

NRA

*National Rivers Authority
Southern Region*

NKA Southern Region Box 1

1993 Control Area

Analysis Results



ENVIRONMENT AGENCY

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ENVIRONMENT AGENCY



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Control Area Analysis 1993

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1 Introduction

This report briefly outlines the work done by the NRA and water companies to produce reliable per capita consumption estimates for 1993. It summarises the availability of data, the results produced and discusses the issue of estimating legitimate night use. It is a continuation of the work that has been undertaken since 1986.

Per capita consumption (pcc) estimates are derived from the results of up to 67 domestic consumption monitors within the NRA Southern Region but operated by the water companies. Pcc is estimated for all companies within the NRA Southern Region by extrapolating the Control Area results based on Acorn type. Per capita consumption is influenced by many factors including size of house and garden, occupancy rate, and social and economic factors. Acorn is a method of profiling these factors.

For a full description of the methodology used, reference should be made to the NRA report "Review of Control Area Results and Estimation of Domestic Water Consumption in 1991."

2 Data Availability

Data from 56 of the 67 Control Areas was used in the 1993 per capita consumption analysis. Of these 33 Areas are single Acorn type.

This equates to 611 months of good data, an average of 11 months for each of the Areas used.

The distribution of the data collected is shown in Figure 1 (a+b).

Gaps in the data have been caused by unreliable data, logger malfunction, or in some cases meter error.

3 Results Produced

The results produced are shown in Table 1. The table summarises the results produced by each Control Area for the relevant company, the Regional pcc estimates by Acorn type and the final estimate for the company based on the Acorn profile.

Figure 2 shows the change in pcc over the period 1986 to 1993 by company with the NRA Southern Region as a whole for comparison:

Southern Water

Pcc is below the overall Regional estimate and has been since 1986. Peak pcc occurred in 1988 with a declining trend since. 1993 pcc at 134.7 l/h/d is below the 1986 level.

At a zonal level there is as would be expected considerable variation in pcc, ranging from 128 l/h/d in Kent Medway to 147 l/h/d in Sussex Coast.

South East Water

South East Water pcc is consistently well above the overall Regional estimate. The 1993 figure is 143.1 l/h/d, 7.2 l/h/d above the Regional figure. The company pcc reached a peak in 1988 and has since been declining to below the 1986 level.

At the Control Area level the Eastdean, Eastbourne area produces the highest single Acorn type pcc estimate at 290.5 l/h/d. The next highest is 189.6 l/h/d in Hampshire.

Folkestone and Dover

The Folkestone and Dover estimates approximate well to the Regional estimate for most of the years. The 1993 estimate is 135.4 l/h/d. The pcc reached a peak in 1988 and has since steadily declined to below the 1986 value.

Mid Kent Water Company

Mid Kent pcc estimates are consistently below the NRA Southern Regional estimate. The 1993 estimate is 132.7 l/h/d, 3.2 l/h/d below the Regional figure. The pcc reached its highest level in 1988 and has since declined to below the 1986 level.

Portsmouth Water Company

Portsmouth pcc estimates are consistently below the NRA Southern Regional estimate. The 1993 value is 132.7 l/h/d. The pcc reached its highest level in 1988 and has since declined to below the 1986 level.

Overall

i) Regional Pcc 1986 - 1993

Figure 3 shows the trend in Regional per capita consumption 1986 - 1993.

The NRA Southern Regional pcc for 1993 is 135.9 l/h/d. As with the company trends, pcc peaked in 1988 and has since declined to below the 1986 level. There is no indication of a reversal in this trend which it was

assumed would occur as "bounce back" after the drought although within the accuracy of measurement 1993 is the same as 1992 perhaps indicating that no further decline will occur.

ii) Domestic Consumption 1993 by Acorn type

Figure 4 shows the 1993 domestic consumption by Acorn type. Type "E", council estates has the lowest pcc at 111.7 l/h/d whereas type "K", private houses and flats with well off older people has the highest pcc at 190.8 l/h/d. Type "K" also has the widest confidence limits reflecting the variations between different control Area estimates.

iii) Domestic Water Consumption by Acorn Type 1986 - 1993

Figure 5 shows the variation in pcc by Acorn type over the period 1986 - 1993. Whilst the overall Regional figure has shown the profile as described above, the Acorn types are more variable. Only type "K" however is showing a significantly increasing trend with some evidence of "bounce back".

4 Discussion

4.1 Legitimate Night Use

During 1994 demand forecasts were produced for OFWAT as part of the Asset Management Plans using 1992/3 Control Area results. All companies within the NRA Southern Region with the exception of Portsmouth used the Control Area results. The basis of the estimates is water into supply and the minimum night flow based on the minimum 15 minute reading.

The Leakage Initiative recommends allowing 1.7 l/prop/hr for legitimate night use. However this is based on taking the average nightline and not the minimum which is the technique used here. The NRA believes an allowance of 12 l/h/d is unrealistic.

4.2 Meter Suitability

When meters were initially installed in 1986 the type required was assessed on the night flows recorded at the time. Since then in many areas leakage has been significantly reduced and the flow rates are in some cases below the minimum response speed of the meters. This is a problem which is currently being addressed.

4.3 Base Data

The Control Areas and overall company areas were surveyed for both Acorn type and population in 1986. It is recognised that invariably the situation will have changed since then and a comprehensive update of the data will be undertaken in 1995.

SOUTHERN WATER SERVICES AREA DATA:

ID	B	C	E	F	J	K	popn	pcc	l/d
004	0.	239.	18.	0.	605.	0.	862.	136.8	117918.
A13	165.	0.	0.	0.	1656.	0.	1821.	128.6	234188.
008	0.	0.	847.	210.	0.	0.	1057.	97.9	103528.
009	499.	132.	0.	261.	0.	0.	892.	115.4	102959.
010	0.	734.	0.	0.	0.	0.	734.	155.6	114228.
A14	670.	0.	0.	0.	0.	0.	670.	189.6	127053.
011	0.	0.	82.	0.	0.	0.	82.	146.5	12013.
012	0.	47.	0.	0.	0.	0.	47.	113.0	5312.
013	0.	0.	0.	0.	619.	0.	619.	137.8	85303.
015	0.	0.	278.	484.	0.	0.	762.	120.3	91663.
016	107.	0.	0.	0.	0.	0.	107.	117.9	12618.
019	438.	530.	0.	0.	2999.	120.	4086.	136.0	555684.
020	0.	462.	0.	0.	638.	0.	1100.	124.5	138987.
023	0.	85.	0.	0.	0.	443.	528.	159.7	84342.
024	0.	81.	0.	0.	0.	1397.	1478.	164.0	242382.
025	306.	0.	0.	0.	0.	0.	306.	126.9	38830.
026	0.	69.	0.	0.	0.	0.	69.	108.5	7485.
027	0.	164.	0.	0.	0.	0.	164.	113.9	18673.
028	837.	0.	0.	0.	0.	0.	837.	113.7	95172.
029	388.	0.	1324.	615.	0.	0.	2328.	123.9	288404.
034	1119.	220.	0.	0.	0.	0.	1339.	127.8	171179.
035	0.	0.	0.	0.	81.	0.	81.	146.3	11854.
036	0.	0.	69.	0.	0.	83.	153.	111.1	16996.

PCC ESTIMATES FOR ACORN GROUPS (using all areas in region):

	B	C	E	F	J	K	all
weighted PCC l/p/d	138.5	125.2	111.7	113.3	133.8	190.8	135.3
total volume l/d	1150233.	722445.	530977.	385814.	983471.	791287.	4564226.
population	8303.	5771.	4753.	3405.	7351.	4147.	33731.
number of values	22.	22.	12.	9.	13.	12.	90.
sample variance	724.5	335.6	197.8	95.7	50.8	3330.6	1082.0
population variance	759.0	351.6	215.7	107.7	55.0	3633.4	1094.1
standard error	5.9	4.0	4.2	3.5	2.1	17.4	3.5
t value	2.080	2.080	2.201	2.306	2.179	2.201	1.999
95% lower limit pcc	126.3	116.9	102.4	105.3	129.3	152.5	128.3
95% upper limit pcc	150.7	133.5	121.0	121.3	138.3	229.1	142.3

SOUTHERN WATER SERVICES SUPPLY AREA PCC ESTIMATES:

ACORN group	PCC l/p/d	IOW %popn	HD %popn	SW %popn	SC %popn	SE %popn	KN %popn	KT %popn	SWS %popn	REGION %popn
B	138.5	6.6	23.4	17.7	6.9	4.1	32.9	4.3	17.5	17.1
C	125.2	37.7	19.2	16.2	17.4	29.6	18.0	33.6	21.0	21.4
E	111.7	8.3	16.7	26.6	10.3	11.1	14.7	11.0	14.7	12.4
F	113.3	2.8	7.4	1.7	6.5	7.4	10.4	8.6	7.0	6.1
J	133.8	14.7	21.4	23.3	18.6	10.5	11.2	11.5	17.2	20.1
K	190.8	18.5	2.0	4.9	28.5	28.7	.4	17.6	11.4	12.1
% popn acc for		88.6	90.1	90.4	88.2	91.4	87.6	86.6	88.8	89.2
PCC l/p/d		139.7	128.7	129.4	146.8	144.8	127.9	137.4	134.7	135.9
variance		997.5	414.6	488.2	1347.5	1330.0	429.9	957.9	754.0	772.5
standard error		4.2	2.7	3.0	4.9	4.9	2.8	4.1	3.7	3.7
95% lower limit		131.2	123.2	123.5	137.0	135.0	122.4	129.2	127.4	128.5
95% upper limit		148.1	134.1	135.3	158.6	154.5	133.5	145.7	142.1	143.3

