HYDROLOGICAL SUMMARY FOR ENGLAND AND WALES

JANUARY 1989

This report updates the briefing note compiled on the 20th January and provides a broader review of the developing drought. Data for this report have been provided, principally, by the water authorities and the Meteorological Office. A substantial proportion of the recent data - particularly that relating to January 1989 - is of a provisional nature and subject to revision.

'AT A GLANCE'

The last three weeks have witnessed an intensification of the drought and the distinct regional contrasts - which had become evident by the end of 1988 - have, generally, been reinforced. Dry conditions which would have qualified as 'unusual' up to December have persisted and the accumulated rainfall deficit may now, more appropriately, be termed 'rare'. A winter drought exists and is becoming severe in parts of central and southern England. In the affected areas, river flows are more typical of those associated with a normal summer and groundwater levels are similar to those experienced early in 1976. With regard to water resources, the continuing decline in runoff rates, and in aquifer storage, is of a lesser significance than the diminishing period available for sustained rainfall to ameliorate the potential impact of the drought; from April the hydrological effectiveness of rainfall will be increasingly reduced by the acceleration in evaporation rates. Rainfall over the next 8/10 weeks will be critical in determining the magnitude and impact of the 1989 drought.

The exceptionally low rainfall from the end of October 1988 has created a significant drought in meteorological terms and a considerable drought in hydrological terms. However, its impact on the community will be critically dependent on the variation in reservoir contents over the next couple of months; clearly these will directly influence the ability of particular regions to successfully withstand the effect of a spring and summer drought in 1989. For a balanced view of the water resources outlook, therefore, the following review should be considered alongside the current, and projected, reservoir storage for each water authority area.

RAINFALL

The first six weeks of 1989 has seen a continuation of the synoptic situation which has brought dry, or extremely dry, conditions to much of central and western Europe. A near-stationary high pressure system - normally located close to the Azores in the winter - is centred over the mainland of Europe. This has served to divert the usual run of Atlantic troughs away from the English lowlands and is the major factor in the north/south contrasts (and, to a lesser degree, west/east contrasts) which have characterised the rainfall pattern over Great Britain for several months.

Table 1 gives the monthly rainfall totals for 1988/89 as a percentage of the 1941-70 average, together with the accumulated totals from April, September and November. Also tabulated is the difference between actual rainfall and the monthly mean for each area. Monthly rainfall deficits may be seen to be general features during 1988 apart from July and, in some regions, October. Figure 1 confirms the existence of a sustained dry spell for England and Wales and illustrates the monthly rainfall pattern for two of the most severely affected water authorities - Southern and Thames.

Table 1 enables the development of the drought to be examined and a picture emerges of a relatively long term shortfall overlain - recently - by notably dry conditions leading to a rapid intensification in the drought in some areas. Assuming stable climatic conditions*, the April-January shortfall, expressed as a percentage of the average, over England and Wales might be expected about once every ten years on average. The period commencing in August is rather more notable with a return period approaching 20 years and the exceptionally dry conditions from November to January are significantly rarer again, with an expectation of one occurrence, perhaps, every 50 years. Provisional data indicate that the three months to January are, in fact, the driest such period over England and Wales since 1879 and, for England alone, the three months were some 30 mm drier than in 1933/34 when the previous minimum this century was recorded.

Whilst Table 1 testifies to rainfall deficiencies in all regions, concern is focusing on those water authority areas where November to January rainfall has been below half of the average. For the Thames Water area, the five months beginning in August were almost as dry as the notable winter droughts of 1933/34 and 1964/65. More remarkably, the three-month rainfall total (to the end of January) is unprecedented in the 105 year areal rainfall record for the Thames catchment above Kingston. Even drier conditions have been experienced in parts of the Southern Water area where the Hampshire Division's November-January total is approximately 30 per cent of the long term average; an exceptionally rare occurrence to be expected not more than once in 100 years on average.

The magnitude of the rainfall deficits, and their spatial distribution, makes for an increasingly compelling comparison with the winter of 1975/76. In some regions - particularly the South - the current winter has been considerably drier than its precursor. However, no two droughts are identical and too much can be made of parallels with the 'Great Drought' - during this extreme event several districts in central and southern England registered less than half their average rainfall over a 16 month period (May 1975 - August 1976) and in terms of accumulated rainfall deficiencies, for England and Wales, the 1988/89 drought does not yet bear comparison with the notable droughts of 1901/02, 1921, 1933/34, 1943/44, 1959, 1964/65 and 1975/76.

An appreciation of the spatial variation in the intensity of the current drought may be gained by considering Table 1 in conjunction with Figure 2 which illustrates the accumulated rainfall deficiency over the November-January period together with the percentage of the February to April rainfall required to make good this shortfall. The probability of completely compensating for the deficit over the next three months ranges from very unlikely (return period > 50 years) in the West and North to vanishingly small in the South East. More realistically, the return periods associated with rainfall totals 75 mm above the average (for February-April) range from a few years (5-10) in the North West and Welsh Water areas to over 30 years for the Thames Water area, and other regions of lowland England, where February to April are normally the driest months of the year.

* Clearly, this is an assumption to be made with increasing caution. Nonetheless it does allow the spatial and temporal variations in the drought's intensity to be examined within a consistent framework.

SOIL MOISTURE DEFICITS

Whilst the water resources situation would improve significantly with above average rainfall over the ensuing three or four months it should be emphasised that, with the dry conditions continuing into February, appreciable soil moisture deficits will need to be satisfied before runoff becomes generally available to augment river flows and to substantially replenish lowland reservoirs.

