Thames Water
Annual Review 2012-13

Environment Agency Annual Review

June 2013

TABLE OF CONTENTS

List of Figures

List of Tables

Annual Return 2012/13 V0.0

Environment Agency Data - Annual Average Out-turns

				Guildford	Henley	Kennet Valley	London	Slough / Wycombe / Aylesbury	SWOX	Total
Supply										
Resources										
1	Raw water abstracted	Ml/d	2dp	48.41	12.60	106.42	2,232.18	132.09	258.48	2,790.19
2	Raw water imported	Ml/d	2dp	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Potable water imports	Ml/d	2dp	0.00	0.00	0.00	0.00	0.19	0.93	1.12
4	Raw water losses & operational use	Ml/d	2dp	0.14	-0.01	0.71	11.68	0.13	0.55	13.20
5	Raw water exported	Ml/d	2dp	0.00	0.00	0.00	91.42	0.00	0.00	91.42
5.1	Non potable water supplied	Ml/d	2dp	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Potable water exports	Ml/d	2dp	1.71	0.00	0.00	0.39	1.11	0.02	3.22
7	Deployable output	Ml/d	2dp	65.01	25.65	137.06	2,144.00	181.08	316.34	2,869.14
Process losses										
9	Treatment works losses & operational use	Ml/d	2dp	1.22	-0.05	6.52	136.60	1.13	4.94	150.37
10	Outage experienced	Ml/d	2dp	2.08	0.00	0.02	120.28	18.30	3.83	144.51
Demand										
11	Distribution input	Ml/d	2dp	44.28	12.38	97.10	1,987.99	129.03	255.16	2,525.95
Consumption										
19	Measured non household water delivered	Ml/d	2dp	8.22	1.96	19.38	365.49	21.93	60.33	477.31
20	Unmeasured non-household water delivered	Ml/d	2dp	0.24	0.06	0.33	19.99	0.35	0.90	21.87
21	Measured household water delivered	Ml/d	2dp	8.57	3.77	20.44	235.86	26.12	65.12	359.90
22	Unmeasured household water delivered	Ml/d	2dp	16.26	3.87	37.66	965.10	53.86	80.10	1,156.86
23	Measured non household - consumption	Ml/d	2dp	8.03	1.91	19.09	360.77	21.50	59.40	470.70
24	Unmeasured non household - consumption	Ml/d	2dp	0.21	0.05	0.30	17.96	0.31	0.81	19.64
25	Measured household - consumption	Ml/d	2dp	7.76	3.47	18.95	220.93	24.16	60.29	335.56
26	Unmeasured household - consumption	Ml/d	2dp	13.49	3.29	32.75	847.17	46.82	69.50	1,013.02
29	Measured household - pcc	Ml/d	2dp	134.57	138.06	125.77	134.84	131.89	123.21	131.88
30	Unmeasured household - pcc	l/h/d	2dp	155.34	149.31	146.96	167.06	154.14	149.02	164.10
31	Average household - pcc	Ml/d	2dp	147.05	143.31	138.41	159.19	145.77	135.81	154.70
32	Water taken unbilled	Ml/d	2dp	0.79	0.18	1.40	28.66	1.60	4.80	37.43
33	Distribution system operational use	Ml/d	2dp	0.14	0.03	0.21	4.65	0.27	0.58	5.88
Leakage										
34	Measured non household - uspl	Ml/d	2dp	0.20	0.05	0.28	4.72	0.43	0.93	6.61
35	Unmeasured non-household - uspl	Ml/d	2dp	0.03	0.01	0.04	2.03	0.04	0.09	2.23
36	Measured household - uspl	Ml/d	2dp	0.81	0.31	1.49	14.93	1.97	4.83	24.34
37	Unmeasured household - uspl	Ml/d	2dp	2.77	0.59	4.91	117.93	7.04	10.61	143.85
38	Void properties - uspl	Ml/d	2dp	0.13	0.03	0.20	4.47	0.26	0.50	5.58
39	Total mains and trunk mains leakage (Distribution losses)	Ml/d	2dp	10.06	2.50	17.68	368.23	24.89	43.34	466.69
40	Total leakage	Ml/d	2dp	14.00	3.48	24.60	512.31	34.62	60.29	649.30
41	Total leakage	l/prop/d	2dp	221.84	163.64	153.93	182.80	168.47	145.41	177.07
Customers										
Properties										
43	Unmeasured household - properties	000's	3dp	31.640	8.009	80.345	1,899.981	106.854	167.818	2,294.646
42	Measured household - properties	000's	3dp	25.808	11.621	67.838	668.553	83.011	212.443	1,069.274
46	Unmeasured non household - properties	000's	3dp	0.343	0.095	0.577	32.696	0.620	1.414	35.746
45	Measured non household - properties	000's	3dp	3.844	1.139	7.838	129.366	11.045	25.102	178.334
44	Void household - properties	000's	3dp	1.052	0.269	2.325	53.336	2.933	5.983	65.898
47	Void non households - properties	000's	3dp	0.404	0.121	0.874	18.614	1.055	1.881	22.949
48	Total properties	000's	3dp	63.090	21.254	159.797	2,802.545	205.518	414.641	3,666.846
Population										
50	Unmeasured household - population	000's	3dp	86.851	22.011	222.823	5,071.172	303.786	466.351	6,172.994
49	Measured household - population	000's	3dp	57.664	25.115	150.683	1,638.485	183.155	489.315	2,544.417
52	Unmeasured non household population	000's	3dp	0.000	0.000	0.000	0.000	0.000	0.000	0.000
51	Measured non household - population	000's	3dp	7.373	2.404	19.056	342.326	24.844	48.758	444.762
53	Total population	000's	3dp	151.889	49.531	392.562	7,051.983	511.785	1,004.424	9,162.173
Occupancy										
55	Unmeasured household - occupancy rate	h/pr	2dp	2.75	2.75	2.77	2.67	2.84	2.78	2.69
54	Measured household - occupancy rate	h/pr	2dp	2.23	2.16	2.22	2.45	2.21	2.30	2.38
Metering										
56	Total Household Metering penetration (excl voids)	%	2dp	44.92%	59.20%	45.78%	26.03%	43.72%	55.87%	31.79%
57	Total Household Metering penetration (incl voids)	%	2dp	44.12%	58.40%	45.07%	25.50%	43.06%	55.00%	31.18%