NATIONAL RIVERS AUTHORITY - SOUTHERN REGION
ACORN ANALYSIS OF CONTROL AREA RESULTS FOR 1993

FINAL PCC ESTIMATES FOR ACORN GROUPS (using all areas)

	B	C	E	F	J	K	all
weighted PCC l/p/d	138.5	125.2	111.7	113.3	133.8	190.8	135.3
total volume l/d	1150233.	722445.	530977.	385814.	983471.	791287.	4564228.
population	8303.	5771.	4753.	3405.	7351.	4147.	33731.
number of values	22.	22.	12.	9.	13.	12.	90.
sample variance	724.5	335.8	197.8	95.7	50.8	3330.6	1082.0
population variance	759.0	351.6	215.7	107.7	55.0	3633.4	1094.1
standard error	5.9	4.0	4.2	3.5	2.1	17.4	3.5
t value	2.080	2.080	2.201	2.306	2.179	2.201	1.999
95% lower limit pcc	126.3	116.9	102.4	105.3	129.3	152.5	128.3
95% upper limit pcc	150.7	133.5	121.0	121.3	138.3	229.1	142.3

PORTSMOUTH WATER COMPANY

ACORN group	PCC l/p/d	PWC %popn	REGION %popn
B	138.5	18.6	17.1
C	125.2	21.4	21.4
E	111.7	13.1	12.4
F	113.3	9.0	6.1
J	133.8	20.5	20.1
K	190.8	8.2	12.1
% popn acc for	90.8	89.2	
PCC l/p/d	132.7	135.9	
variance	620.7	772.5	
standard error	3.3	3.7	
95% lower limit	126.0	128.5	
95% upper limit	139.3	143.3	

ID	B	C	E	F	J	K	popn	pcc	1/d
c31	0.	0.	40.	0.	101.	184.	325.	124.5	40458.
c32	520.	0.	0.	0.	0.	5.	525.	104.4	54805.
c33	136.	0.	76.	0.	0.	0.	212.	179.5	38049.
c34	0.	0.	622.	0.	0.	0.	622.	106.7	66386.
c35	0.	66.	923.	0.	7.	0.	996.	103.9	103463.
c36	0.	0.	0.	0.	0.	936.	936.	290.5	271944.
c37	0.	845.	0.	53.	0.	240.	1138.	131.3	149432.
c50	0.	0.	0.	0.	0.	339.	339.	147.8	50088.
c51	94.	217.	0.	0.	0.	0.	311.	124.7	38769.
c54	0.	0.	0.	855.	0.	0.	855.	109.0	93235.

FINAL PCC ESTIMATES FOR ACORN GROUPS (using all areas)

	B	C	E	F	J	K	all
weighted PCC 1/p/d	138.5	125.2	111.7	113.3	133.8	190.8	135.3
total volume 1/d	1150233.	722445.	530977.	385814.	983471.	791287.	4564226.
population	8303.	5771.	4753.	3405.	7351.	4147.	33731.
number of values	22.	22.	12.	9.	13.	12.	90.
sample variance	724.5	335.6	197.8	95.7	50.8	3330.8	1082.0
population variance	759.0	351.6	215.7	107.7	55.0	3633.4	1094.1
standard error	5.9	4.0	4.2	3.5	2.1	17.4	3.5
t value	2.080	2.080	2.201	2.306	2.179	2.201	1.999
95% lower limit pcc	126.3	116.9	102.4	105.3	129.3	152.5	128.3
95% upper limit pcc	150.7	133.5	121.0	121.3	138.3	229.1	142.3

SOUTH EAST WATER

ACORN group	PCC 1/p/d	SEW %popn	REGION %popn
B	138.5	14.5	17.1
C	125.2	17.7	21.4
E	111.7	9.6	12.4
F	113.3	1.6	6.1
J	133.8	28.4	20.1
K	190.8	20.8	12.1
% popn acc for	92.8	89.2	
PCC 1/p/d	143.1	135.9	
variance	1043.3	772.5	
standard error	4.3	3.7	
95% lower limit	134.4	128.5	
95% upper limit	151.7	143.3	

NATIONAL RIVERS AUTHORITY - SOUTHERN REGION
ACORN ANALYSIS OF CONTROL AREA RESULTS FOR 1993

ID	B	C	E	F	J	K	popn	pcc	1/d
c40	0.	216.	0.	0.	0.	0.	216.	108.1	23350.
c41	159.	0.	0.	0.	0.	0.	159.	122.4	19459.
c43	0.	0.	266.	0.	0.	0.	266.	134.8	35865.
c44	162.	0.	0.	0.	0.	0.	162.	140.7	22793.
c45	0.	0.	0.	0.	0.	99.	99.	161.2	15963.
c48	0.	268.	0.	0.	0.	0.	268.	111.2	29793.
c47	267.	0.	0.	0.	0.	0.	267.	137.3	36661.
c48	0.	0.	0.	0.	0.	160.	160.	117.2	18757.
c49	0.	0.	0.	0.	290.	0.	290.	134.7	39061.

FINAL PCC ESTIMATES FOR ACORN GROUPS (using all areas)

	B	C	E	F	J	K	all
weighted PCC 1/p/d	138.5	125.2	111.7	113.3	133.8	190.8	135.3
total volume 1/d	1150233.	722445.	530977.	385814.	983471.	791287.	4564226.
population	8303.	5771.	4753.	3405.	7351.	4147.	33731.
number of values	22.	22.	12.	9.	13.	12.	90.
sample variance	724.5	335.6	197.8	95.7	50.8	3330.6	1082.0
population variance	759.0	351.6	215.7	107.7	55.0	3633.4	1094.1
standard error	5.9	4.0	4.2	3.5	2.1	17.4	3.5
t value	2.080	2.080	2.201	2.306	2.179	2.201	1.999
95% lower limit pcc	126.3	116.9	102.4	105.3	129.3	152.5	128.3
95% upper limit pcc	150.7	133.5	121.0	121.3	138.3	229.1	142.3

FOLKESTONE AND DOVER WATER SERVICES

ACORN group	PCC 1/p/d	FDWS %popn	REGION %popn
B	138.5	11.0	17.1
C	125.2	32.2	21.4
E	111.7	9.0	12.4
F	113.3	6.5	6.1
J	133.8	17.0	20.1
K	190.8	12.3	12.1
% popn acc for	88.0	89.2	
PCC 1/p/d	135.4	135.9	
variance	772.0	772.5	
standard error	3.7	3.7	
95% lower limit	128.0	128.5	
95% upper limit	142.9	143.3	

NATIONAL RIVERS AUTHORITY - SOUTHERN REGION
ACORN ANALYSIS OF CONTROL AREA RESULTS FOR 1993

ID	B	C	E	F	J	K	popn	pcc	1/d
c01	0.	0.	0.	0.	65.	0.	65.	143.5	9325.
c02	0.	0.	0.	0.	0.	141.	141.	90.1	12698.
c03	0.	0.	208.	193.	0.	0.	401.	106.1	42547.
c04	0.	475.	0.	170.	0.	0.	645.	105.9	68323.
c05	0.	8.	0.	584.	0.	0.	572.	127.7	73053.
c06	0.	0.	0.	0.	177.	0.	177.	152.7	27034.
c08	0.	334.	0.	0.	0.	0.	334.	130.6	43621.
c09	321.	0.	0.	0.	0.	0.	321.	174.7	56087.
c10	52.	0.	0.	0.	61.	0.	113.	146.7	16573.
c11	498.	189.	0.	0.	0.	0.	687.	193.1	132684.
c12	870.	378.	0.	0.	0.	0.	1248.	119.9	149586.
c13	176.	0.	0.	0.	52.	0.	228.	156.1	35592.
c14	250.	0.	0.	0.	0.	0.	250.	141.7	35420.
c16	269.	12.	0.	0.	0.	0.	261.	137.3	38581.

