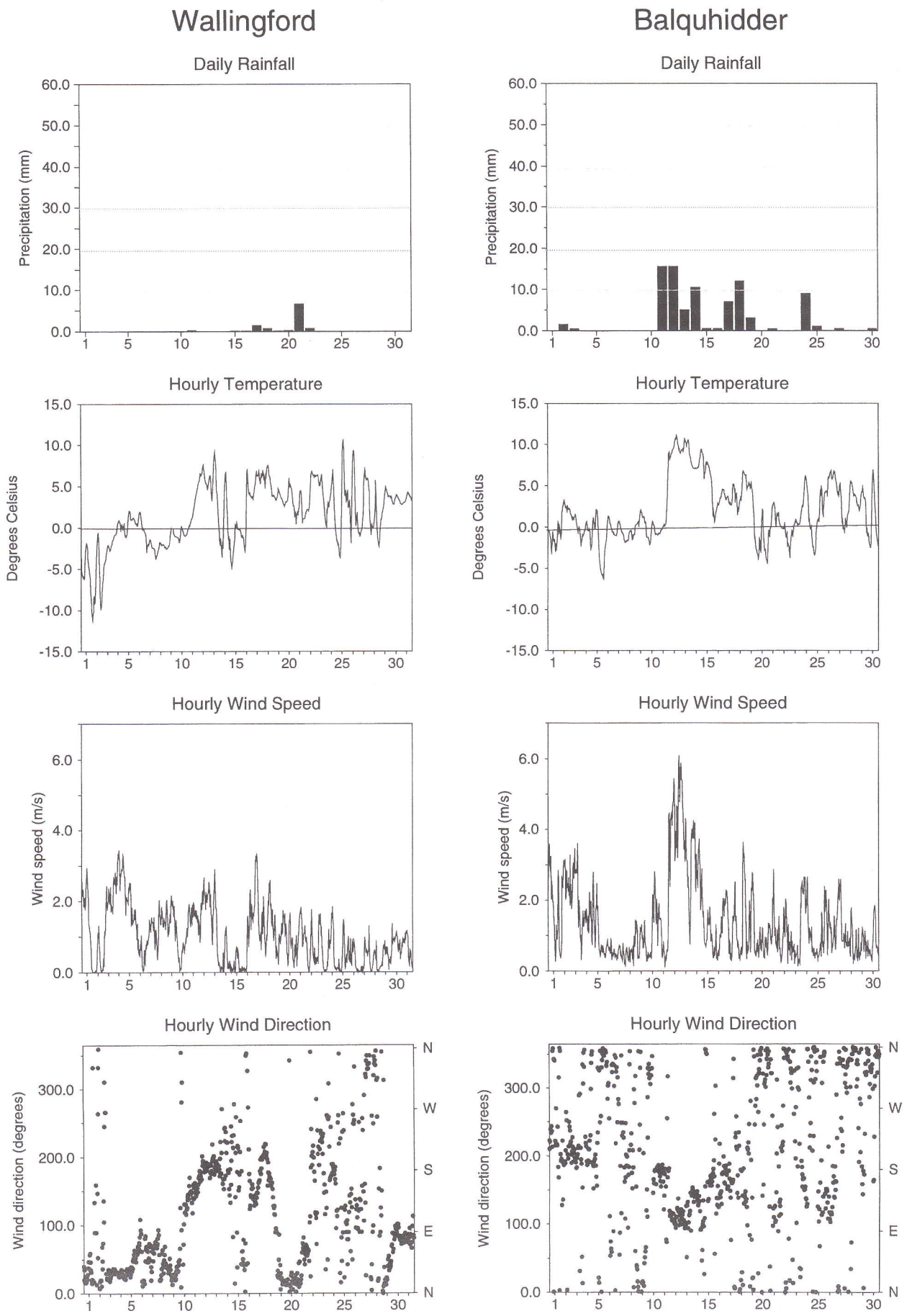
TABLE 5 JANUARY GROUNDWATER LEVELS 1997

Site	Aquifer	Records commence	Minimum Jan	Average Jan	Maximum Jan	No. of years Jan/Feb	Jan/Feb 1997	
			<1997	<1997	<1997	<1997	day	level
Dalton Holme	Ck	1889	10.47	17.14	23.64	5	24/01	11.77
Wetwang	Ck	1971	17.00	23.35	32.36	7	24/01	20.02
Keelby Grange	Ck	1980	4.09	10.13	17.23	2	20/01	5.17
Washpit Farm	Ck	1950	40.51	43.60	47.60	9	03/02	42.26
The Holt	Ck	1964	83.90	87.04	92.02	3	10/02	85.06
Therfield Rectory	Ck	1883	70.72	77.70	96.05	>10	03/02	72.77
Redlands Hall	Ck	1964	32.38	40.81	51.48	0		31.8
Rockley	Ck	1933	dry<128.44	136.03	143.75	3	10/02	129.21
Little Bucket Farm	Ck	1971	57.64	66.96	84.05	9	03/02	61.5
Compton House	Ck	1984	27.84	45.77	68.75	8	14/01	31.04
Chilgrove House	Ck	1836	33.46	55.86	77.19	>10	14/01	40.25
Westdean No.3	Ck	1940	1.14	2.15	4.29	1	31/01	1.3
Ashton Farm	Ck	1974	63.80	68.95	71.43	4	03/02	66.98
West Woodyates Manor	Ck	1942	70.08	91.02	103.45	7	03/02	80.8