Annual Return 2012/13 V0.0

Environment Agency Data - Critical Period Out-turns

				Guildford	Henley	Kennet Valley	London	Slough / Wycombe / Aylesbury	SWOX	Total
Supply										
Resources										
1	Raw water abstracted	Ml/d	2dp	52.69	14.25	113.23	2,232.18	138.14	383.09	2,933.59
2	Raw water imported	Ml/d	2dp	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Potable water imports	Ml/d	2dp	0.00	0.00	0.00	0.00	0.17	1.35	1.52
4	Raw water losses & operational use	Ml/d	2dp	0.13	-0.14	0.91	11.68	-0.15	-1.11	11.32
5	Raw water exported	Ml/d	2dp	0.00	0.00	0.00	91.42	0.00	0.00	91.42
5.1	Non potable water supplied	Ml/d	2dp	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Potable water exports	Ml/d	2dp	1.79	0.00	0.00	0.39	1.76	0.02	3.95
7	Deployable output	Ml/d	2dp	71.20	26.30	160.08	2,144.00	209.89	371.21	2,982.68
Process losses										
9	Treatment works losses & operational use	Ml/d	2dp	1.14	-1.29	8.27	136.60	-1.37	-9.99	133.36
10	Outage experienced	Ml/d	2dp	2.08	0.00	0.02	120.28	18.30	3.83	144.51
Demand										
11	Distribution input	Ml/d	2dp	49.29	15.51	102.23	1,987.99	137.15	278.37	2,570.53
Consumption										
19	Measured non household water delivered	Ml/d	2dp	10.35	3.51	18.15	365.49	22.62	59.53	479.66
20	Unmeasured non-household water delivered	Ml/d	2dp	0.29	0.10	0.32	19.99	0.36	0.89	21.95
21	Measured household water delivered	Ml/d	2dp	9.48	4.49	22.57	235.86	28.40	75.25	376.05
22	Unmeasured household water delivered	Ml/d	2dp	18.15	4.70	41.96	965.10	59.07	93.91	1,182.89
23	Measured non household - consumption	Ml/d	2dp	10.15	3.46	17.87	360.77	22.19	58.60	473.05
24	Unmeasured non household - consumption	Ml/d	2dp	0.26	0.09	0.28	17.96	0.32	0.80	19.72
25	Measured household - consumption	Ml/d	2dp	8.67	4.18	21.08	220.93	26.43	70.42	351.71
26	Unmeasured household - consumption	Ml/d	2dp	15.38	4.11	37.05	847.17	52.03	83.31	1,039.04
29	Measured household - pcc	Ml/d	2dp	150.35	166.43	139.89	134.84	144.33	143.91	138.23
30	Unmeasured household - pcc	l/h/d	2dp	177.09	186.64	166.26	167.06	171.26	178.63	168.32
31	Average household - pcc	Ml/d	2dp	166.42	175.87	155.62	159.19	161.13	160.86	159.54
32	Water taken unbilled	Ml/d	2dp	0.84	0.21	1.46	28.66	1.66	5.23	38.06
33	Distribution system operational use	Ml/d	2dp	0.14	0.03	0.21	4.65	0.27	0.58	5.88
Leakage										
34	Measured non household - uspl	Ml/d	2dp	0.20	0.05	0.28	4.72	0.43	0.93	6.61
35	Unmeasured non-household - uspl	Ml/d	2dp	0.03	0.01	0.04	2.03	0.04	0.09	2.23
36	Measured household - uspl	Ml/d	2dp	0.81	0.31	1.49	14.93	1.97	4.83	24.34
37	Unmeasured household - uspl	Ml/d	2dp	2.77	0.59	4.91	117.93	7.04	10.61	143.85
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39	Total mains and trunk mains leakage (Distribution losses)	Ml/d	2dp	10.03	2.47	17.56	368.23	24.77	42.98	466.04
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53	Total population	000's	3dp	151.889	49.531	392.562	7,051.983	511.785	1,004.424	9,162.173
Occupancy										
55	Unmeasured household - occupancy rate	h/pr	2dp	2.75	2.75	2.77	2.67	2.84	2.78	2.69
54	Measured household - occupancy rate	h/pr	2dp	2.23	2.16	2.22	2.45	2.21	2.30	2.38
Metering										
56	Total Household Metering penetration (excl voids)	%	2dp	44.92%	59.20%	45.78%	26.03%	43.72%	55.87%	31.79%
57	Total Household Metering penetration (incl voids)	%	2dp	44.12%	58.40%	45.07%	25.50%	43.06%	55.00%	31.18%

1. Executive Summary

1.1.1 Overview of Actual Performance for Reporting Year

The water resources programme from 2010 to 2015 (AMP5) was agreed with Ofwat as a part of the Price Review process undertaken in 2009 and is defined within Ofwat's Final Determination (FD09). This report presents progress against the FD09 unless otherwise stated.

Due to the publication of updated climate change scenarios, UKCP09, in summer 2009, Ofwat removed climate change related investment in its determination of the Company's Business Plan and directed Thames Water instead to resubmit its climate change investment case during AMP5 using the new scenarios. The regulatory targets for AMP5 therefore do not include an allowance for this factor and the assessment of the supply demand position presented in this report has climate change impacts removed from WAFU and target headroom.

Security of Supply

Security of Supply Index (SoSI) for both 'annual average' (AA) and 'critical period' (CP) conditions remain at 100, with all water resource zones in surplus. The Thames Water region values for SoSI, annual average and critical period, are presented below along with targets for the AMP5 period.

SoSI		2010/11	2011/12	2012/13	2013/14	2014/15
SoSI (AA)	Target	100	100	100	100	100
	Actual/*Forecast*	100	100	100	*100*	*100*
SoSI (CP)	Target	99	99	100	100	100
	Actual/*Forecast*	100	100	100	*100*	*100*

Drought Update

The dry period, which started in April 2010 resulted in the driest 24 month period on record with 18 of the 24 months to March 2012 with below average rainfall. By April 2012 this had led to low groundwater levels and reduced river flows and affected the whole of the South East of England.

In November 2011 an Event Team was set up to manage the situation as it developed. It was chaired at director level supported by a full-time Project Manager and technical specialists, from both within the company and external resources, were brought in as required. In line with our revised draft Drought Plan a wide range of supply side and demand side measures were carried out, including extensive customer communications. Throughout this period Thames Water worked closely with the Environment Agency and neighbouring water companies.

On 5 April 2012, in an effort to conserve water so as to make best use of limited supplies and help protect the environment, Thames Water introduced a Temporary Use Ban (TUB). The restrictions were applied to the entire company area. The restrictions were then lifted on 14 June 2012 after substantial rainfall in the period following the introduction of the TUB.

Water Resource Schemes and Network Constraint Removals

During the year two schemes were delivered, both in the Swindon and Oxford (SWOX) WRZ. In June 2012 the Ashdown Park Water Treatment Works (WTW) pump upgrade was completed delivering a further 0.67 Ml/d CP on top of the outputs delivered in 2011/12. In September 2012 the Manor Road WTW nitrate removal scheme was completed delivering the full licence of 3.0 Ml/d AA and 3.6 Ml/d CP.

Sustainability Reductions

The remaining actions relating to AMP3 (non-statutory) Restoration of Sustainable Abstraction Programme (RSAP) were completed during the reporting year. The AMP4 investigations relating to sustainability reductions were all completed in AMP4, as reported in JR10 Table 10b. The majority of the AMP5 investigations have been completed and indicative results were used in the draft WRMP14. Additional options appraisals for Pann Mill and Waddon are being undertaken following completion of the AMP5 investigations at the request of the Environment Agency.

Distribution Input and Dry year Demand

2012/13 was a year of extremes. Demand restrictions associated with the drought combined with extreme rainfall resulted in abnormally low demand during the summer. The year also included significant exceptional events such as the Olympic and Paralympic games with the vast majority of the Olympic estate in the Thames Water supply area, and up to an estimated 800,000 visitors per day travelling to venues.

Our normal process for assessing the “dry year” demand for 2012/13 would be to uplift actual measured demand to account for the differences in weather between this year and a “dry year”. However, given the extreme events of 2012/13 it is considered to be more reliable to instead use the dry year demand that was forecast for 2012/13 in the dWRMP14.

Water Balance

Despite the unusual circumstances during the year, the components of the water balance this year are generally similar to last. The most significant changes are:

- a reduction in distribution input of 25 Ml/d,
- a reduction in unmeasured household demand of 26 Ml/d
- a reduction in measured non-household demand of 10 Ml/d
- an increase in leakage of 8 Ml/d, and
- an increase in measured household demand of 6 Ml/d.

At Company level the overall water balance discrepancy has widened a little since last year, increasing from 2.9% to 3.6%.

Population numbers this year have been updated to reflect the 2011 Census data.

The Water Resource Zone water balance discrepancies (in Ml/d) are shown in the table below:

Water Balance Reconciliation Values 2012/13 (Ml/d)								
Water Balance Component	**Confidence Interval (%)**	**Guildford**	**Henley**	**Kennet Valley**	**London**	**SWA**	**SWOX**	**TWUL**
Distribution Input	2	-0.71	-0.09	-0.27	-15.33	0.03	-2.85	-19.12
Unmeasured Household Volume	8	0.80	0.09	0.36	25.16	-0.05	2.94	29.55
Unmeasured Non-Household Volume	25	0.03	0.00	0.01	1.57	0.00	0.10	1.68
Measured Household Volume	4	0.24	0.05	0.11	3.33	-0.01	1.30	4.97
Measured Non-Household Volume	4	0.25	0.03	0.11	5.44	-0.01	1.28	6.96
Water taken unbilled	50	0.19	0.02	0.08	3.88	-0.01	0.93	5.02
Distribution System Operational use	50	0.04	0.00	0.01	0.75	0.00	0.12	0.93
Leakage	10	1.03	0.12	0.34	18.88	-0.05	3.15	23.50
Discrepancy		3.29	0.42	1.29	74.33	-0.16	12.68	91.74
% Discrepancy		**7.32**	**3.33**	**1.33**	**3.71**	**-0.13**	**4.91**	**3.60**

With the exception of Guildford all Water Resource Zone water balances are within 5%.