FINAL PCC ESTIMATES FOR ACORN GROUPS (using all areas)

	B	C	E	F	J	K	a11
weighted PCC 1/p/d	138.5	125.2	111.7	113.3	133.8	190.8	135.3
total volume 1/d	1150233.	722445.	530977.	385814.	983471.	791287.	4564226.
population	8303.	5771.	4753.	3405.	7351.	4147.	33731.
number of values	22.	22.	12.	9.	13.	12.	90.
sample variance	724.5	335.6	197.8	95.7	50.8	3330.6	1082.0
population variance	759.0	351.8	215.7	107.7	55.0	3633.4	1094.1
standard error	5.9	4.0	4.2	3.5	2.1	17.4	3.5
t value	2.080	2.080	2.201	2.306	2.179	2.201	1.999
95% lower limit pcc	126.3	116.9	102.4	105.3	129.3	152.5	128.3
95% upper limit pcc	150.7	133.5	121.0	121.3	138.3	229.1	142.3

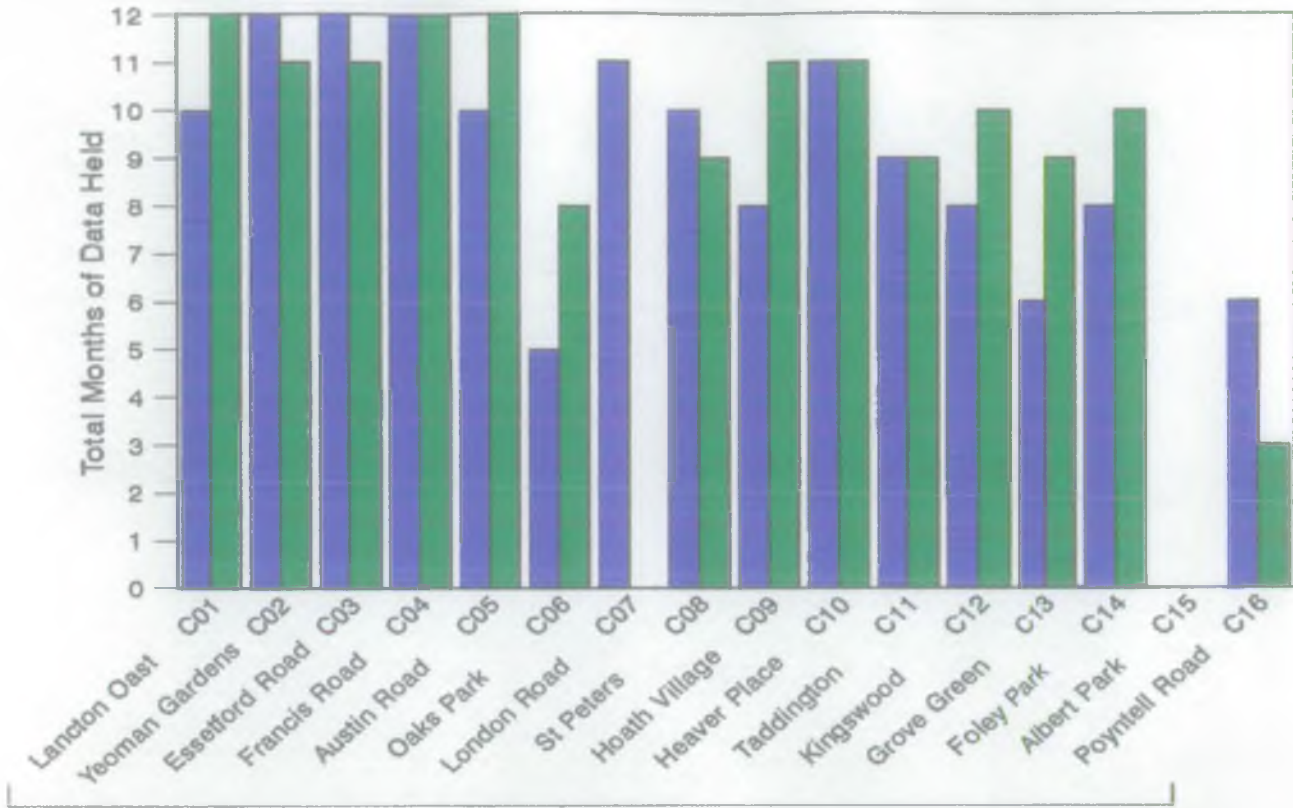
MID KENT WATER COMPANY

ACORN group	PCC 1/p/d	MK %popn	REGION %popn
B	138.5	22.8	17.1
C	125.2	20.1	21.4
E	111.7	13.4	12.4
F	113.3	4.4	6.1
J	133.8	19.2	20.1
K	190.8	6.3	12.1
% popn acc for		86.2	89.2
PCC 1/p/d		132.7	135.9
variance		599.6	772.5
standard error		3.3	3.7
95% lower limit		126.2	128.5
95% upper limit		139.3	143.3