In some parts of central and southern England SMDs increased through December and January and, by the end of the month, appreciable deficits obtained in Kent, in the lower Thames Valley and the basin of the River Trent where the soil was considerably drier than in a normal January (see Figure 3). Away from the English lowlands most areas are at, or close to field capacity but there is no obvious pattern to the existing deficits in the drier regions; East Anglia, for instance, is characterised by large variations in the magnitude of deficits. The above average deficits implied by Figure 3 reflect both the low rainfall and the extraordinarily mild weather which is conducive to higher evaporation losses than would typify a normal winter. A further factor may be the recent changes in agricultural cropping practices which may provide greater scope for transpiration losses; these in turn would diminish runoff and infiltration rates.

RIVER FLOW

The failure of effective rainfall totals (the net rainfall after allowing for the requirements of the soil and vegetation) to follow their normal seasonal cycle, with a steady increase through the autumn and much of the winter, has resulted in January 1989 river flows being more typical of summer discharge rates throughout many parts of England and Wales. Table 2 lists monthly runoff totals (from April 1988) for a number of representative rivers together with the accumulated runoff over the April-January and November-January periods; the associated ranking is also given. In those regions most affected by the drought (see below), monthly runoff totals display a remarkable stability and the lack of any strong seasonal upturn after October is a common feature. For some rivers a gentle downward trend in monthly flow began in February 1988 - see, for instance, the River Ouse at Gold Bridge. Nonetheless, by early autumn most rivers were flowing close to - or a little below - the average for the time of year. Since November, the flows have altered little but the hydrological perspective has changed dramatically at least in relation to the rivers of central and southern England and, especially, those draining to the eastern English Channel and the Thames estuary. Table 3 shows that in this region the Rivers Itchen, Ouse, Medway and Teise all established new monthly runoff minimum for January and in some instances discharges had declined to considerably below the corresponding flow rates in 1976. Table 4 serves to confirm the rarity of the prevailing flow rates in this area; the associated return periods are of the order of 25-50 years. Table 3 and 4 taken together, tend to confirm the regional pattern that emerges from a consideration of the rainfall and soil moisture situations. Very low flows (return periods in excess of 25 years) are associated with catchments in central England (south from the Trent basin) and in a broad band abutting against the south coast as far west as Dorset. To the west and east of these zones flows are at seasonally low levels but are, as yet, in no way remarkable. Northwards - and particularly north-westwards - the drought becomes increasingly less evident and in Cumbria, for instance, preliminary estimates of the January 1989 flow have closely approached the long term mean.

A comparison of the ranks given in Table 2 for the runoff totals corresponding to the: April-January, November-January and January (see Table 3) periods underlines the relatively rapid intensification of the drought. Over the full ten months, few rivers recorded outstandingly low runoff totals - the Sussex Ouse is an exception. Accumulated runoff over the three months (Nov-Jan) is well below average but only in a few areas are they notably rare. January 1989 proved something of a watershed, with those catchments registering a decline from the December runoff appearing particularly vulnerable to a sustained period of very low discharge during 1989 unless the synoptic pattern changes relatively quickly. Runoff for the River Thames (gauged at Kingston) in January was about 1/5th of the long term January average and only a little greater than the corresponding flow rates during the winter droughts of 1887/88, 1904/05, 1921/22, 1933/34, 1943/44 and 1975/76. Flows throughout much of Kent, Sussex and Hampshire are extremely low for the time of year and, in some cases, appreciably lower than in 1976. Significant increases in winter runoff rates did, however, occur in some rivers during January. Examples include the Yscir and the Cynon, in South Wales; nonetheless Table 5 shows that the combined Nov-Jan runoff for the Yscir remains the lowest in an eighteen year record for these three months. Table 5 also confirms that very limited winter runoff is typical of regions extending beyond the South East but that the drought is currently only of moderate proportions in East Anglia where, on average, the lowest annual runoff totals (<100 mm) are recorded.

Figure 5 is provided as a location map for the rivers featured in this report.

GROUNDWATER

The groundwater position is little changed from that reported in mid-January. Generally, no significant recharge to the major aquifers has occurred in central and southern England (see Fig. XX in the report of 20/1/89); levels in the Dalton Holme borehole confirm that minimum recharge has been available to replenish the Chalk and Upper Greensand aquifer in Yorkshire also. Data assembled for the IH meteorological site demonstrate that no effective recharge has occurred since February 1988 in the Wallingford area. Groundwater levels for the index boreholes monitored by the British Geological Survey, confirm that this absence of significant recharge is representative of a large proportion of lowland England - levels are, in some areas, comparable with those recorded early in 1976. Figure 4 compares groundwater hydrographs for the period 1986-89 with the corresponding trace for 1973-76; data for a wider range of sites will be presented in the February review. A few deep boreholes are still recording groundwater levels above the seasonal average; examples include the Therfield site - near Royston (see earlier report) - where the infiltrate takes several months to percolate down to the water table; as a consequence of this lag the borehole levels are still in relatively steep decline from an early summer peak arising from the abundant recharge early in 1988 (for some aquifer units, 25 per cent of the total 1988 rainfall occurred in January). A number of springs in the driest regions have ceased to flow and shallow boreholes are drying up at an increasing rate. This is not an unprecedented situation. Many springs and boreholes were dry for extended periods in 1973 and 1976. However, notwithstanding some evidence that a less stable weather pattern may become established, the prospects for any recharge throughout lowland England in February 1989 are not good - approximately 80 per cent of the mean monthly rainfall will be needed in many districts to satisfy SMDs before any infiltration can commence - and it is likely that no major recovery in groundwater levels can be expected before the autumn.