Metering

Our on-going communication strategy with customers through our website and via the billing process has generated an optant rate broadly in line with expectations with 29,083 optant meters being installed during 2012/13 against a forecast of 28,000.

No progressive (previously described as selective) meters have been installed during 2012/13. The commencement of the programme has been deferred until 2013/14 while we refine our roll-out strategy. This includes communications planning, literature design, and charging methodology so that we manage customer impacts and enable a smooth transition from unmeasured to measured billing for customers.

Leakage

At Company level, leakage for 2012/13 is 645.5 Ml/d. This means we have met the leakage target set by Ofwat for a seventh consecutive year and brings total leakage reductions achieved since the peak in 2003/04 to over 300 Ml/d.

The slight increase in leakage this year compared to last is due to both the additional street works restrictions imposed leading up to and during the Olympic and Paralympic games, which significantly impacted our ability to undertake leakage repairs during that period, and the colder winter this year which has seen temperatures remain low right up to the end of March.

Leakage was well below the Ofwat target of 674 Ml/d.

Water Efficiency

In total we have delivered 6.45 Ml/d of water savings in 2012/13, exceeding our annual target by over 2.0 Ml/d.

Under our baseline water efficiency programme we delivered 5.46 Ml/d of reportable savings in 2012/13, exceeding our baseline annual target of 3.45 Ml/d. This has been achieved through a mix of activities including targeted non-household activities, the distribution of water saving devices to household and non-household customers and through influencing behaviour by the provision of advice and guidance to customers.

We have also delivered 0.99 Ml/d of reportable savings in 2012/13 against our Sustainable Economic Level of Water Efficiency (SELWE) annual target of 0.97 Ml/d, through a number of projects involving household and non-household customers and behaviour change activities.

Update on impacts of climate change

Further work has been undertaken to evaluate the impacts of the UKCP09 climate change scenarios on both resource side and demand side components. This includes developing models to estimate the likely impacts of climate change upon household demand. Full details are provided in our dWRMP14.

1.2 Changes in the Resource Zones

There have been no changes to the geographical boundaries of any of the Water Resource Zones (WRZs) between AR12 and AR13.

1.3 Changes to Levels of Service

There have been no changes to any levels of service between AR12 and AR13.

2. Supply

2.1 Deployable Output

2.1.1 Water Resource Schemes and Network Constraint Removals

Table 1: AMP5 Resource Schemes Progress

Resource Schemes (Ml/d)		2010/11	2011/12	2012/13	2013/14	2014/15	AMP5 Total
Annual Average	Target	5.80	4.27	7.10		5.40	23
	Actual/*Forecast*	10.10	2.90	3.00	1.50	*2.40*	*20*
Critical Period	Target	5.80	4.27	12.10		5.80	28
	Actual/*Forecast*	17.00	2.68	4.27	1.60	*2.30*	*28*

Table 1 presents a summary of progress against targets for the delivery of our water resources development programme and network constraint removal for AMP5. All schemes are being delivered within the SWOX WRZ, which was driven by the deficit between supply and demand during the peak week condition.

The under delivery against annual average benefit is being offset by out-performance on leakage reduction in London. This decision was considered appropriate as the SWOX WRZ is comfortably in surplus, whereas the reintroduction of climate change would mean a substantial deficit in London at the start of the next planning period.

Table 2 sets out the latest progress of delivery of each scheme against the original programme. The supply demand deficit in SWOX was removed by the enhanced delivery of Gatehampton in 2010/11 and a review of the need for all schemes has identified an opportunity to defer delivery of Leckhampstead until 2013/14, reduce the benefit delivered by Woods Farm and defer South Stoke pending the results of further review.

Table 2: AMP5 Water Resource Schemes Schedule

X Delayed forecast of WAFU benefit X Current forecast of WAFU benefit

	Option	Scheme name	rdWRMP Ml/d		Forecast Ml/d		WAFU Claim Timing					Current Forecast Delivery
			AA	CP	AA	CP	10/11	11/12	12/13	13/14	14/15	
SWOX	Goring Gap 1	Gatehampton/Compton licence transfer	4.5	4.5	9.5	16.0	X					complete
SWOX	SWOX NC1	Britwell WTW DO constraint relief	1.0	1.0	0.6	1.0	X					complete
SWOX	SWOX NC2	Chinnor network constraint relief	0.3	0.3	0.7	0.3		X				complete
SWOX	Lambourn Down	Ashdown Park WTW pump upgrade	0.94	0.94	0.94	0.94		X				complete
SWOX						0.67			X			complete
SWOX	SWOX NC3	Leckhampstead WTW high lift pump replacement	2.0	2.0	1.5	1.6				X		2013/14
SWOX	SWOX NC4	Ramsbury WTW connection to Aldbourne network	1.0	1.03	0.6	1.14		X				complete
SWOX	SWOX NC5	Watlington WTW Option 2	0.3	0.3	0.7	0.3		X				complete
SWOX	Goring Gap 3	South Stoke Replacement resource	5.0	10.0	0.0	0.0						deferred
SWOX	SWOX NC6	Manor Road WTW nitrate removal	2.1	2.1	3.0	3.6			X			complete
SWOX	Goring Gap 2	Woods Farm licence uprate & transfer/treatment to Compton	5.4	5.8	2.4	2.3					X	2014/15
	Annual Average Ml/d						10.1	2.9	3.0	1.5	2.4	
	Critical Period Ml/d						17.0	2.7	4.3	1.6	2.3	

Goring Gap 1 – Gatehampton groundwater

This scheme delivered 9.5 Ml/d annual average (AA) and 16 Ml/d critical period (CP), against the original target of 4.5 Ml/d (AA and CP) in 2010/11.

SWOX NC1 – Britwell network constraint

This network constraint removal scheme delivered 0.6 Ml/d AA and 1.0 Ml/d CP benefit in 2010/11. The scheme was split into two phases to enable the benefits of the work to be delivered by end of 2010/11.

Phase 1 – Uprating of booster pumps with manual operation of the network to allow delivery of maximum licensed borehole output of 1.309 Ml/d, and

Phase 2 – network improvements with automatic operation of network.

Phase 1 was achieved by March 2011 and the site is available to meet the full licence as the network constraint has been removed.

Phase 2 still requires extensive flushing due to deterioration of the water quality to bring the site online. Operations have decided not to continue with this course of action as the resource is not currently required. The site is not therefore in supply and this is not likely to happen during the rest of AMP5 unless we have a drought and need the resource. Flushing will be easier when the proposed run to waste main is installed in AMP6.

SWOX NC2 – Chinnor network constraint

This scheme removed the existing constraint on the site to enable full utilisation of the licence. It was originally forecast to deliver 0.7 Ml/d AA and 0.3 Ml/d CP by 31 March 2011, the higher AA benefit being demand related. The scheme was reprogrammed and delivered by the end of June 2011.

Lambourne Down - Ashdown Park WTW pump upgrade
This scheme delivered 0.94 Ml/d (AA and CP) by the end of March 2011/12 and delivered a further 0.67 Ml/d CP by June 2012 on the installation of the second pump.

SWOX NC3 - Leckhampstead WTW high lift pump replacement
The enhanced delivery of Gatehampton in 2010/11 has enabled this scheme to be deferred until 2013/14. This network constraint removal scheme is forecast to deliver 1.5 Ml/d AA and 1.6 Ml/d CP by the end of March 2014.