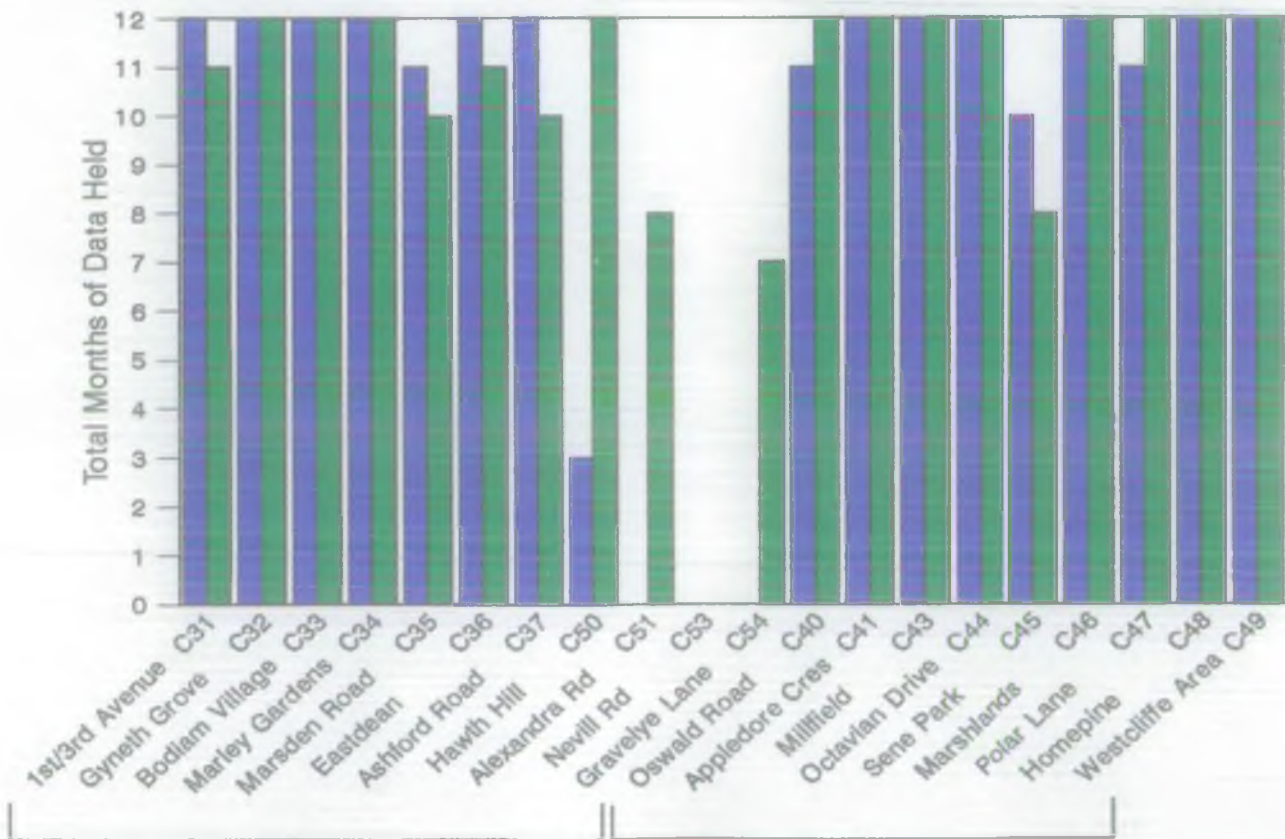
CONTROL AREA

Total Months of Data Held on Record

Fig. 1a

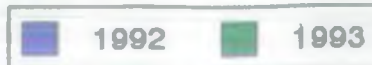


MID KENT W.Co



SOUTH EAST WATER

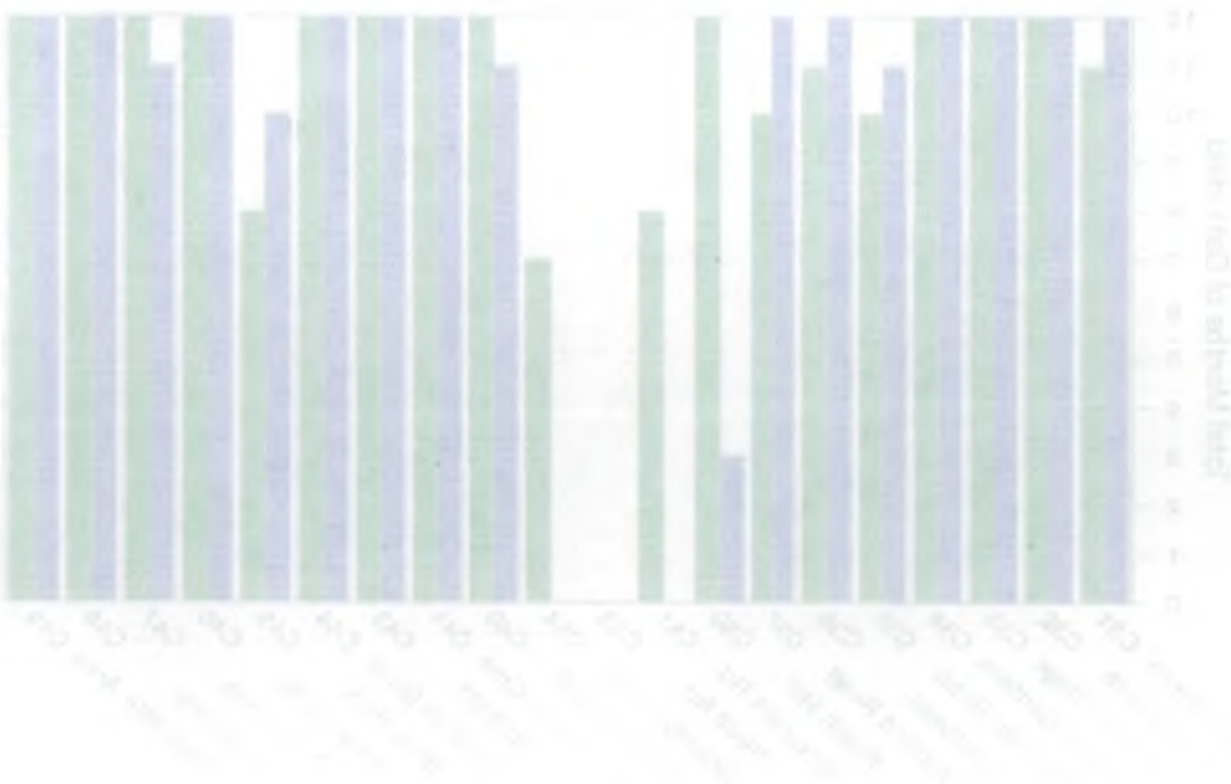