New Red Lion	LLst	1964	6.06	14.20	22.58	2	28/01	7.76
Ampney Crucis	Mid Jur	1958	100.09	102.34	103.28	1	05/02	100.2
Yew Tree Farm	PTS	1973	12.43	13.56	13.92	2	31/01	13.39
Skirwith	PTS	1978	129.80	130.42	130.97	0		129.4
Llanfair D.C	PTS	1972	79.39	79.93	80.52	0		78.99
Morris Dancers	PTS	1969	31.78	32.50	33.56	6	20/01	32.13
Heathlanes	PTS	1971	60.37	61.92	63.03	3	09/12	61.06
Bussels No.7A	PTS	1972	23.18	24.02	25.04	3	30/01	23.52
Rushyford NE	MgLst	1967	64.79	72.62	76.84	>10	18/01	75.94
Peggy Ellerton	MgLst	1968	31.78	34.07	36.18	2	20/01	32.17
Alstonfield	CLst	1974	175.81	200.33	214.39	1		182.00

A few values in this table have not been updated, others are provisional
groundwater levels are in metres above Ordnance Datum

Ck	Chalk	Mid Jur	Middle Jurassic limestones
LLst	Lincolnshire Limestone	MgLst	Magnesian Limestone
PTS	Permo-Triassic sandstones	CLst	Carboniferous Limestone

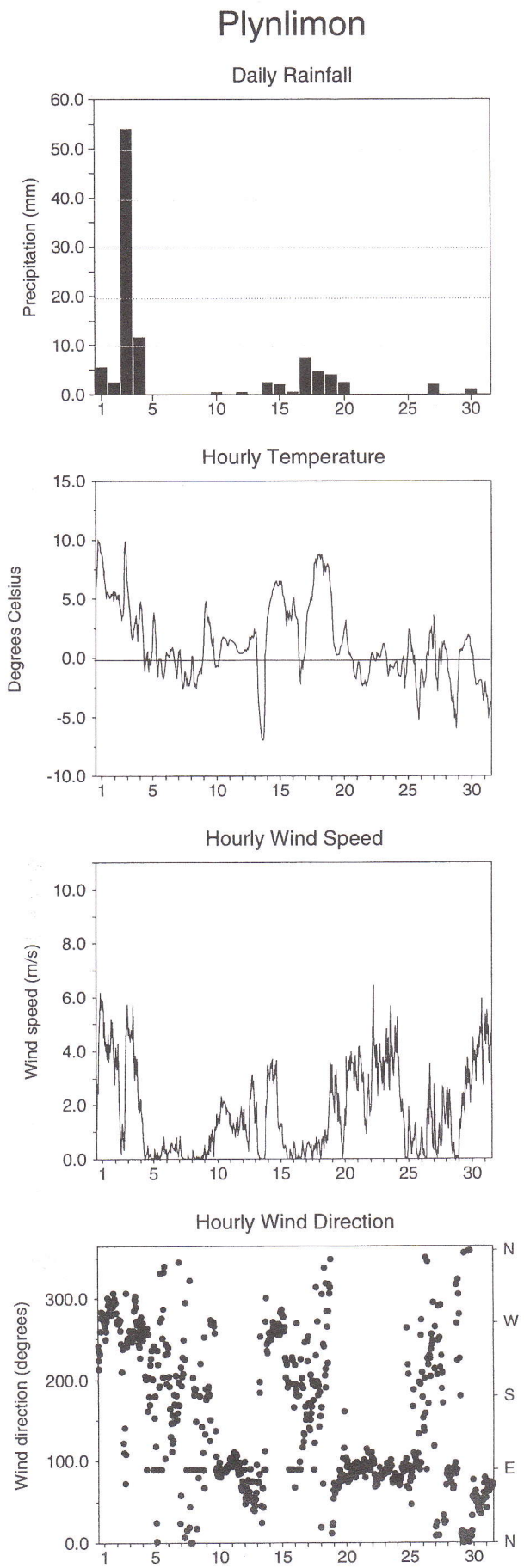
FIGURE 3 METEOROLOGICAL SUMMARY - JANUARY 1997