This is a complex scheme, with major works at the WTW and in the network. There are two options which both require replacement booster pumps and borehole pumps, cross connection of mains at Stanmore Reservoir and control valves within East Ilsley. This would achieve the reduction of the peak constraint by 1.4 Ml/d, and remove the average constraint. However, to remove the full 2.0 Ml/d peak constraint requires an additional balancing tank, and mains reinforcement. Owing to the greater output delivered from Gatehampton, it has been possible to deliver an additional 0.4 Ml/d of peak output at Gatehampton, thus only requiring an increase of 1.6 Ml/d at Leckhampstead.

The contract has now been let and work is underway on the detailed design.

SWOX NC4 - Ramsbury WTW connection to Aldbourne network
This network constraint removal scheme to release available water at Ramsbury delivering 0.6 M/d AA and 1.14 Ml/d CP benefit was completed in 2011/12.

SWOX NC5 - Watlington WTW Option 2
This network constraint removal scheme delivered 0.7 Ml/d AA and 0.3 Ml/d CP in 2011/12. The higher AA than CP constraint is demand related.

SWOX NC6 - Manor Road WTW nitrate removal
This network constraint removal scheme delivered the full licence of 3.0 Ml/d AA and 3.6 Ml/d CP in September 2012. This scheme has reinstated the original output that was removed from DO in 2009/10 due to the long term outage associated with nitrate. The work was done as part of the Water Quality submission.

The increased outputs are because the works were taken out of supply so delivered the full output and not just removal of network constraints. In the AR13 updates Manor Road has a DO of 2.7 Ml/d AA & CP.

Goring Gap 3 - South Stoke replacement resource
This scheme was forecast to deliver 5.0 Ml/d AA and 10.0 Ml/d CP by the end of 2012/13. However, owing to the additional output delivered by the Gatehampton scheme, there is now flexibility in determining the most appropriate combination of scheme outputs for SWOX in AMP5. The South Stoke scheme output has been deferred.

Goring Gap 2 - Woods Farm licence uprate and transfer treatment to Compton
This scheme originally included both increased output and the removal of existing network constraint elements and was forecast to deliver 5.4 Ml/d AA and 5.8 Ml/d CP by the end of 2014/15. Due to the surplus supply demand in SWOX and removal of the quality element by DWI, part of the scheme has been put on hold. The decision has been made to only deliver the network constraint (2.4 Ml/d AA and 2.3 Ml/d CP)

and not the borehole (3.0 Ml/d AA and 3.5 Ml/d CP) part of the scheme. The elements currently being delivered are the transfer mains from Woods Farm to Streatley reservoir, and a new main from Streatley to the GATOX main at Moulsford. The only work that is being undertaken at Woods Farm is the provision of an orthophosphate dosing plant for lead control, as this water could ultimately feed into the Oxford network which is a high risk lead area. The network constraint removal work contract has been let but due to its complexity will not be delivered until the end of 2014/15.

2.1.2 Update of Deployable Output

Table 3 provides a summary of the Dry Year Annual Average (DYAA) DO's for each WRZ for last year and this year. Similarly, Table 4 provides a summary of the Dry Year Critical Period (DYCP) DO's for each WRZ for last year and this year.

Table 3: WRZ Dry Year Annual Average (DYAA) DOs

Supply (Ml/d)	London	SWOX	Kennet Valley	Henley	SWA	Guildford
DYAA DO 2011-12	2146	326.6	141.6	25.7	188.2	65.2
DYAA DO 2012-13	2144	319.5	137.1	25.7	186.3	65.0
DO Difference	-2	-7.1	-4.5	0.0	-1.9	-0.2

Table 4: WRZ Dry Year Annual Average (DYCP) DOs

Supply (Ml/d)	London	SWOX	Kennet Valley	Henley	SWA	Guildford
DYCP DO 2011-12	N/A	381.9	165.8	26.3	220.3	75.7
DYCP DO 2012-13	N/A	373.9	160.1	26.3	215.1	71.2
DO Difference	N/A	-8.0	-5.7	0.0	-5.2	-4.5

In line with the EA Water Resources Planning guidelines we have reassessed the groundwater source DOs to take account of the 2011/12 drought and also hindcasting, assessing hydrological conditions back to 1920.

The hindcasting has been carried out by identifying groundwater levels at key observation boreholes that reflect critical historic droughts outside the period of operational abstraction records. By identifying these historic droughts it is then possible to define hydrogeologically consistent groundwater SDOs; that is, the same drought year defines the SDO for sources located in the same and similar groundwater catchments.

The historic groundwater levels used to identify critical historic droughts have been derived using a mix of approaches, including the following:

- Long term, measured groundwater level records, some of which extend to the 1900
- Long term groundwater level records modelled hydrologically using analytical models extending back to at least 1910
- Groundwater level records modelled statistically to infill data gaps and to provide long term records.

This reassessment of the SDOs accounts for the majority of the reductions seen in the Deployable Outputs, with the largest being in the SWOX WRZ.

Further details of the updates to the Company's Deployable Output can be found in Appendix 3.

Upgrade of WARMs

We use a simulation model entitled WARMS (Water Resources Management System) to calculate the amount of water available for supply. Over the past 2 years we have been progressing work to upgrade WARMS and to develop a new model in AQUATOR, called WARMS2. The benefits of the new model will be to give much greater transparency of modelling assumptions and enable much easier audit of the overall DO assessment by third parties. We have briefed the EA and other interested stakeholders on this work as it progresses. Subject to its successful implementation, we intend to use WARMS2 for AR14

2.1.3 Review of the Lower Thames Abstraction Licence

The Water Framework Directive (WFD) compels European Union member states to achieve good ecological and environmental health in all water bodies. It is expected that part of the required set of actions to achieve good ecological status will be to reduce abstraction in over abstracted catchments to sustainable levels.

The implementation of the WFD will require future sustainability reductions in abstraction from the Thames catchment and the wider South-East. This need is recognised in published documents and the "Restoring Sustainable Abstraction" programme from the Environment Agency (EA).

Thames Water has been working with the EA to understand the impact of abstraction under licence from the lower Thames.

The approach to the investigations to understand the impact of abstractions from the Lower Thames was agreed with the EA. The investigation has been completed and an options appraisal has been initiated.

The conclusions of the investigation were that there was no overriding significant adverse impact of abstraction that would lead to a requirement for major sustainability reductions. However an options appraisal would be required to determine the best, most cost-effective, options to mitigate the impact that had been identified. This is nearly complete and the potential for there to be some reduction in abstraction remains. The options appraisal will be completed and agreed with the Environment Agency in summer 2013.

2.2 Outage

2.2.1 Comparison of Actual Outage against Planned Outage

Whilst there are changes in Outages year on year, the total Actual Outage for the Thames Water area is 144.5 Ml/d, which is an increase from last years and the highest recorded, predominately due to Outages in London. This information has been used to improve the assessment of Outage Allowance. Details of actual and planned Thames Water Outages for each WRZ can be found in Appendix 4.

2.2.2 Outage Allowance

Table 5: AMP5 Outage Allowance

Outage Allowance (Ml/d)	2010/11	2011/12	2012/13	2013/14	2014/15
Target (fWRMP09)	31.55	31.55	31.55	31.55	31.55
Actual/*Forecast*	64.15	66.67	77.39	-	-

The outage assessment follows the principles set out in the UKWIR report "Outage allowances for water resources planning (UKWIR, 1995)" but also incorporates the improved probabilistic methodology that employs Monte Carlo techniques.

The outage allowance has been updated for AR13 to incorporate the latest experiences of actual outage and for most WRZs reflect increases over that used in the fWRMP09 and AR12. Details are provided in Appendix 4.