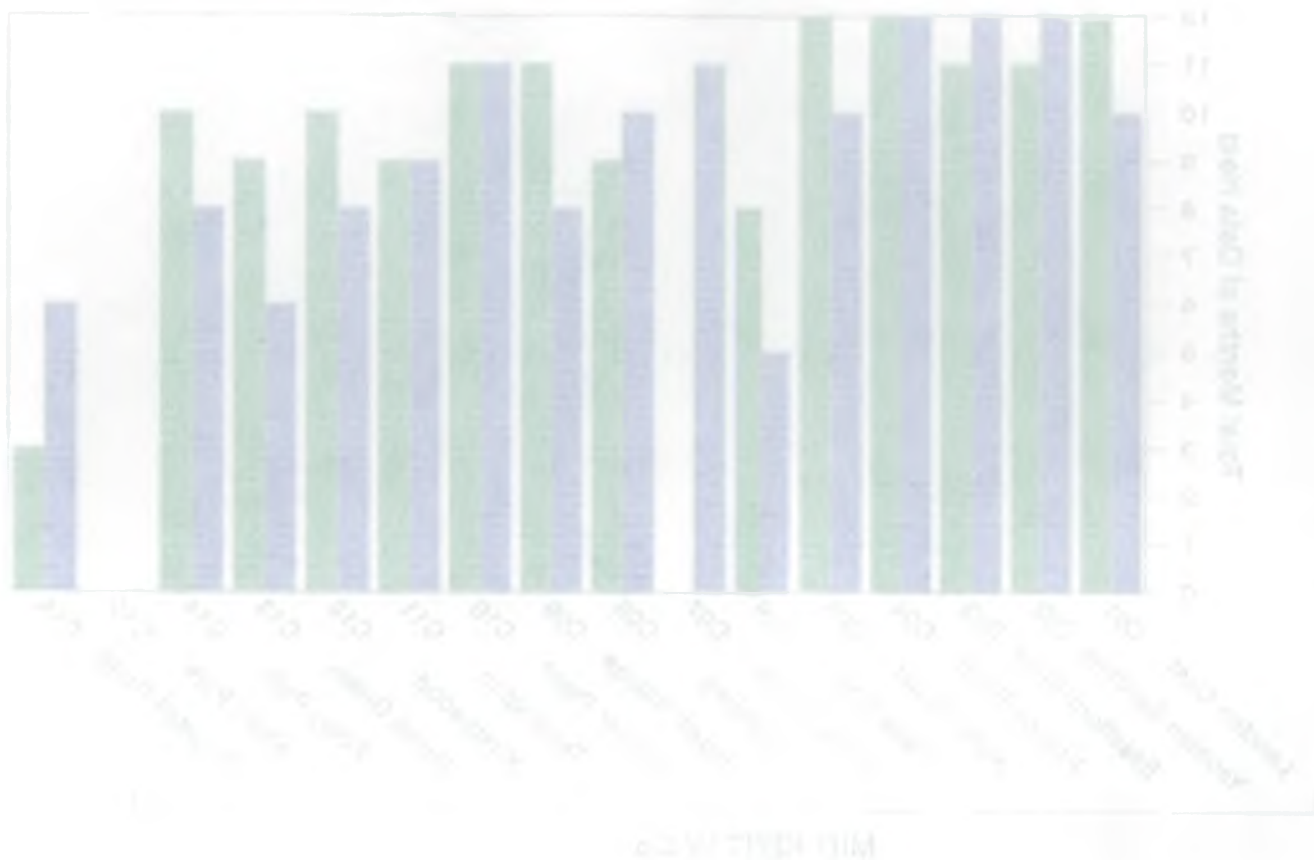
FOLKESTONE W.Co



Months included with half a months data or more.

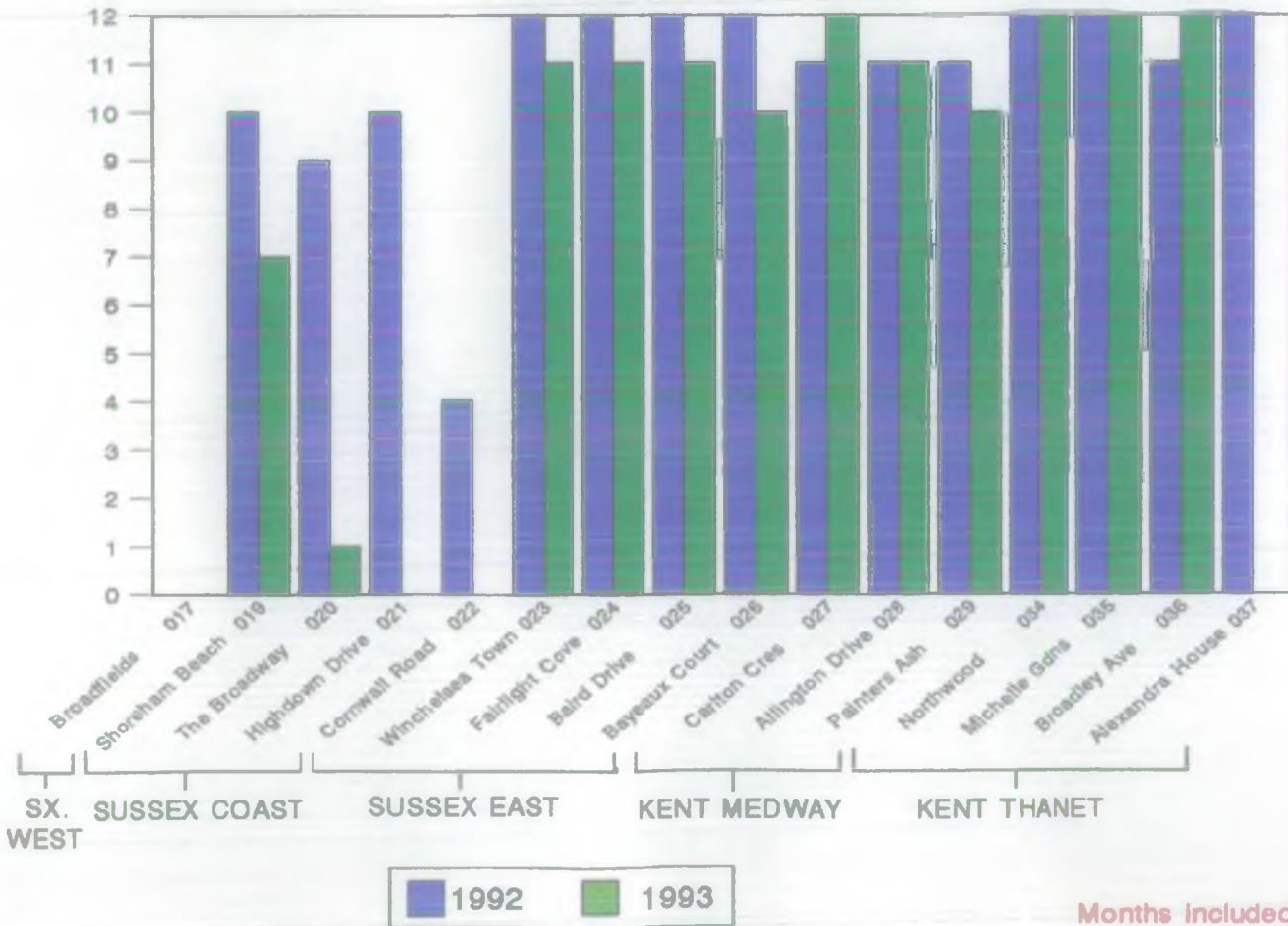
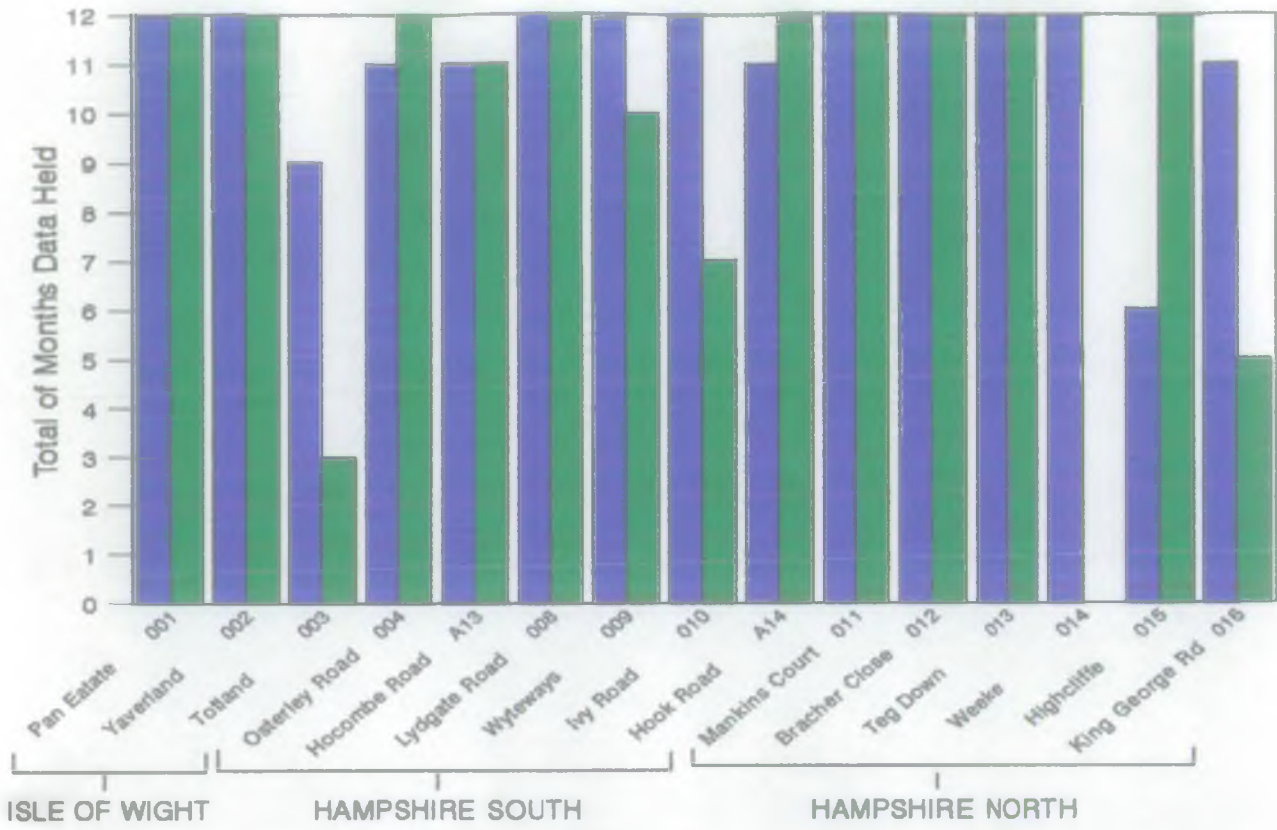
CONTROL AREA