IH/BGS
10/2/89

TABLE 1

1988/9 RAINFALL AS A PERCENTAGE OF THE 1941-70 AVERAGE TOGETHER WITH THE SHORTFALL RELATIVE TO THE AVERAGE

		Apr	May	Jun	Jul	Aug 1988	Sep	Oct	Nov	Dec	Jan 1989	Apr-Jan	Sep-Jan	Nov-Jan
England and Wales	%	71	88	64	177	94	77	107	49	46	51	78	65	49
	shortfall in mm	17	8	22	56	5	19	+6	49	49	42	193	286	140
WATER AUTHORITIES														
North West	%	73	74	41	187	116	90	102	55	71	61	88	76	63
	mm	16	21	49	+90	+20	12	+2	54	34	44	123	142	132
Northumbria	%	71	98	41	219	70	80	135	78	50	40	89	76	57
	mm	16	1	36	+92	30	16	+26	21	37	48	87	96	106
Severn Trent	%	71	86	80	180	83	70	95	48	48	51	80	62	49
	mm	15	9	11	+52	14	20	3	41	36	24	131	134	111
Yorkshire	%	57	84	67	184	96	74	130	61	51	31	83	67	48
	mm	24	10	19	+59	4	22	+21	35	36	53	123	125	124
Anglia	%	75	100	78	170	67	71	100	58	41	60	82	66	53
	mm	10	0	9	+40	19	15	0	26	31	21	95	93	78
Thames	%	67	86	79	160	76	74	103	38	25	50	75	57	37
	mm	15	8	11	+36	23	16	+2	45	50	31	155	140	126
Southern	%	87	76	36	141	63	65	108	34	24	38	64	53	32
	mm	6	13	32	+24	33	25	+6	62	61	47	249	189	170
Wessex	%	63	77	74	163	99	62	123	35	25	52	74	58	37
	mm	20	16	14	+39	1	30	+19	63	68	40	194	182	171
South West	%	76	89	69	121	121	68	127	41	41	50	81	64	44
	mm	17	9	20	+60	+21	33	+31	79	79	64	189	224	222
Welsh	%	65	105	56	179	121	87	97	47	45	59	83	66	50
	mm	30	+5	36	+75	+25	16	4	76	80	56	193	232	212

Note: July 1988-January 1989 rainfall figures are provisional.
December and January rainfalls are MORECS figures supplied by the Meterological Office.

TABLE 2 CATCHMENT RUNOFF IN MM AND AS A PERCENTAGE OF LTA

River/Station Name		Apr	May	Jun	Jul	Aug 1988	Sep	Oct	Nov	Dec	Jan 1989	Apr-Jan	Rank/No. of Yrs	Nov-Jan	Rank/No. of Yrs
S Tyne at Haydon	mm	32	31	13	100	43	51	65	38						
	%	57	83	45	370	102	93	94	40						
Wharfe at Flint Ml	mm	25	20	9	50	73	56	80	65	81	42	501	10/32	188	3/33
	%	45	50	35	192	102	82	125	80	84	43	87		68	
Derwent at B'crambe	mm	27	21	12	21	18	16	22	21	29	17	204	4/26	67	3/26
	%	77	78	67	162	86	80	92	81	67	33	81		58	
Trent at Colwick	mm	24	22	16	28	16	17	23	17	29	21	213	3/30	107	2/29
	%	77	85	84	175	94	94	96	55	64	41	77		85	
Lud at Louth	mm	45	29	23	19	14	13	14	13	17	15	202	10/20	45	6/20
	%	132	100	110	112	100	108	117	87	85	48	102		67	
Witham at Claypole	mm	18	14	10	9	6	5	5	5	9	8	89	7/29	22	5/29
	%	85	88	100	129	86	83	56	42	47	31	79		39	
Ouse at Bedford	mm	15	20	13	29	8	10	11	9	18	13	146	27/55	40	12/55
	%	75	154	163	483	160	50	110	45	64	36	96		48	
Colne at Lexden	mm	14	9	7	7	4	5	9	8	11	13	87	10/28	32	6/29
	%	108	100	140	175	100	125	100	62	65	59	85		62	
Thames at Kingston	mm	17	12	6	8	3	5	9	8	9	7	84	15/106	24	8/107
	%	89	80	60	133	50	83	90	42	32	21	55		30	
Coln at Bibury	mm	44	27	19	18	14	14	15	15	18	15	199	4/25	48	2/26
	%	100	79	68	82	82	93	88	60	44	30	68		41	
Kennet at Theale	mm	30	23	17	17	13	13	18	14	16	16	177	6/27	46	1/30
	%	94	85	77	100	81	93	113	70	59	46	79		57	
Ouse at Gold Bridge	mm	33	24	13	15	12	12	13	10	11	8	151	1/26	29	1/27
	%	97	92	123	150	109	80	43	20	20	13	49		17	
Test at Broadlands	mm	32	26	21	21	18	18	20	20	20	20	216	4/28	60	4/30
	%	94	87	84	100	95	95	87	80	67	51	83		64	
Itchen at Highbrdg	mm	50	42	32	31	25	24	27	27	27	26	311	4/30	80	3/28
	%	106	98	91	100	86	89	87	77	63	53	84		57	
Stour at Throop	mm	25	18	11	11	9	10	25	13	20	19	161	3/16	52	2/16
	%	71	72	69	100	82	77	109	38	59	31	56		34	
Tone at Bishops H	mm	29	21	15	22	13	24	42	20	26	25	237	5/28	71	2/28
	%	73	72	83	138	100	160	156	45	38	31	68		37	
Brue at Lovington	mm	18	11	7	35	13	33	76	21	25	32	271	3/24	78	2/25
	%	60	44	44	219	81	220	36	47	36	45	51		42	
Exe at Thorverton	mm	39	28	20	51	31	82	118	27	59	57	512	6/31	143	1/32
	%	67	72	80	255	107	210	157	28	43	44	79		39	
Torridge at T'ngton	mm	32	14	6	33	30	62	124	27	73	53	454	5/25	153	1/26
	%	65	33	33	100	115	214	234	28	60	51	79		48	
Severn at Bewdley	mm	24	17	13	19	22	35	41	22	36	27	256	6/68	85	3/68
	%	77	71	72	136	122	159	121	41	57	38	73		45	
Yscir at Pont'yscir	mm	44	57	44	75	53	97	91	39	66	92	658	5/16	197	1/16
	%	72	130	142	394	177	211	98	28	43	64	87		45	
Cynon at Abercynon	mm	55	92	41	113	103	118	100	56	66	94	838	9/29	216	2/31
	%	71	151	98	353	206	171	82	36	34	51	83		40	
Lune at Caton	mm							129	68	168					
	%							71	42	86					
Eden at Sheepmount	mm							92	48	95					
	%							75	35	62					