Table 6: Outage allowance by WRZ as reported in AR12, AR13 and fWRMP09 and dWRMP14 2012/13 forecasts

Outage Allowance (Ml/d)				
WRZ	2011/12	2012/13		
	AR12	AR13	fWRMP09	dWRMP14
Guildford	0.78	0.81	0.38	0.78
Henley	1.08	1.05	1.05	1.08
Kennet Valley	1.77	1.85	1.68	1.77
London	36.04	46.27	14.76	36.04
SWA	11.97	12.53	3.06	11.97
SWOX	15.04	14.88	10.62	15.04

2.3 Bulk Supplies

2.3.1 Changes in Agreements

There have been no changes to bulk supply agreements during 2012/13 except those associated with Inset Appointments.

2.3.2 Inset Appointments

There are currently 15 appointed inset sites in TWUL's region. At the time of writing there are two inset providers in operation within Thames Water's region:

- SSE Water (11 inset sites)
- Independent Water Networks Limited (4 inset sites)

Once fully developed, there will be approximately 16,600 properties located within the inset sites, with a contracted total maximum demand of 9.66 Ml/d. Many are still

in construction phases and as a result the total billed volume for 2012/13 was only 0.84 Ml/d.

A summary table of all existing Inset Appointments is provided in Appendix 5.

2.4 Sustainability Reductions

Outstanding issues with the remaining AMP3 schemes under the non-statutory Restoration of Sustainable Abstraction Programme (RSAP) have been completed during the reporting year. The AMP4 investigations are all complete, as reported in JR10 Table 10b. The majority of the AMP5 schemes have been completed and indicative results were used in the draft WRMP14. Additional options appraisals for Pann Mill and Waddon are being undertaken following completion of the AMP5 investigations at the request of the Environment Agency.

A detailed update of progress on the delivery of AMP3, AMP4 and AMP5 sustainability reductions can be found in Appendix 6

3. Demand

3.1 Distribution Input and Dry Year Demand against Forecast

Table 7: AMP5 Dry Year Distribution Input

Dry Year Distribution Input (Ml/d)		2010/11	2011/12	2012/13	2013/14	2014/15
Annual Average	Target (fWRMP09)	2537	2523	2504	2485	2467
	FD Target	2546	2549	2555	2561	2568
	Actual/*Forecast*	2595	2579	2581	*2584*	*2587*
Critical Period	Target (fWRMP09)	2711	2697	2678	2659	2640
	FD Target	2721	2724	2730	2736	2744
	Actual/*Forecast*	2748	2707	2709	*2713*	*2717*

2012/13 was a year of extremes. Demand restrictions associated with drought combined with extreme rainfall result in abnormally low demand during the summer. The year also included significant exceptional events such as the Olympics. Given these conditions, the normal procedure for estimating dry/normal years will not be applied this year. Instead the dry year demand that was forecast for 2012/13 in the dWRMP14 has been used as a base for planning.

At the start of 2012/13 the Thames region was in drought. The preceding two years were the driest since records began, with below average rainfall for 20 of the previous 25 months. Rainfall for December 2011 was slightly above average; however, January, February and March were very dry with just 63%, 38.5% and 43% of average rainfall respectively. Groundwater levels in some parts of our region were unprecedentedly low. These conditions were not peculiar to Thames Water, and drove a number of water companies in the south of England to implement Temporary Use Bans (TUB) on the 5th April 2012. The TUBs were accompanied by widespread media on the water resource situation and a significant water efficiency programme.

Almost immediately after the TUBs were put in place, it began to rain. April saw over 200% of long-term average rainfall. There was a short (two week) dry spell in late May, but the rain returned. By early June the water resource situation had recovered sufficiently for the TUBs to be lifted (on the 14th June). The abnormally wet conditions continued for most of the rest of the year, never falling significantly below average and often being significantly above average.

As a result of the restrictions and weather, demand in 2012/13 was extremely low. Any summer peaks were both small and very short lived. The peak-week in most water resource zones occurred around the 30th May with only Henley and SWA peaking marginally higher at the end of July.

Figure 1 and Figure 2 show the 7-day rolling average Distribution Input DI for London and Thames Valley respectively.

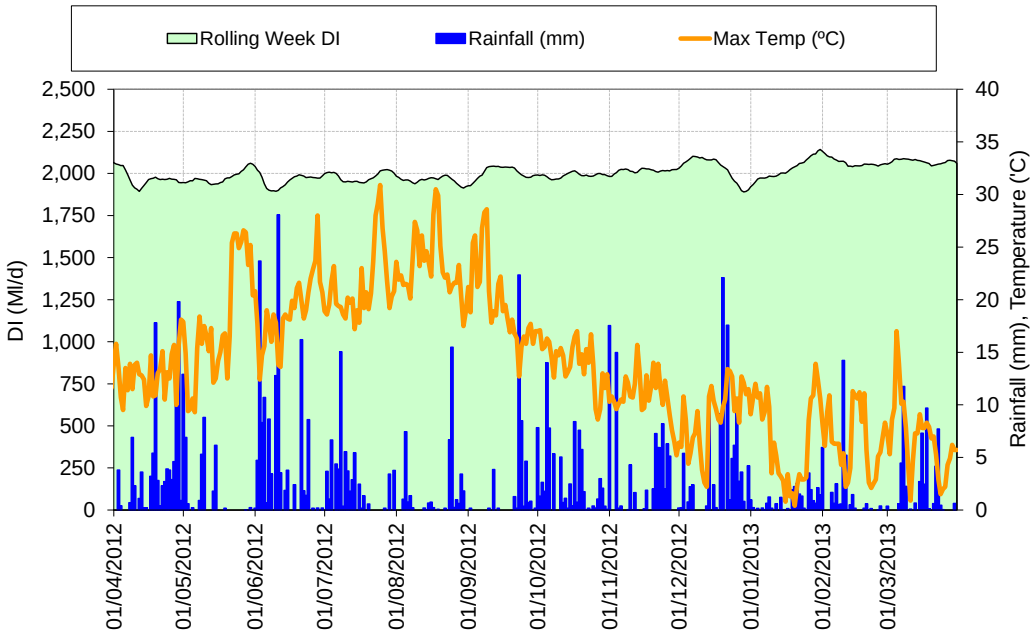


Figure 1: London 7-day rolling average demand 2012/13

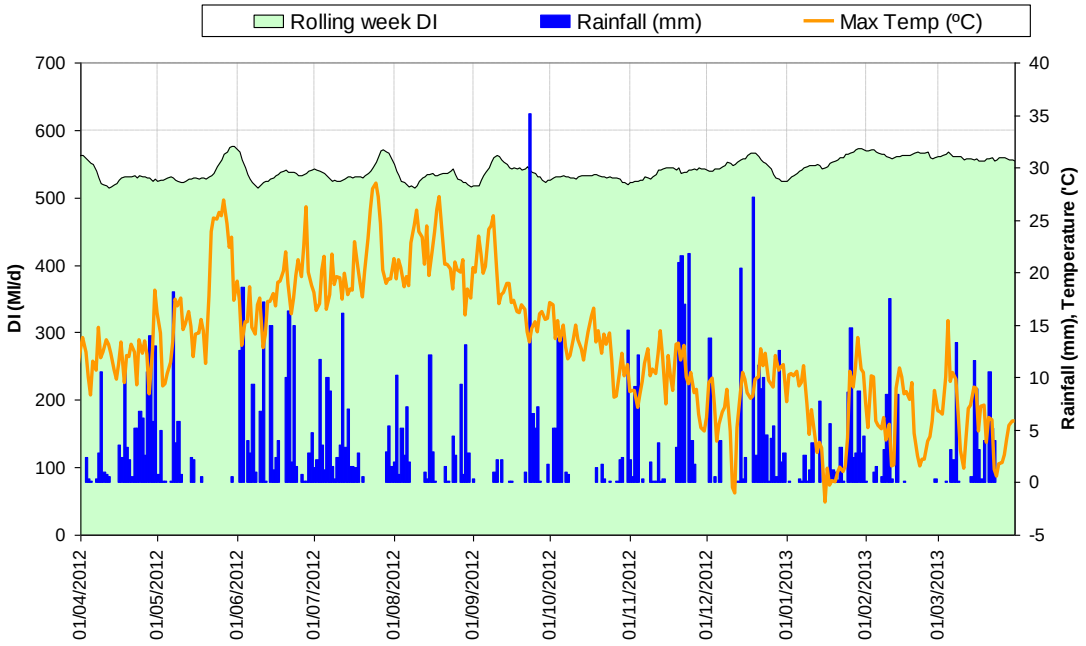


Figure 2: Thames Valley 7-day rolling average demand 2012/13

Table 8 presents the actual distribution input for each of the last three years for the company.