Total Months of Data Held on Record



Legend: Green, Blue

Fig. 1b



Months included with half a months data or more

Total of Monthly Data Field



11/10/2011 10:10 AM

11/10/2011 10:10 AM

11/10/2011 10:10 AM

100 90 80 70 60 50 40 30 20 10 0



1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.

Legend



Per Capita Consumption Estimates by Company

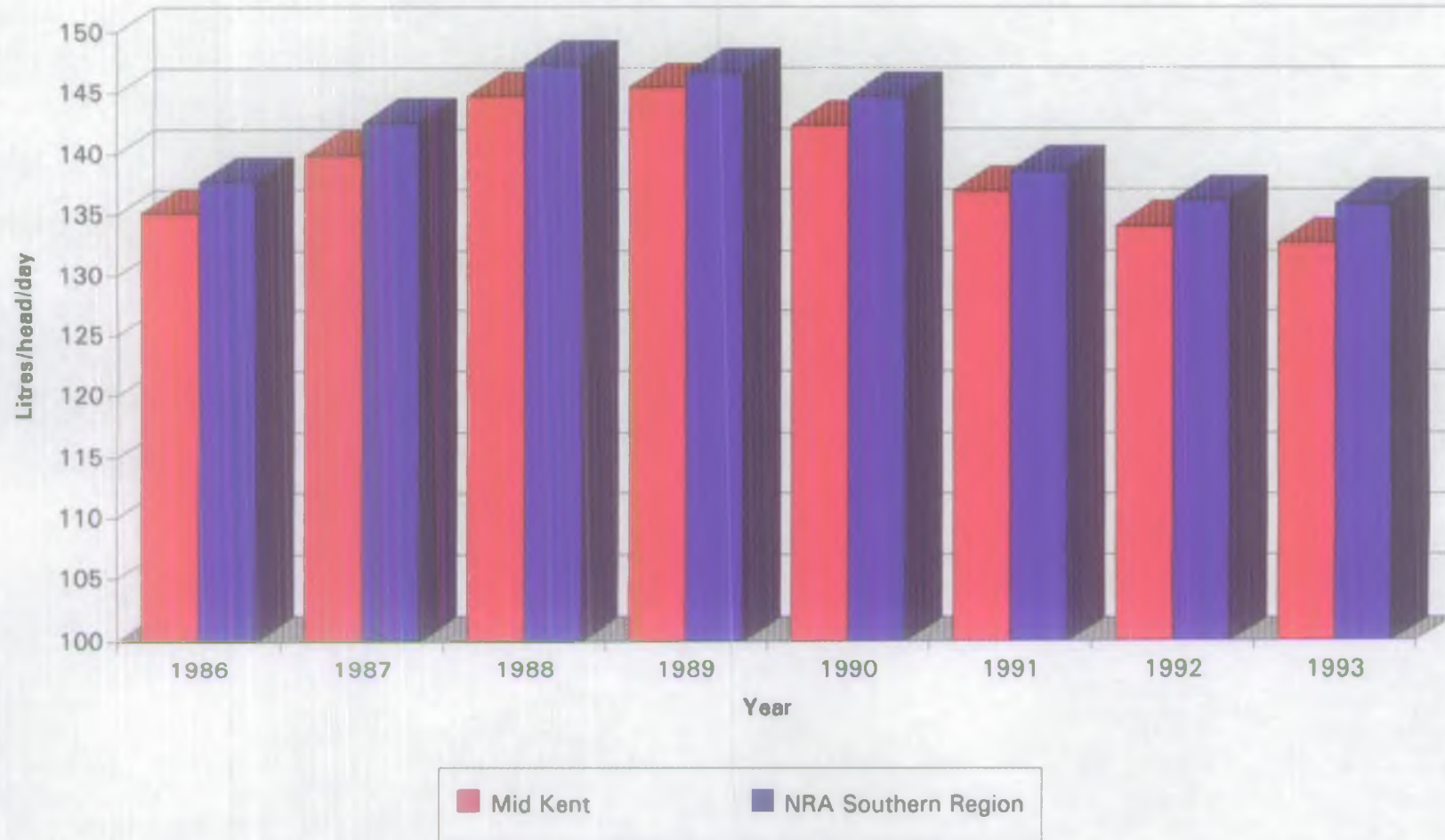


Fig. 2