TABLE 3 RIVER FLOWS - January 1989

River/Station Name	POR	Mean Flow Jan 1989 (cumecs)	% of Ave	Rank	Jan Min/Year		Comment
Wharfe at Flint Mill	1937-1989	12.0	44	3	4.47	(1963)	
Aire at Kildwick	1968-1989	5.0	47	3	4.46	(1973)	
Derwent at B'crambe	1961-1989	10.0	37	1	10.0	(1989)	Similar flow in 1973
Trent at Colwick	1958-1989	58.9	41	3	52.9	(1963)	Sig. lower than '76 and '73
Lud at Louth	1968-1989	0.31	79	3	0.14	(1976)	
Witham at Claypole	1959-1989	0.85	31	5	0.67	(1965)	Driest since 1976
Ouse at Bedford Ouse	1933-1989	7.0	37	9	2.88	(1944)	
Roding at Redbridge	1950-1989	1.19	32	6	0.68	(1973)	Lower flows in'54 '63 '65 '76
Colne at Lexden	1959-1989	1.17	62	8	0.46	(1973)	
Mimram at Panshanger	1952-1989	0.47	82	6	0.24	(1974)	Very high baseflow component
Turkey Brk at Albany	1971-1989	0.11	41	3	0.04	(1973)	7 Januarys - similar flows
Thames at Kingston	1883-1989	25.9	21	2	18.6	(1976)	1905 also ranks third
" "	naturalised	46.9	34	8	33.4	(1905)	3 Jan flows similar to 1905
Kennet at Theale	1961-1989	6.1	46	2	4.15	(1976)	Similar to 1963
Coln at Bibury	1963-1989	0.62	30	2	0.37	(1976)	
Medway at Teston	1956-1989	3.3	15	1	3.3	(1989)	Compare 1976: 5.44
Teise at Stonebridge	1961-1989	0.46	19	1	0.46	(1989)	Compare 1976: 0.55
Ouse at Gold Bridge	1960-1989	0.57	13	1	0.57	(1989)	Compare 1976: 1.18
Test at Broadlands	1957-1989	7.6	67	2	7.2	(1976)	
Itchen at Highbridge	1958-1989	3.5	63	1	3.5	(1989)	Compare 1976: 4.21
Stour at Throop	1973-1989	7.6	31	2	4.32	(1976)	
Piddle at Baggs Mill	1963-1989	1.2	33	2	1.05	(1976)	
Exe at Thorverton	1956-1989	12.73	44	4	5.44	(1963)	
Torridge at T'rington	1962 1989	14.35	48	4	5.02	(1964)	
Tone at Bishops Hull	1961-1989	1.91	32	3	1.3	(1976)	
Brue at Lovington	1964-1989	1.63	31	2	0.74	(1976)	
Severn at Bewdley	1921-1989	44.5	38	5	22.1	(1963)	
Yscir at Pontaryscir	1972-1989	2.16	64	5	1.15	(1973)	Drier than 1976
Cynon at Abercynon	1957-1989	3.72	51	6	1.05	(1963)	Driest since 1976
Dee at Manley Hall	1937-1989	28.45	55	9	13.5	(1964)	

*Rank: Driest = 1

A significant proporation of January 1989 flows are estimates.

TABLE 4

ESTIMATED RETURN PERIODS FOR JANUARY 1989 FLOWS

	Station	Hyd. Area	PoR	Jan 1989 mean flow (m^3s^{-1})	Jan '89 / Jan mean	Return Period (yrs)	BFI
1	Trent/Colwick	28	58-88	58.9	0.41	25	.64
2	Lud/Louth	29	68-87	0.31	0.48	5-10	.90
3	Bedford Ouse/Bedford	33	33-87	7.0	0.36	5-10	.51
4	Stour/Langham	36	62-87	3.1	0.58	5	.51
5	Mimram/Panshanger Pk	38	52-88	0.45	0.76	5	.94
6	Turkey Bk/Albany Pk	38	71-88	0.11	0.24	10	.21
7	Thames/Kingston (nat)	39[10]	83-88	47.0	0.34	10-25	.64
8	Kennet/Theale	39	61-88	6.1	0.46	10-25	.87
9	Coln/Bibury	39	63-88	0.62	0.30	50	.94
10	Ouse/Gold Bridge	41	60-87	0.57	0.13	50	.49
11	Test/Broadlands	42	57-87	7.6	0.50	25-50	.94
12	Itchen/Highbridge	42	58-87	3.5	0.53	50	.97
13	Stour/Throop Mill	43	73-88	7.6	0.31	25-50	.66
14	Severn/Bewdley	54	21-88	44.5	0.39	10-25	.53
15	Yscir/Pontaryscir	56	72-87	2.2	0.66	5	.47
16	Cynon/Abercynon	57	57-87	3.7	0.51	5	.42

TABLE 5

LOWEST RECORDED NOVEMBER-JANUARY RUNOFF TOTALS

Trent at Colwick (1958-1989)	YEAR	RANK	Witham at Claypole (1959- 1989)	YEAR
55mm	1975/6	1	12mm	1964/5
76mm	1962/3	2	16mm	1975/6
85mm	**1988/9**	3	19mm	1963/4
88mm	1964/5	4	19mm	1962/3
95mm	1963/4	5	**22mm**	**1988/9**
Average 127mm			57mm	