Table 8: AMP5 Measured Distribution Input

Measured Distribution Input (Ml/d)	2010/11	2011/12	2012/13
Annual Average	2589	2551	2526
Critical Period	2695	2616	2571

As described above, given the exceptional nature of 2012/13, and the uncertainties this would introduce into the estimated dry year demand, it was considered more reliable to use the dry year demands for 2012/13 from the draft WRMP14. For reference purposes only, the normal process for estimating dry/normal year demands has been followed as described in Appendices 7 and 8. Appendix 7 considers demand in 2012/13 as unconstrained (given that the restrictions were only in place for 70 days, during which it mostly rained). In Appendix 8, 2012/13 is treated as a constrained year and our standard approach to estimating dry years from constrained years is applied.

Table 9 presents the dry year demands (both annual average and critical period) for each WRZ as reported in AR13, AR12 and in the fWRMP09 for 2012/13.

Table 9: Dry Year Distribution Input by WRZ

Dry Year Distribution Input (Ml/d)								
WRZ	2011/12		2012/13					
	AR12		AR13		fWRMP09		dWRMP14	
	AA	CP	AA	CP	AA	CP	AA	CP
Guildford	44.8	61.6	44.7	61.3	40.8	61.7	44.7	61.3
Henley	13.0	19.0	13.0	19.1	13.1	18.9	13.0	19.1
Kennet Valley	100.1	118.7	100.1	118.8	102.1	133.0	100.1	118.8
London	2022.5	2022.5	2025.2	2025.2	1954.2	1954.2	2025.2	2025.2
SWA	134.3	166.1	134.5	166.5	125.8	164.4	134.5	166.5
SWOX	263.8	319.1	263.2	318.2	268.5	345.6	263.2	318.2
Total	2578.6	2707.1	2580.8	2709.0	2504.4	2677.8	2580.8	2709.0

3.2 Per Capita Consumption

Table 10: Company level PCC against plan

Per Capita Consumption (l/head/day)		2010/11	2011/12	2012/13	2013/14	2014/15
Unmeasured	Target	163.87	163.55	163.24	162.98	162.76
	Actual/*Forecast*	170.40	169.14	164.10	*170.21*	*170.11*
Measured	Target	149.28	148.35	147.58	146.93	146.27
	Actual/*Forecast*	141.46	138.57	131.88	*137.88*	*137.78*

Table 10 presents the annual average Per Capita Consumption (PCC) for the Company. The target is taken from the fWRMP09 and reflects “dry year” demand. Actual is the actual PCC for the report year, and will therefore be dependent on the weather conditions within the report year. Table 11 shows similar information broken down into WRZs for this year and last.

Table 11: Per Capita Consumption by WRZ

Per Capita Consumption (l/head/day)						
WRZ	2011/12		2012/13		2012/13	
	AR12		AR13		fWRMP09	
	Measured	Unmeasured	Measured	Unmeasured	Measured	Unmeasured
Guildford	143.44	164.89	134.57	155.34	158.56	182.50
Henley	141.39	152.88	138.06	149.31	150.14	163.51
Kennet Valley	130.61	154.49	125.77	146.96	140.22	159.41
London	141.50	171.84	134.84	167.06	149.19	162.54
SWA	142.56	160.34	131.89	154.14	143.63	159.51
SWOX	129.30	154.83	123.21	149.02	143.52	171.76

Further details of the derivation of unmeasured household PCC for each resource zone can be found in Appendix 9 .

3.3 Metering

Table 12 presents the total number of meters installed during 2012/13 and forecasted progress against targets for the rest of AMP5.

Table 12: Company Optant and Progressive meter installations

Metering		2010/11	2011/12	2012/13	2013/14	2014/15	AMP5 Total
Optant Metering	Target	29,000	29,000	28,000	27,000	26,000	139,000
	Actual/*Forecast*	23,700	36,817	29,083	*29,000*	*29,000*	*142,600*
Progressive Metering	Target	36,038	36,038	4,528	4,528	4,528	85,660
	Actual/*Forecast*	0	0	0	*tbc*	*tbc*	*tbc*
TOTAL	Target	65,038	65,038	32,528	31,528	30,528	224,660
	Actual/*Forecast*	23,700	36,817	29,083	*tbc*	*tbc*	*tbc*

The proportion of Billed Households which are metered is now 31.8% for the company. This compares to a figure of 30.3% for 2011/12.

3.3.1 Optant metering

Our on-going communication strategy with customers through our website and via the billing process has generated an optant rate broadly in line with expectations. 29,083 Optant meters have been installed during 2012/13 which is marginally over our stated target of 28,000.

3.3.2 Progressive (previously described as Selective) Metering

Our metering strategy is consistent with previous returns in that our preferred method of charging for water is to charge customers via a metered tariff, as it has the most potential to encourage behavioural change toward more efficient use of water, will identify customer side leakage earlier and assist in validating consumption and leakage data.

No progressive meters have been installed during 2012/13. The commencement of the programme has been deferred until 2013/14 whilst we refine our roll-out strategy including communications planning, literature design, and charging methodology in order to manage customer impacts and to enable a smooth transition from unmeasured to measured billing for customers.

Recognising the potential affordability issues associated with the extension of household metering a number of measures will be implemented with specific regard to progressive metering as follows:

- Implementation of a deferred tariff which will allow customers a maximum of two years from date of meter installation before transferring from an unmeasured to measured account. During this period they will be provided with comparative bills that clearly show the difference between their previous unmeasured rate account and impact their actual consumption is having on their bill if they were to pay as a measured customer. Customers can opt to switch at any time during the two year period.

- Deferring metering in areas with a high density of lower-income households until later in the metering programme – given concerns about potential bill increases for lower income households due to being moved from rateable value charging to metered charging. Individual customers will still be able to opt for a meter as normal.

- An enhanced water efficiency offering, with plumber assistance, for lower income households receiving a meter - to ensure lower income customers can save water and save money, including the energy costs associated with reduced hot water usage.

- A revised customer side leakage policy that will see Thames Water offering free repairs, and where appropriate free relays, to customers where meters are installed.

Existing support offered to disadvantaged or vulnerable customers continues as follows:

- WaterSure tariff – where bills are capped at the level of the average bill, for metered customers that have a need to use higher than normal volumes of water, due either to suffering from certain medical conditions or having three or more children under the age of 19, providing that they also qualify for certain means-tested benefits.

- Water Direct and Payment Plans – to make budgeting easier for lower-income customers Thames Water offers a variety of payment plans and also can arrange for payments to come directly from benefits.

- Thames Water Trust Fund – a charitable trust has been established and began operating in February 2009 with the aim of helping disadvantaged customers that are not able to pay their water and sewerage charges. The application process also helps disadvantaged customers through carrying out benefits entitlement checks.

We have also been liaising with neighbouring companies to ensure that confusion is minimised for customers who receive waste water and clean water services from different water companies. We have worked extensively with both Southern Water and South East Water to ensure that customers in these areas, both with universal metering programmes of their own, receive a clear and consistent charging message that promotes water conservation.

We anticipate commencing progressive metering in London during the latter part of 2013.

The metering programme from FD09 was focused on cost effective meter installations fitted in existing boundary boxes, installed as part of the Victorian Mains Replacement (VMR) and District Mains Replacement programmes. Customers would be scattered across the region and consistency of messaging across our customer base would have been difficult and programme efficiency low. We defined six governing control criteria to develop the rollout programme.