Per Capita Consumption Estimates by Company

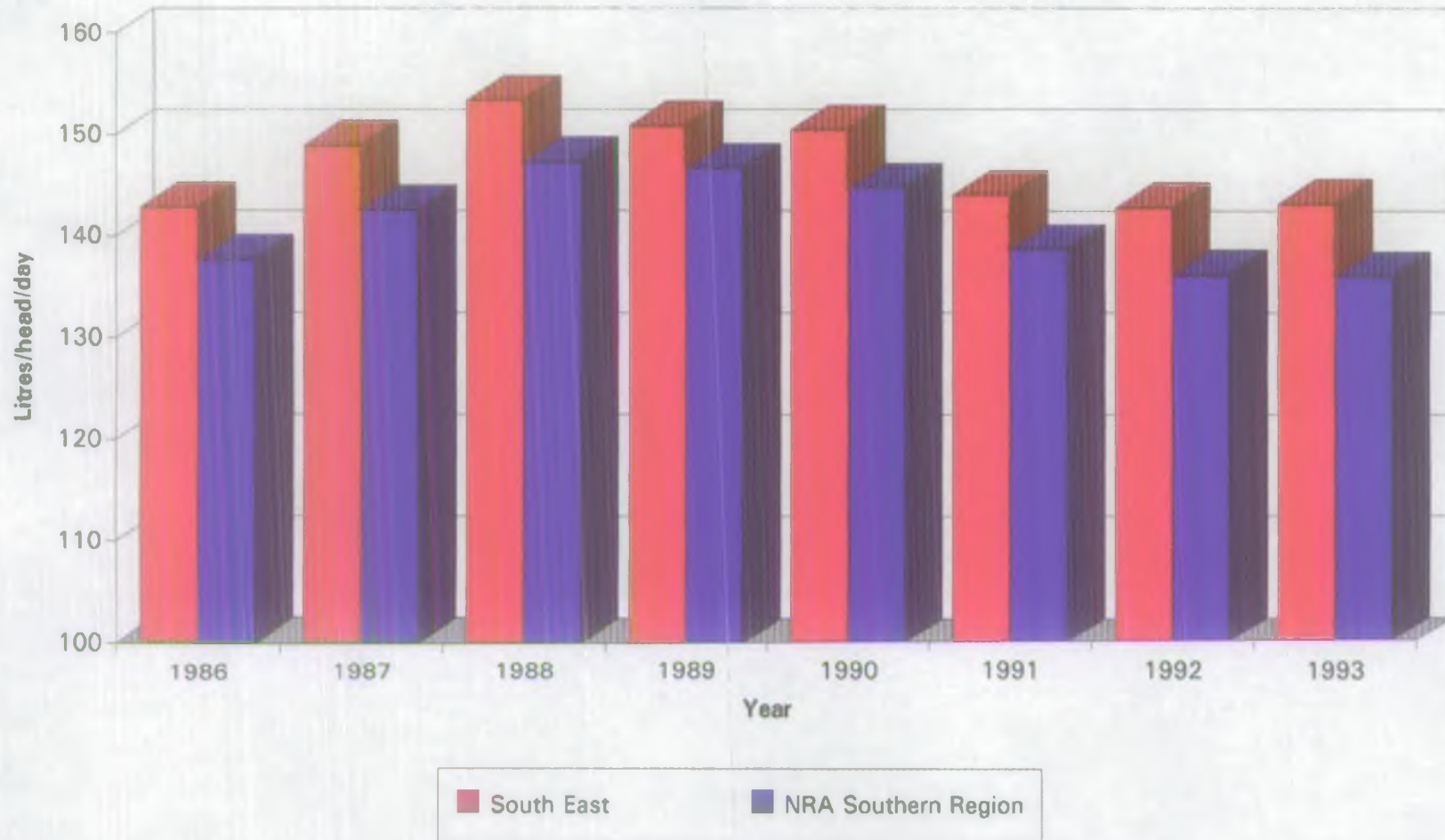


Fig. 2

Per Capita Consumption Estimates by Company

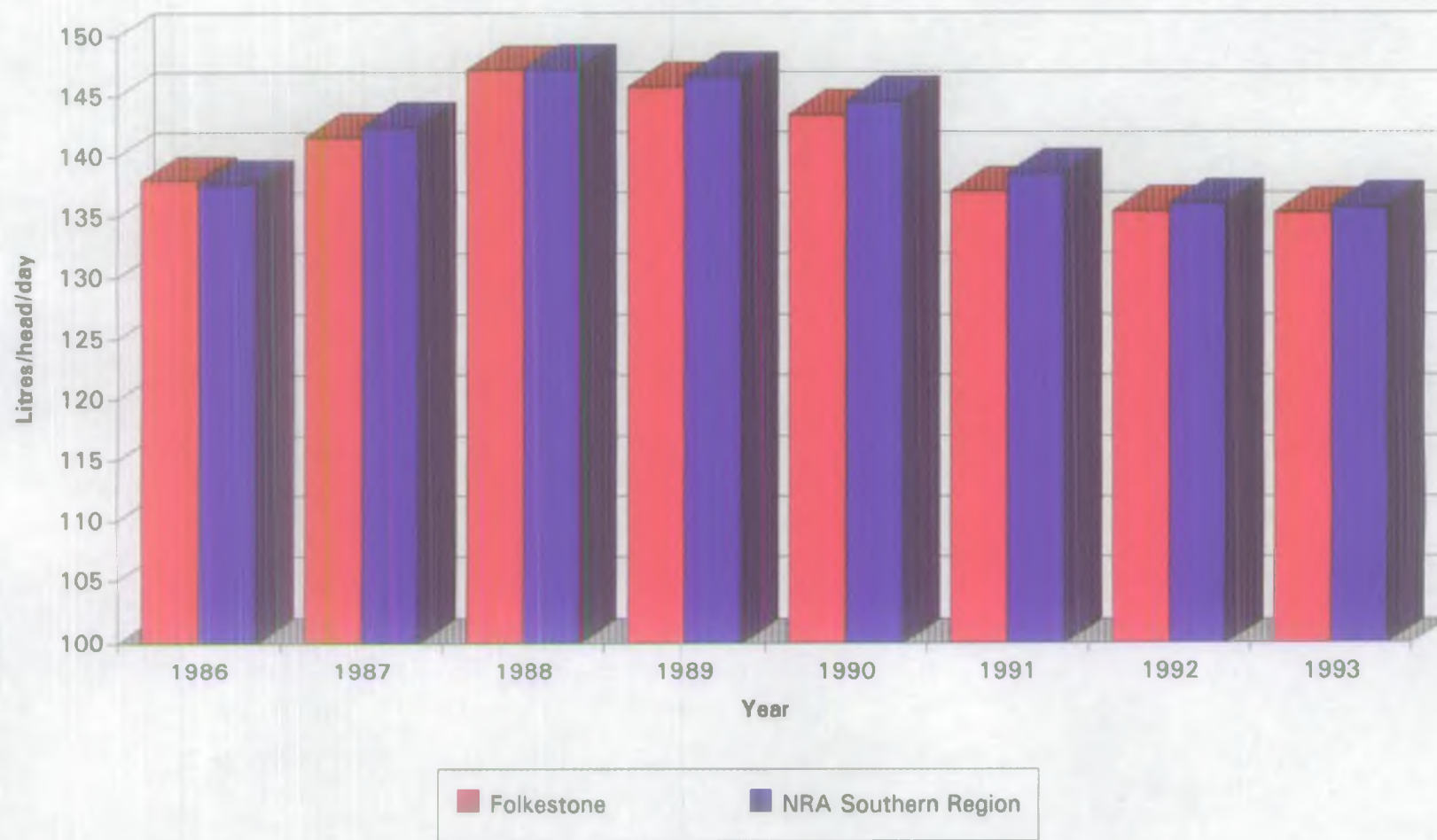


Fig. 2

Per Capita Consumption Estimates by Company

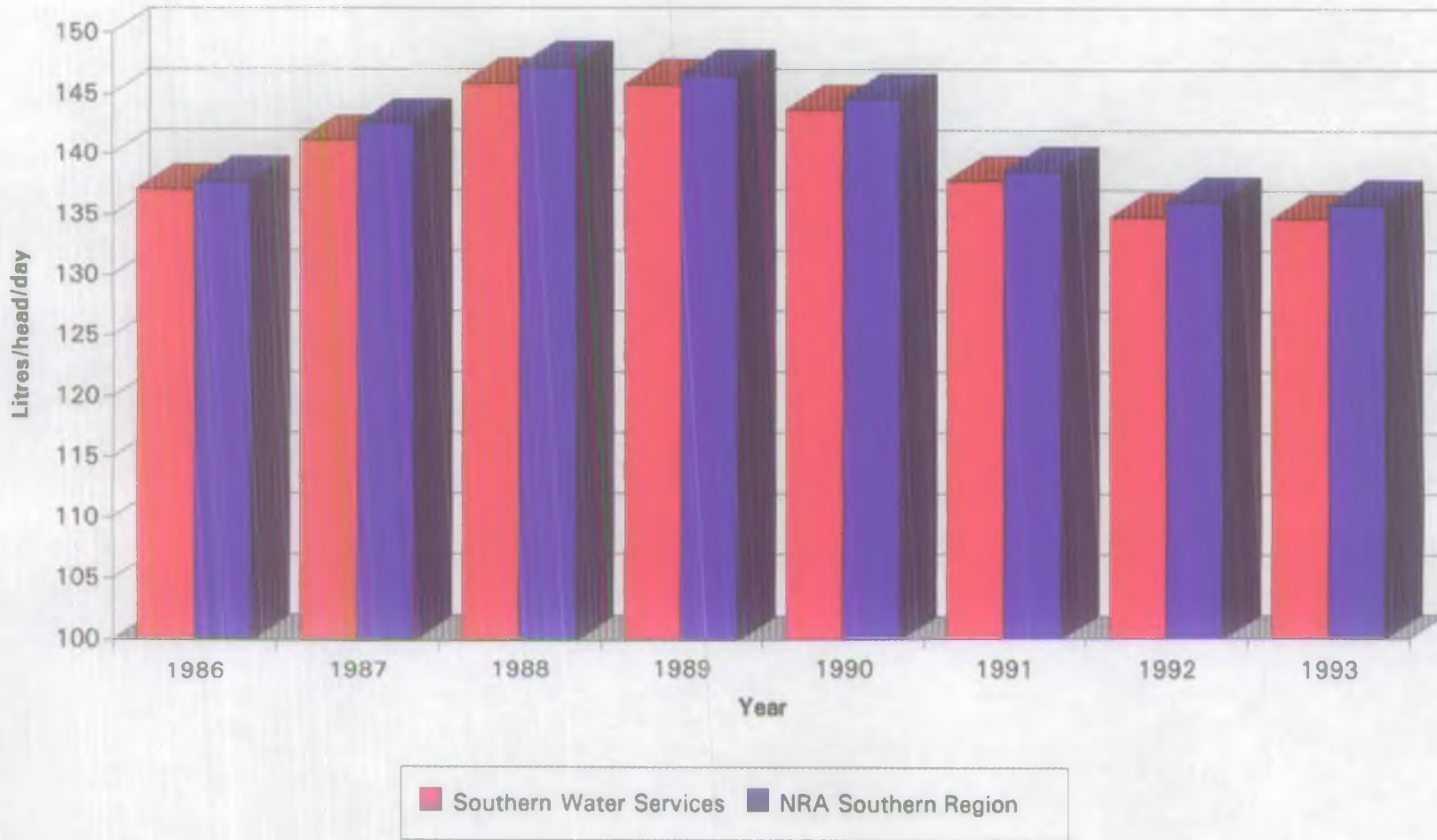


Fig. 2

Per Capita Consumption Estimates by Company

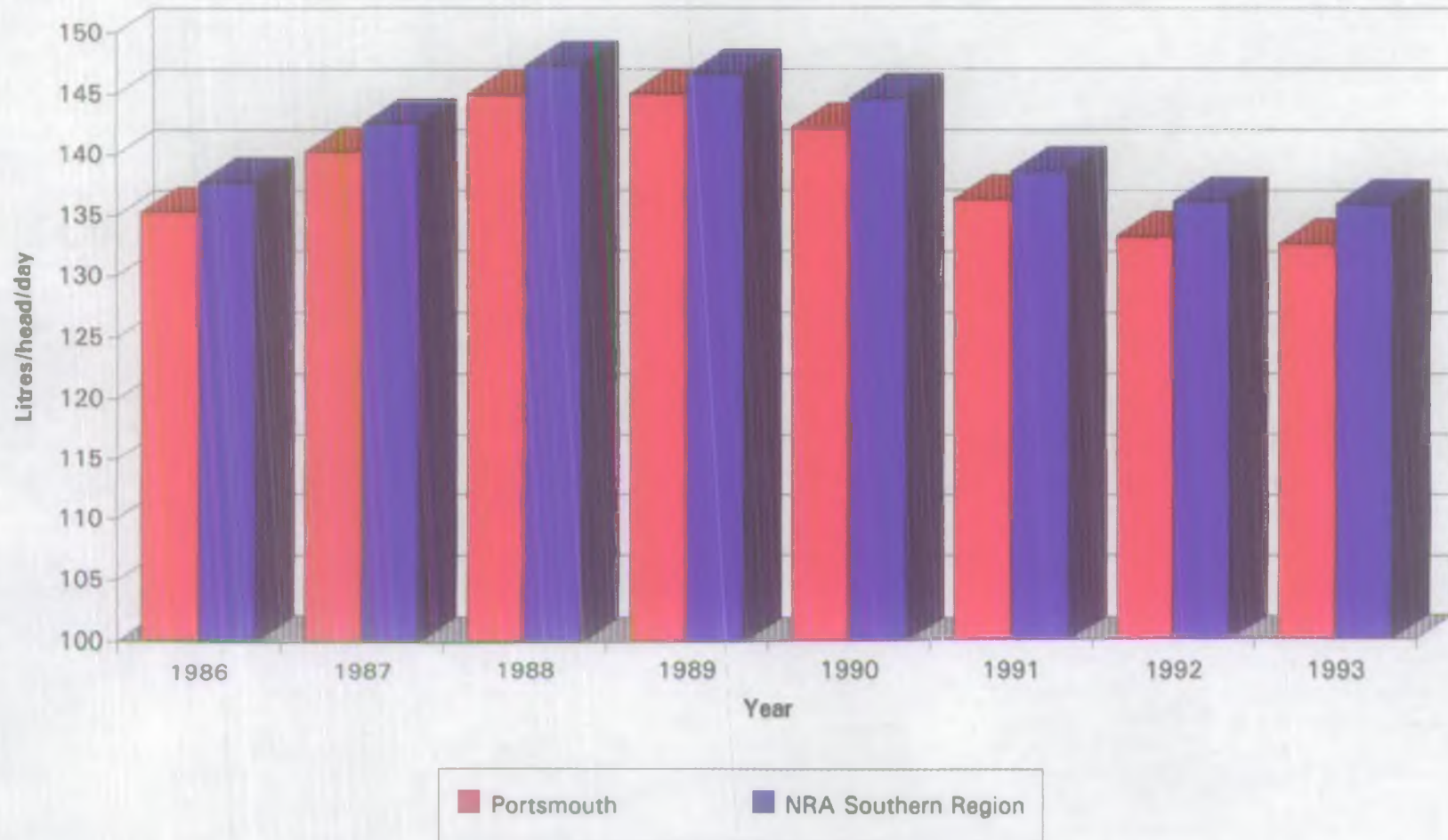
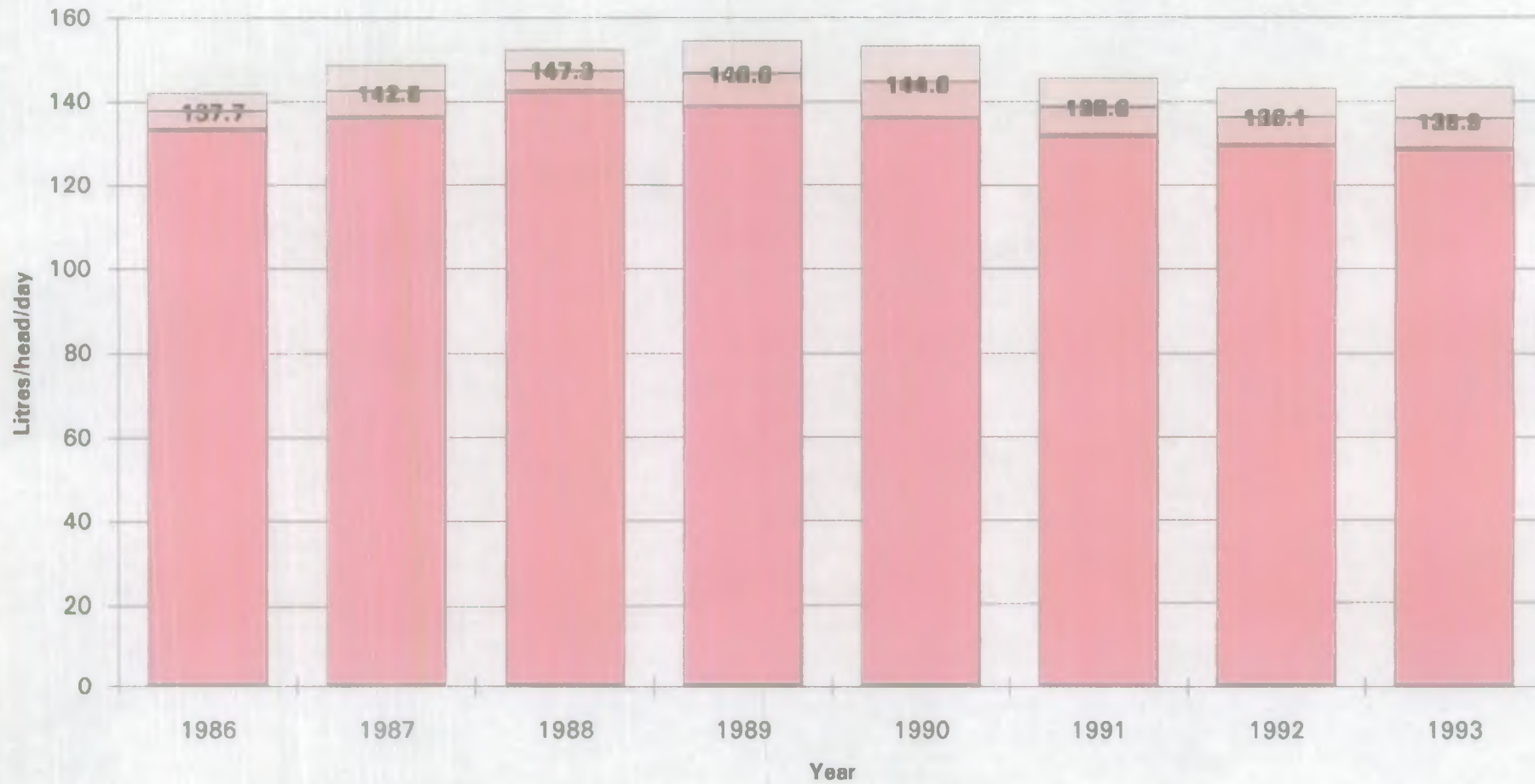