Colne at Lexdon (1959-1989)	YEAR	RANK	Thames at Kingston (1883-1989)	YEAR
12mm	1964/5	1	15mm	1933/4
16mm	1972/3	2	15mm	1921/2
17mm	1973/4	3	18mm	1943/4
18mm	1974/5	4	19mm	1975/6
21mm	1962/3	5	**23mm**	**1988/9**
32mm	**1988/9**	6		
Average 121mm			80mm	

Itchen at Highbridge (1958-1989)	YEAR	RANK	Stour at Throop (1973-1989)	YEAR
79mm	1973/4	1	39mm	1975/6
80mm	**1988/9**	2	**52mm**	**1988/9**
88mm	1964/5	3	93mm	1973/4
92mm	1962/3	4	101mm	1980/1
94mm	1975/6	5	124mm	1978/9
Average 127mm			154mm	

Severn at Bewdley (1921-1989)	YEAR	RANK	Yscir at Pontaryscir (1972-1989)	YEAR
76mm	1933/4	1	**197mm**	**1988/9**
82mm	1975/6	2	257mm	1975/6
85mm	**1988/9**	3	320mm	1976/7
96mm	1962/3	4	354mm	1978/9
111mm	1953/4	5	393mm	1980/1
Average 188mm			440mm	

FIGURE 1 OCTOBER 1987 - JANUARY 1989 RAINFALL AS A PERCENTAGE OF THE 1941-70 AVERAGE

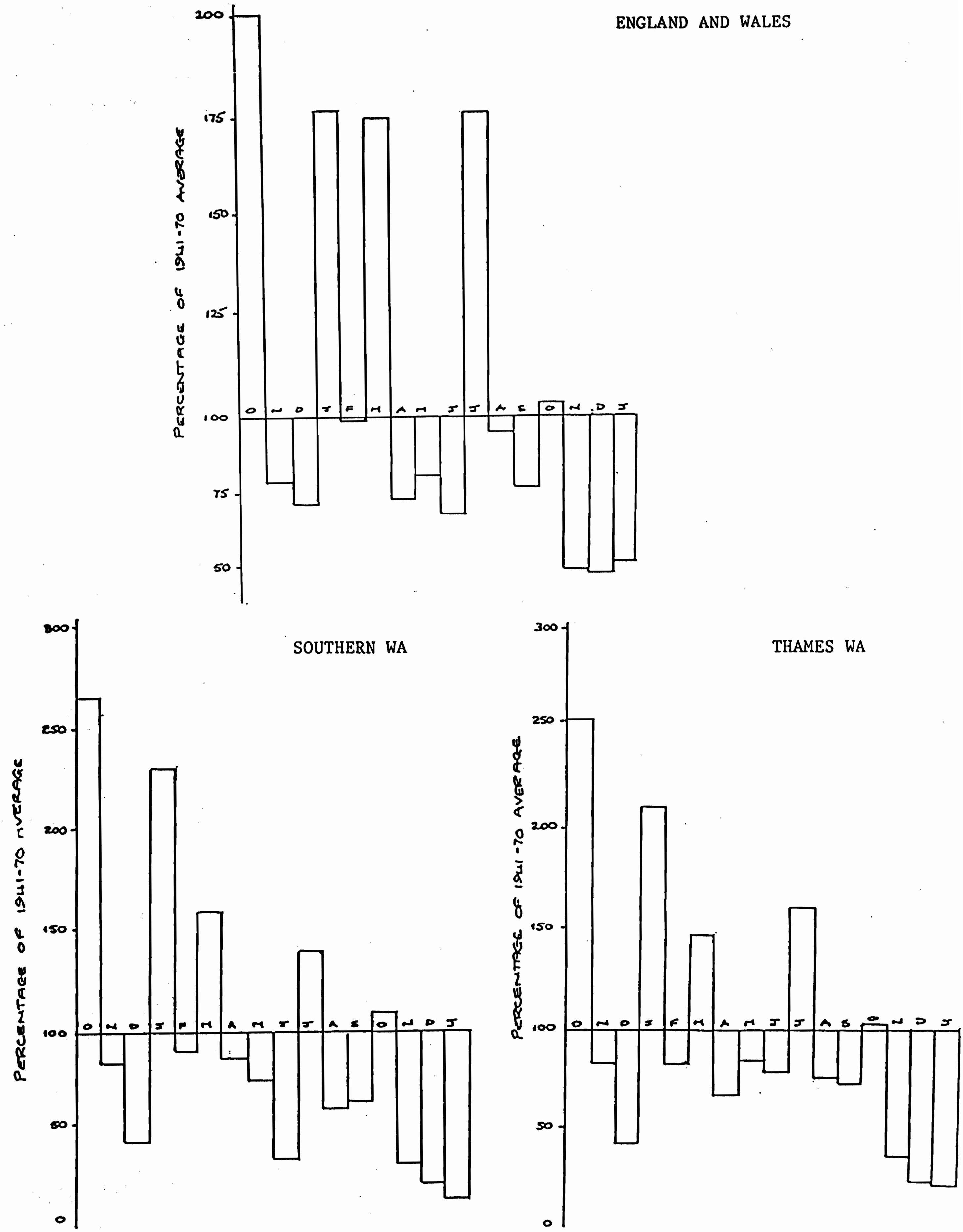


FIGURE 2 RAINFALL - EXPRESSED AS A PERCENTAGE OF THE AVERAGE AND (in brackets) IN MM - REQUIRED OVER THE FEBRUARY TO APRIL PERIOD TO MAKE GOOD THE NOVEMBER 1988 TO JANUARY 1989 DEFICIT