These are:

1. Maximise customer satisfaction;
2. Maximise stakeholder engagement and align our proposals with existing projects/ plans;
3. Maximise benefit delivery – deliver supply-demand benefits in most water-stressed areas;
4. Scalability - ensure the plans for AMP5 are suitable for the larger rollout in AMP6+;
5. Affordability and cost performance - to be cost effective and align with other workstreams where possible;
6. Protect and enhance company reputation.

We will discuss our strategy with Ofwat, CCWater and other interested stakeholders when our plans are firmed.

3.3.3 Fixed Network Technology Trials

We are undertaking trials of two “Smart” meter technology options across some 6000 properties allowing access to near “real-time” metering data. The trials are being undertaken in 5 District Meter Areas (DMAs), 2 in London (trialling SMS/Short Range Radio technology), 2 in Reading (trialling Long Range Radio) and 1 in Swindon (SMS/Short Range Radio). The trials are not for billing purposes but to test data acquisition and accuracy.

Both systems provide 15 minute data in near “real-time” which has allowed test analysis of the data to identify leakage on the customer’s supply pipe and wastage within properties. Initial investigations indicate that the supply pipe leakage accounts for around twice the volume of water as wastage but that wastage is in the order of twice as frequent.

The data has been used to undertake mass balances of flows into and out-of the DMA and has identified the percentage coverage required to ensure a robust water balance can be achieved.

Particular issues have been encountered with the installation of signal boosters, predominately due to planning restrictions.

The trials are still on-going and the results, which have been encouraging to date, will assist in developing our investment strategy for AMP6 in both metering itself and supply demand related activity.

3.4 Leakage

3.4.1 Progress on Leakage

Table 13: AMP5 Leakage progress

Leakage (Ml/d)	2010/11	2011/12	2012/13	2013/14	2014/15
Leakage target (FD)	674	673	673	673	673
Actual/*Forecast*	665	637	646	*665*	*665*

Leakage for 2012/13 is 645.5 Ml/d. This means we have met the leakage target set by Ofwat in their Final Determination for a seventh consecutive year and brings total leakage reductions achieved since the peak in 2003/04 to over 300 Ml/d.

The slight increase in leakage this year compared to last is due to both the additional street works restrictions imposed leading up to and during the Olympic and Paralympic games, which significantly impacted our ability to undertake leakage repairs during that period, and the colder winter this year which has seen temperatures remain low right up to the end of March.

The Final Determination (FD) only provided for partial funding of our WRMP leakage programme. It did not allow for a leakage reduction programme but instead included funding to manage recurrence and hold leakage constant through a combination of mains replacement and find and fix activity. This was because the need to reduce leakage was driven by mitigation of the forecast impacts of climate change and no climate change related investment was funded by Ofwat pending the outcome of analysis of the new UKCP09 scenarios.

Despite the sizable mains replacement programme delivered during AMP4, very high levels of leakage control activity, principally find and fix, are still required to offset some 500 Ml/d of leakage recurrence with a significant proportion of our distribution network still in relatively poor condition.

Given that the funding for leakage control and the associated leakage targets were different in the FD to the planned programme of work in our WRMP, a review of the work programme was required at the start of the AMP period to ensure efficient expenditure of the revised investment. As a result of our planned leakage reduction programme not being funded in the FD many of the original leakage reduction options identified in our original plan remained available for management of leakage recurrence. The tight funding limits meant that it was essential to select the most cost effective options for leakage control if they were available. The capital expenditure activity delivered in 2012/13 has been a mixture of full DMA level mains replacement, partial cohort level distribution mains replacement, new pressure management and trunk mains repairs. This is supported with on-going high levels of find and fix activity.

As part of the development of our draft WRMP14 we have reviewed our supply demand position for 2012/13 onwards and correspondingly revised our baseline leakage targets for the period up to 2014/15. As a result we have set ourselves the leakage target of 665 Ml/d for the next two years. This target reflects an upper bound which we would not expect to exceed unless we experienced a severe winter.

3.4.2 Summary of key leakage control activities during 2012/13

The activities that the Company is currently undertaking to manage leakage are:

- Replacing old mains with new (mains replacement);
- Finding and then fixing leaking parts of the distribution and trunk mains network (find & fix);
- Identifying leaks on our customers supply pipes and then offering subsidies and help to get these leaks fixed;
- Relining trunk mains and installing advanced early warning systems to identify leaks before they become bursts;
- Reducing excessive water pressure within the mains to reduce rate of leakage (pressure reduction) and installing schemes to better manage fluctuations in pressure through advanced pressure and pump control.

We currently have two streams of mains replacement. The first is our Victorian Mains Replacement (VMR) programme, where complete DMAs are targeted principally for leakage reduction and stringent residual leakage targets are set for the area after the work has been completed to ensure all leakage within the area is identified and removed. This includes targeting customer side leakage through installing meters on all outlets from our network. This activity is targeted across our company but the process to date has only selected DMAs in London and Reading where the most cost effective savings can be made. The second stream is our Distribution Mains Replacement (DMR). The DMR programme replaces pipes in individual streets and is targeted at mains that have particularly high burst rates but which fall outside DMAs within our VMR programme. The DMR programme is not just limited to London but is used to target mains replacement in all our water resource zones.

We have also undertaken a review of our mains replacement programme as agreed at the 2010 Public Inquiry into WRMP09. The project was jointly sponsored by Ofwat and Thames Water. The outputs from this project are now being used to shape our approach to mains replacement with trials using innovative approaches to targeting of mains replacement underway.

Weekly leakage meetings continue to be held with managers from across the business. These meetings are used to identify, prioritise and drive through actions with the objective of ensuring that the end of year leakage target is met.

Prior to the start of the year we developed detailed plans for 2012/13 to ensure we did not jeopardise our leakage target whilst adhering to the very considerable restrictions that were imposed on us working up to and during the period of the Olympic and Paralympic games. This plan included additional activity prior to and following the restriction period to compensate for the reduced activity possible during the period of restrictions. It also included activities such as additional valve maintenance and installation of additional monitors on the mains network system to ensure we were in the best possible position should a significant burst occur during the games.

We also looked at the extra activities that could be undertaken in response to the drought. Initially we started accelerated delivery of new pressure management schemes which we had planned for delivery later 2012/13 and 2013/14 and driving

our repair backlogs down to uneconomic lows. We also revised our customer supply pipe repair policy.

We started this year in a good leakage position due to the relatively mild winter of 2011/12 and the warm spring. We then successfully followed our leakage delivery plan through the period of the Olympic and Paralympic games, with leakage control activities being delivered close to plan, ensuring the good leakage performance was maintained throughout the first six months of the year. As drought status was removed in the early part of the year we did not complete the implementation of our drought plan, but rather reverted back to our original leakage delivery plan.

Like in previous years, from 1st November we implemented our Winter Contingency Plan. The Winter Contingency Plan outlines activities and responsibilities for named individuals for different levels of winter event severity. The Winter Contingency Plan covers:

- pre winter planning, i.e. actions that need to be taken to prepare for the winter;
- activities to be undertaken in the "normal" winter, and includes the use of a model to forecast burst numbers up to 10 days ahead based on prevailing and forecasted weather;
- activities to be undertaken in severe weather, such as pulling resources from other parts of the business.

The plan outlines the additional activities that need to be undertaken by each department throughout the business, from those responsible for actually planning and undertaking the repair of burst mains to those talking to our customers at the customer centre and those liasing with 3rd parties such as the County Councils and Highway agencies.

Although this winter was not as cold as 2010/11, it was significantly colder than last year, with temperatures remaining low right up to the end of March. As a result leakage has started high in 2013/14, but with temperatures close to average in April we have seen a swift recovery to levels close to normal for the time of year.

On 15 April 2013 we introduced our new Customer Side Leakage policy. Customers will now be offered a free replacement or repair of their leaking water supply pipe, which should eliminate concerns that customers currently have of having to find their own plumber. Customers will have a choice to either accept our offer or arrange a repair themselves at their own cost. Details of our new policy are accessible via our website.