Fig. 2

Regional Per Capita Consumption 1986 - 1993



Value of pcc estimate is shown
Confidence limits denoted by 95% values

Fig. 3

**Control Area Estimates of Domestic Water Consumption
by Acorn Type 1986 - 1993**

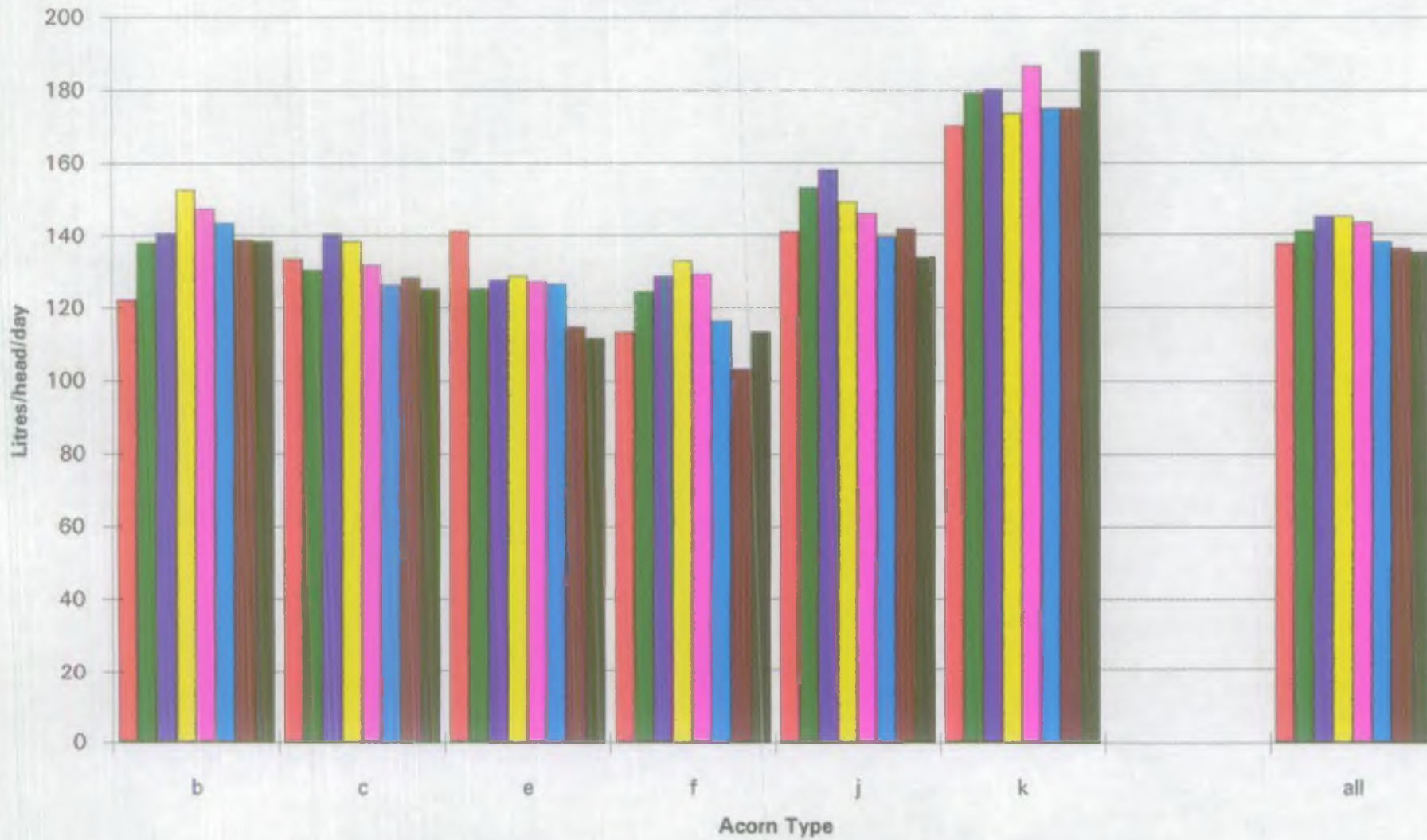
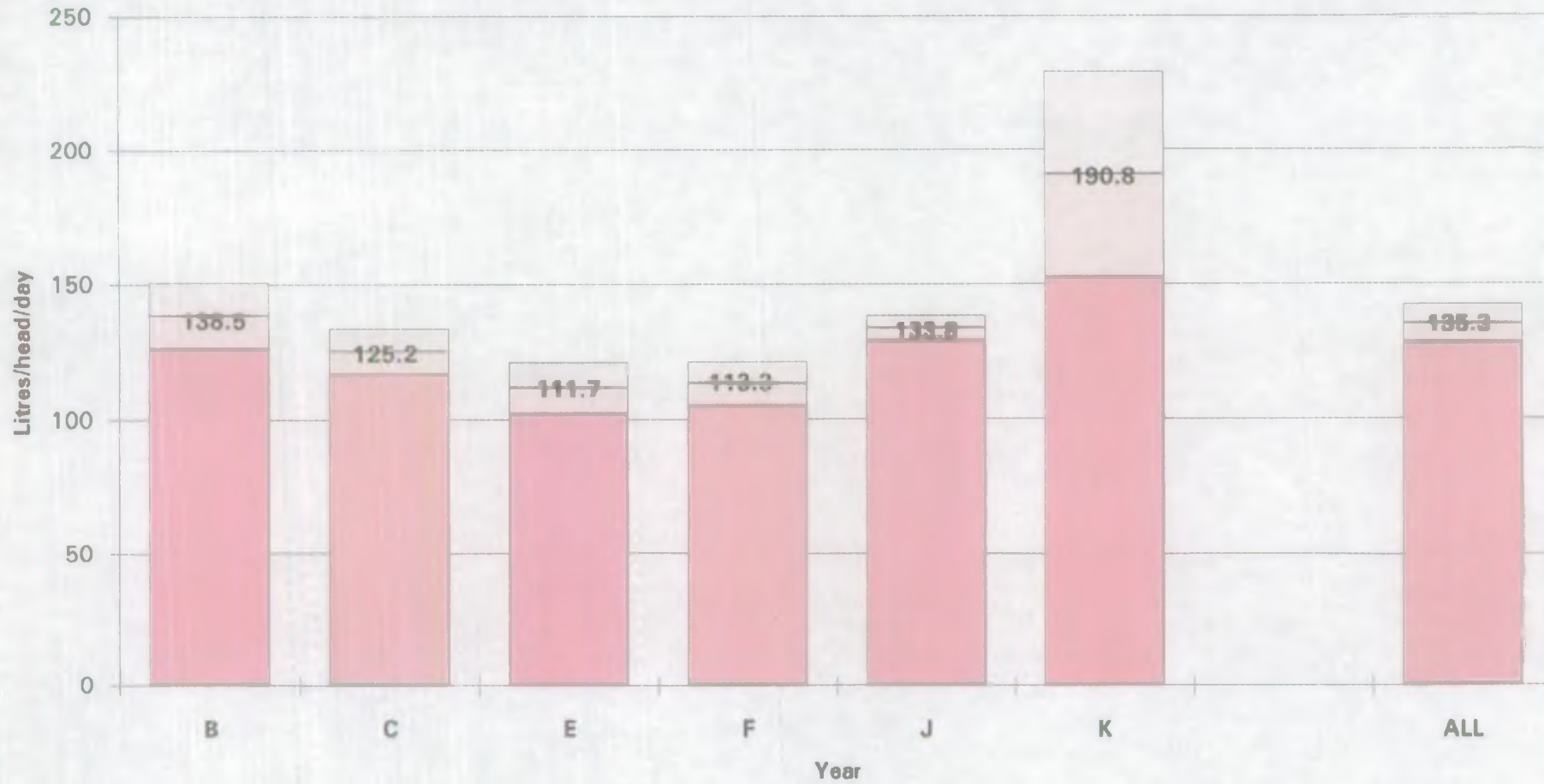


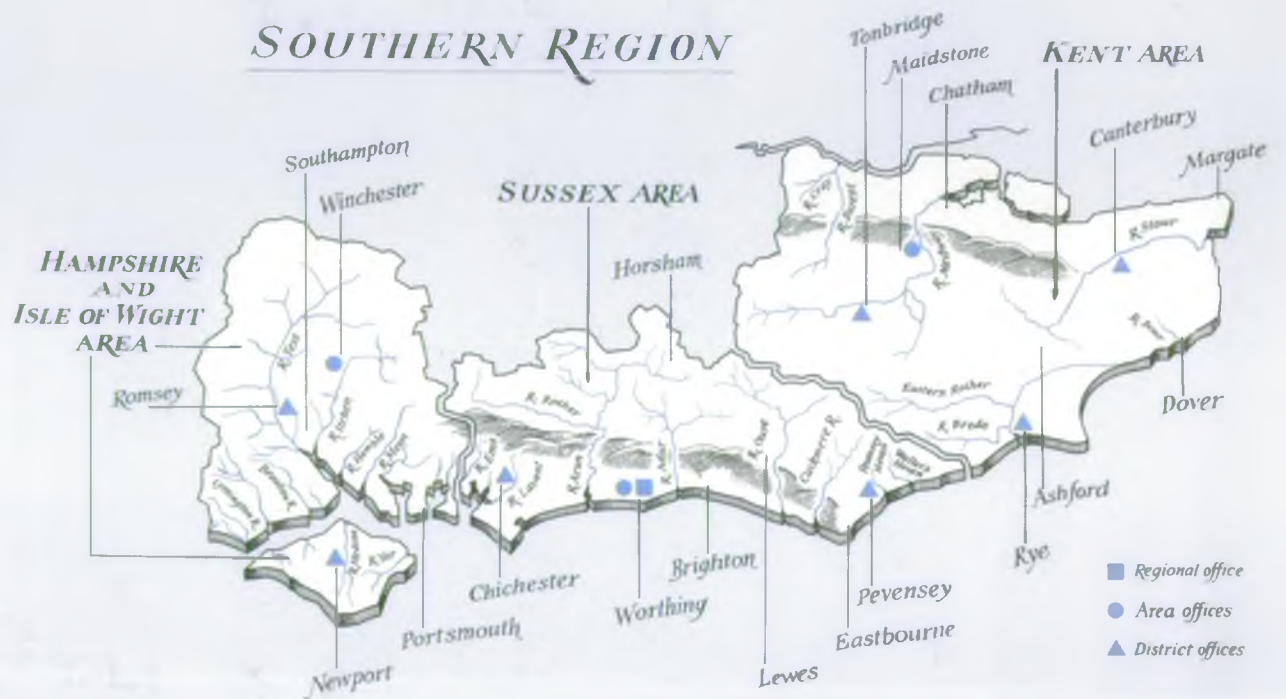
Fig. 4

Domestic Consumption 1993 by Acorn Type



Value of pcc estimate is shown
Confidence limits denoted by 95% values

SOUTHERN REGION



Not to scale



NRA

*National Rivers Authority
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