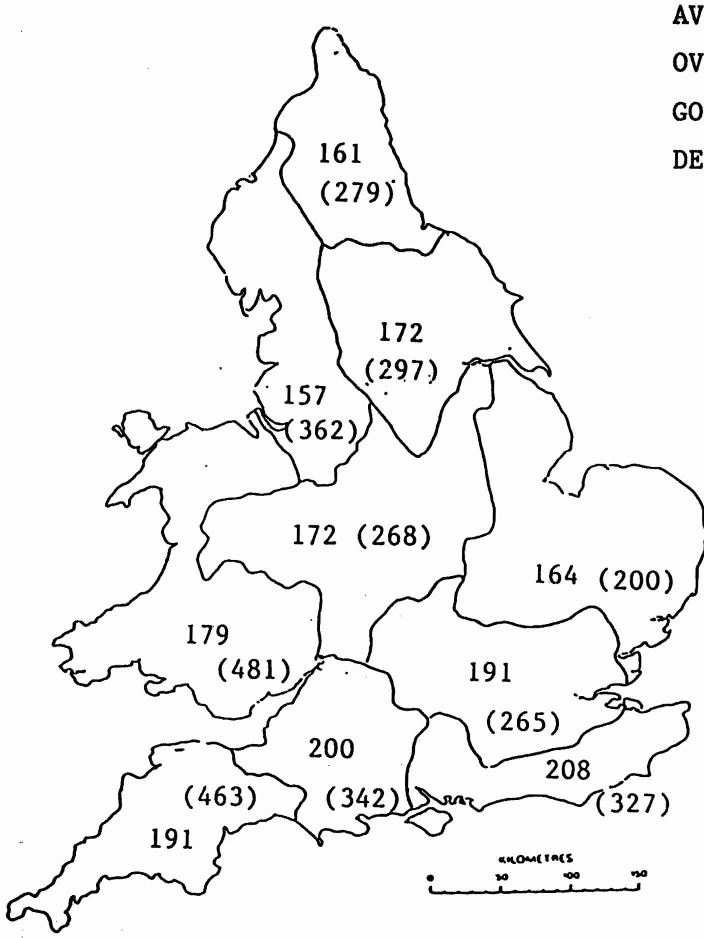
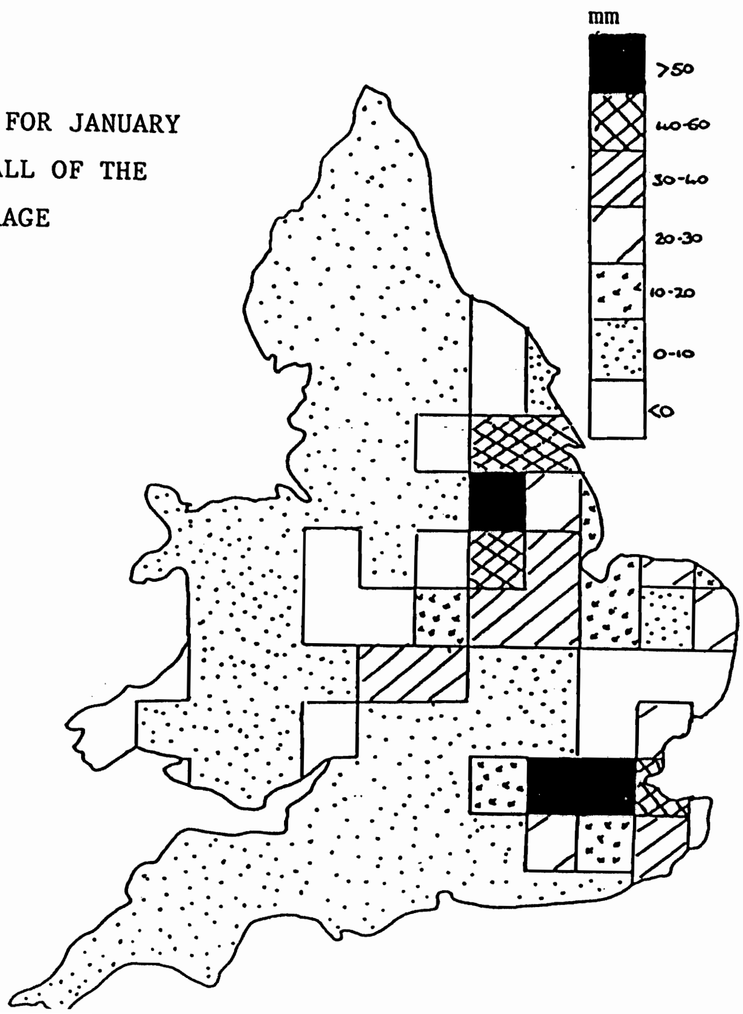