The Institute of Hydrology Meteorological Station occupies a relatively open site on the Thames floodplain about 5km NW of the Chilterns escarpment. Station elevation is 48m

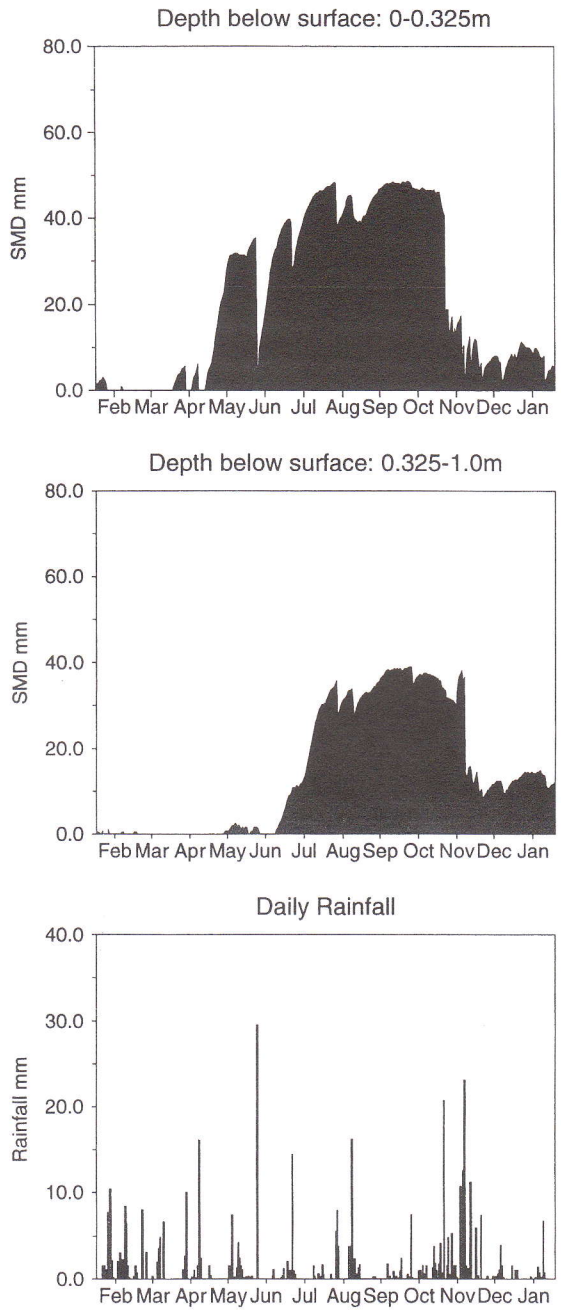
The Lower Kirkton automatic weather station (Balquhidder) occupies a relatively sheltered position at the mouth of the SSE trending Kirkton Glen. Station elevation is 270m aOD and average annual rainfall exceeds 2000mm; snow cover is expected for 10-30 days a year.

FIGURE 3 (continued)



The Dolydd automatic weather station at Plynlimon is sited in an exposed field with a forested area to the south. Surrounding land reaches a peak height of around 400m. Station elevation is 300m aOD and average annual rainfall exceeds 2300mm.

FIGURE 3a. WALLINGFORD SMD DATA 1996/7.



Note

Soil moisture deficit is defined as the amount by which the water stored in the soil is below the quantity held at field capacity. Two automatic soil water stations (ASWSs) deployed at Wallingford, which use capacitance soil water sensors installed at depths of 5,15 and 50 cm, are the sources of the data. Figure 3a shows deficits calculated from one of the stations for the depth ranges 0-0.325m (15cm probe) and 0.325-1.0m (50cm probe) at 0100 GMT on each day. At the end of January 1996, field capacity was re-estimated using recent data and the soil moisture deficit values for the previous months were recalculated accordingly.

Daily rainfall from the Wallingford met station from February 1996 is presented.

FIGURE 4 LOCATION MAP OF GAUGING STATIONS AND GROUNDWATER INDEX WELLS