FIGURE 3 SOIL MOISTURE DEFICIT FOR JANUARY EXPRESSED AS A SHORTFALL OF THE LONG-TERM JANUARY AVERAGE



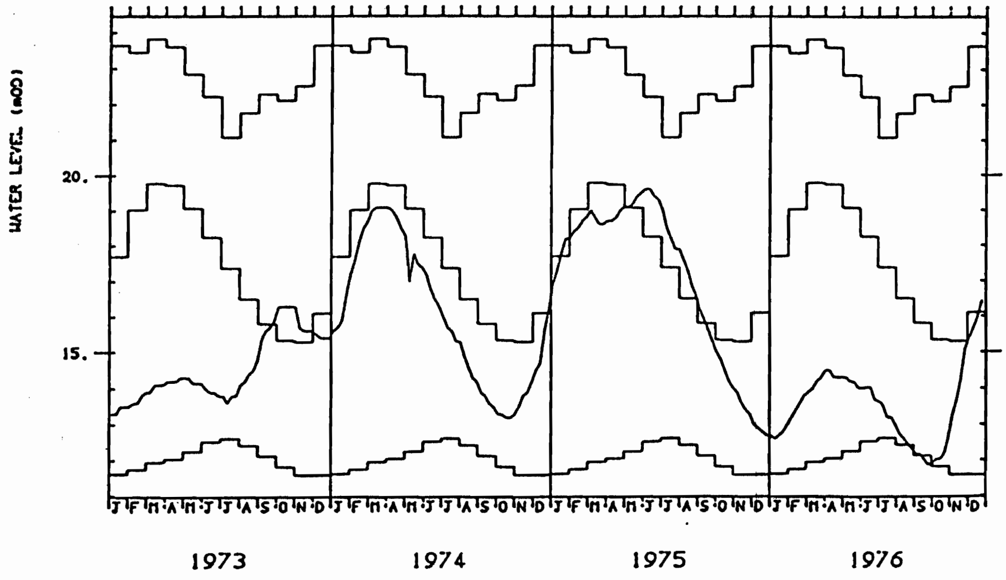
Source: MORECS

FIGURE 4

Site name: DALTON HOLME

National grid reference: SE 9651 4530 Well number: SE94/5

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 33.50



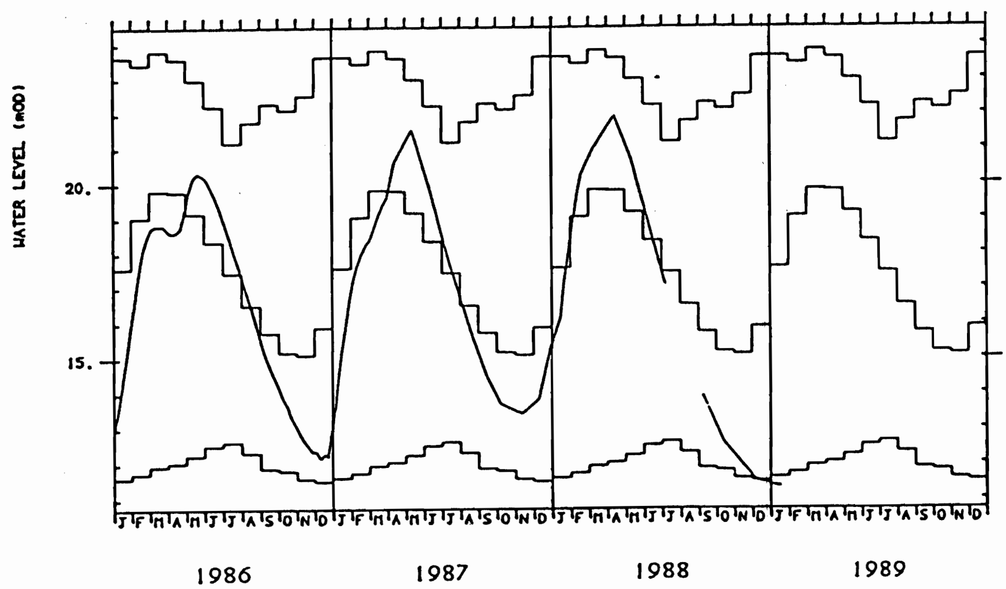
Max, Min and Mean values calculated from years 1889 TO 1975

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: DALTON HOLME

National grid reference: SE 9651 4530 Well number: SE94/5

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 33.50



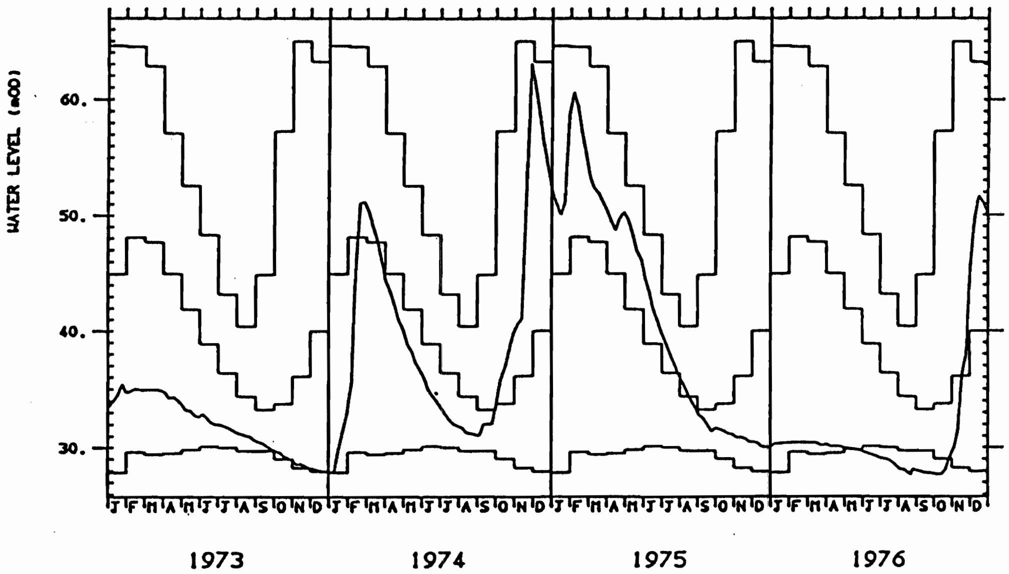
Max, Min and Mean values calculated from years 1889 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: COMPTON HOUSE

National grid reference: SU 7755 1490 Well number: SU71/23

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 81.37



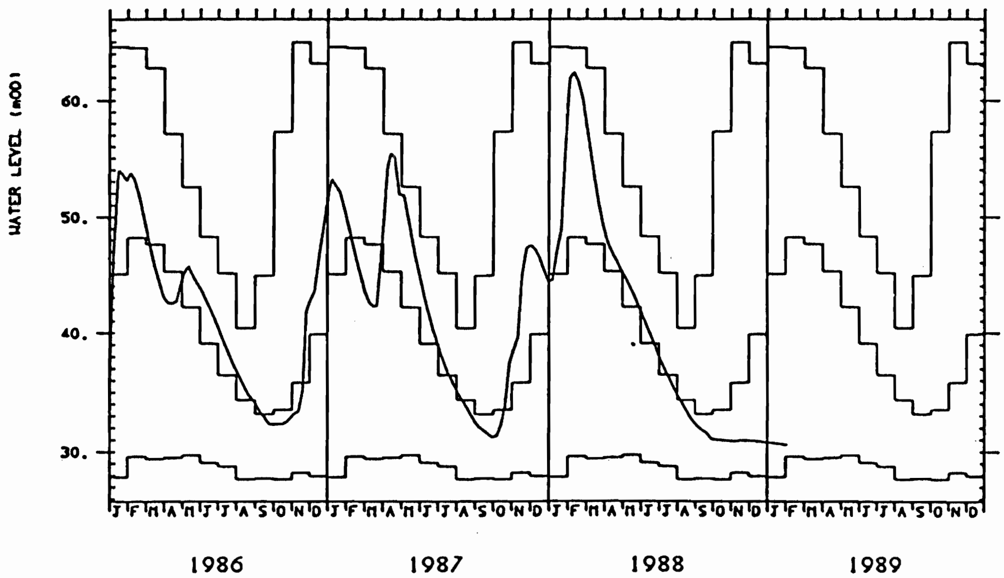
Max, Min and Mean values calculated from years 1893 TO 1975

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: COMPTON HOUSE

National grid reference: SU 7755 1490 Well number: SU71/23

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 81.37



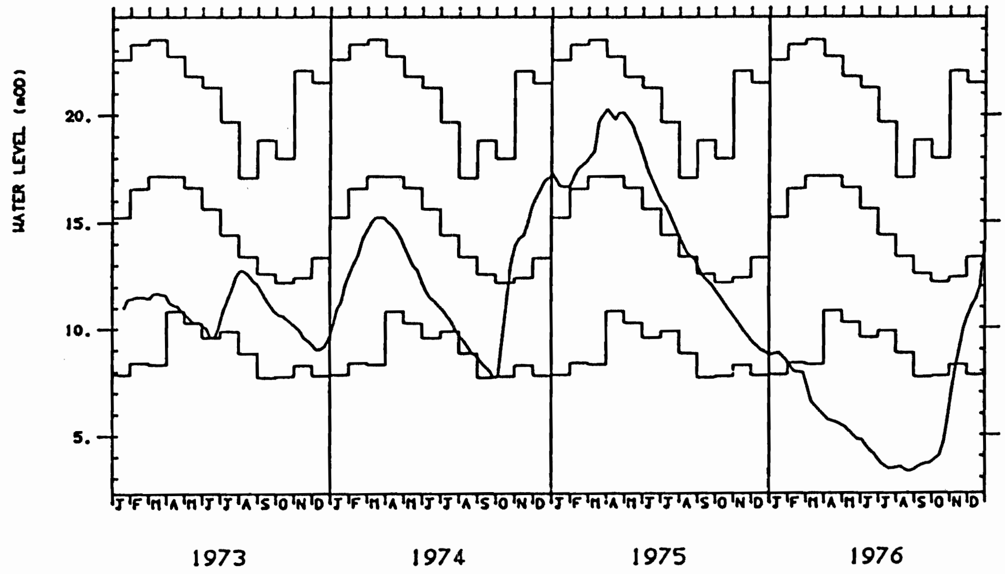
Max, Min and Mean values calculated from years 1893 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: NEW RED LION

National grid reference: TF 0885 3034 Well number: TF03/37

Aquifer: LINCOLNSHIRE LIMESTONE Measuring level: 33.82



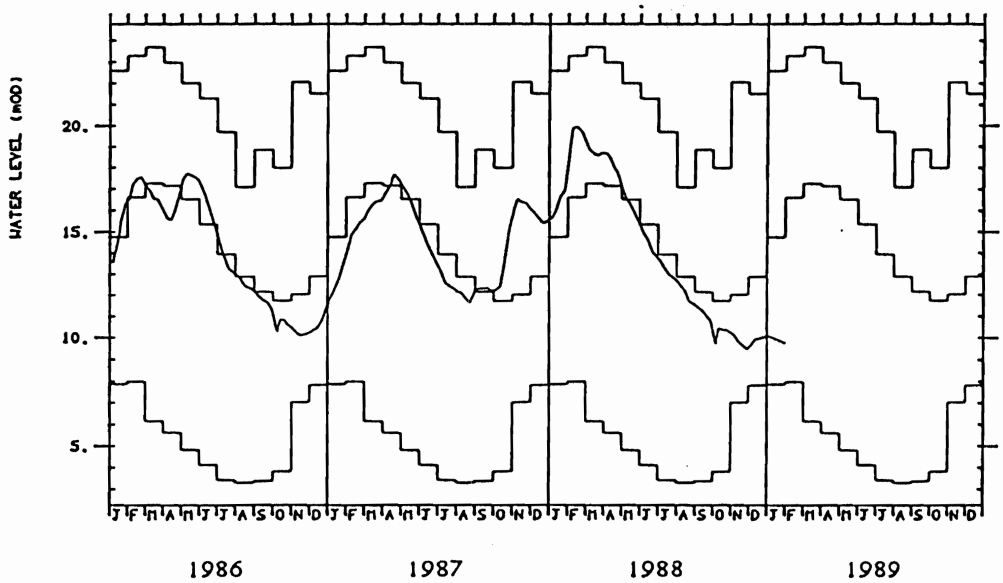
Max, Min and Mean values calculated from years 1964 TO 1975

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: NEW RED LION

National grid reference: TF 0885 3034 Well number: TF03/37

Aquifer: LINCOLNSHIRE LIMESTONE Measuring level: 33.82



Max, Min and Mean values calculated from years 1964 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

FIGURE 5   GAUGING STATION LOCATION MAP