3.4.3 Resource Zone Leakage Levels

Table 14 presents the annual average leakage levels for 2012/13 for each WRZ and Company. It also presents leakage levels for the previous two years and movements between 2011/12 and 2012/13. WRZ leakage levels are taken from our EA Annual Return tables and are therefore derived from WRZ water balances. The Company level leakage is taken from the Company level water balance following the Ofwat Annual Return Table 10 processing rules. There are therefore small differences between the sum of the WRZ leakage levels and the Company total.

This year there have been small increases in the underlying leakage across most WRZs, associated with the colder winter. The specific movements seen in each WRZ are more a reflection of updates to splits of allowances across WRZs than increases in leakage in specific areas. The exception to this is the Guildford WRZ where real leakage increases are apparent.

Table 14: WRZ Leakage Performance

Leakage (Ml/d)	2010/11	2011/12	2012/13	Change
Guildford	11.4	12.5	14.0	1.5
Henley	3.7	3.3	3.5	0.2
Kennet Valley	23.3	21.9	24.6	2.7
London	539.6	512.7	512.3	-0.4
SWA	35.5	35.1	34.6	-0.4
SWOX	54.8	55.6	60.3	4.7
Company (Table 10 consistent)	664.6	637.1	645.5	8.4

London has benefited from the majority of the mains replacement undertaken during 2012/13, and similarly the largest proportion of new pressure management schemes. This year London also benefited from the new Census data which increased the number of people in London, reducing the water balance discrepancy and therefore the MLE adjustment on leakage. It also benefited slightly from an update of the trunk mains leakage estimate, reflecting better understanding of mains inside and outside flow monitoring zones.

SWOX shows the largest increase in reported leakage. The nightflows in SWOX have not increased and the increases in reported leakage are therefore associated with changes in allowances. The most significant movements of these are:

- a reduction in the non-household billed measure volume which in turn results in a reduction in night use which is subtracted from the measured nightflows, and
- an increase in the reported leakage outside flow monitoring zones (FMZs) which is estimated based on the length of mains outside FMZs as reported by our GIS system.

The next largest increase is in Kennet Valley WRZ. This zone includes Reading where we have our worst performing mains outside London. Approximately half the increase in reported leakage is associated with changes in allowances, and half is associated with increases in nightflows.

There has also been an increase in reported leakage for Guildford. In Guildford we have seen an increase in the nightflows, indicating an underlying increase in leakage. Since 2010/11 Guildford has been managed within our Central South London operating area and DMAs in Guildford are prioritised alongside South London DMAs. With the drive on the most efficient delivery of leakage reduction, more effort this year has been focused in London at the expense of Guildford. Because of the surplus between supply and demand in Guildford this does not impact on our water supply levels of service, although our intention is to address this increase in Guildford and return levels to those of 2010/11. In order to deliver this we are in negotiations with the leakage detection contractor to separate out Guildford from the standard leakage detection contract to give Guildford its own specific targets. We are also

using this opportunity to move away from our existing leakage detection contract and trialling a new form of contract which will put more emphasis on leakage levels and less on just finding leaks.

3.5 Water Efficiency

3.5.1 Water Efficiency progress

Table 15: AMP5 Water Efficiency Progress

Water Efficiency (Ml/d)		2010/11	2011/12	2012/13	2013/14	2014/15	AMP5 Total
Baseline	Target	3.45	3.45	3.45	3.45	3.45	17.25
	Actual/*Forecast*	4.01	4.95	5.46	*3.45*	*3.45*	*21.32*
SELWE	Target	0.97	0.97	0.97	0.97	0.97	4.85
	Actual/*Forecast*	1.06	1.12	0.99	*0.97*	*0.97*	*5.11*

Under the baseline water efficiency programme 5.46 Ml/d of reportable savings have been successfully delivered in 2012/13, exceeding our baseline (BSWE) annual target of 3.45 Ml/d. This has been achieved through a mix of activities including targeted non-household activities, the distribution of water saving devices to household and non-household customers and through influencing behaviour by the provision of advice and guidance to customers. A proportion of the overachievement can be attributed to the effect of the Drought, which dramatically increased customer orders for free water efficiency devices and general public awareness of water efficiency.

We have also delivered 0.99 Ml/d of reportable savings in 2012/13 against our Sustainable Economic Level of Water Efficiency (SELWE) annual target of 0.97 Ml/d through a number of projects involving household and non-household customers and behaviour change activities.

Highlights during this regulatory year are presented below:

- We continued to support household and non-household customers in saving water, and have consolidated our understanding of alternative technologies and methods to help customers better understand their own water use.

- We have continued baseline activities; offering customers a range of free water saving products, such as save-a-flushes, aerated tap adapters, showerheads and shower timers, alongside promotion of other water saving products including water butts. Partnership projects, such as the second phase of London's Re:New initiative, have continued to help us promote our water efficiency offering. We experienced a spike in customer orders in February due to non-commissioned internet articles on *Yahoo.co.uk*. We distributed 152,982 products, in 48,520 individual orders during 2012/13.

- We have continued our automatic meter reading (AMR) work with non-household properties (such as schools, universities, supermarkets and offices), and we are currently analysing the data to summarise and understand the findings. These findings will be used as case studies for potential savings and allow us to provide more tailored support to non-household customers in the future.

- The Save Water Swindon project, the UK's first single-town water efficiency campaign, has continued. We have focussed on assisting schools to reduce their consumption by installing AMR technology within school buildings. Contractors have carried out audits and fixes at 12 schools so far, out of 25 schools engaged. The project was shortlisted for the Environment and Energy 'Sustainability Communications Campaign' award.

- London secondary schools project, which is being run in partnership with the Greater London Authority (GLA), Environment Agency, and London Sustainable Schools Forum, targets London secondary schools. This project has continued with the 47 schools recruited to the project in total. Work to develop educational materials and lesson plans has been completed and valuable resources have been produced, which will be made more widely available in the next phase of the project. AMR technology is collecting water consumption data which has been used in educational activities and to inform and enhance water audits. Water efficiency audits have been carried out at 31 schools so far, with savings identified at an average of 11% per school. We have provided and installed water efficiency devices (including urinal controls) where appropriate.

- As part of the Re:New Phase 2 project, which has now been completed, water efficiency devices continued to be installed at customers' homes in selected areas across London. Water efficiency was delivered alongside energy efficiency advice and interventions. We have made a significant contribution to the success of this project, with 52,920 water efficiency products installed in 20,158 domestic properties.

More detail of activities undertaken and water saved during 2012/13 is provided in Appendix 10.

3.5.2 Future Water Efficiency activity

- As part of the Fixed Network trials (section 3.3.3) we are formulating a targeted approach in specific zones. These trials will help determine the best way to promote water efficiency to customers as part of future metering programmes, and provide a baseline measure for water efficiency activities.
- We will be monitoring and analysing data received from AMR devices and presenting the results as case studies to stakeholders and customers. We will then develop improved ways to analyse AMR data and communicate this information to customers.
- In collaboration with our project partners, we are looking at routes for continuing the London Secondary Schools project. We will continue to support education initiatives and resources, whilst supporting water efficiency audits and fixes. We may also extend the remit of the project to include primary schools.
- We will continue our community engagement activities for the Save Water Swindon and Care for the Kennet campaigns in the coming year, with the aim of further engaging communities in water efficiency in these catchment areas.
- Discussions with Girl Guiding South West region are progressing, with the aim of developing a water-related challenge badge to be launched in autumn 2013. Members between the ages of 5 and 25 years will complete challenge activities

and learn about the importance of saving water in order to earn the challenge badge.

- Media activity – Water efficiency installation visits at two customer homes have been recorded for the Martin Lewis Money Show on ITV, to be broadcast in May. This will broaden public awareness of our water efficiency offers, whilst also increasing website traffic and orders for devices.

4. Climate Change

Climate change is expected to lead to variations in patterns and frequencies of droughts, and other extreme weather events. UKCP09 reports that by the 2080's, with medium emissions, "The biggest changes in precipitation in summer, down to about –40% (–65 to –6%), are seen in parts of the far south of England", (UKCP09 Briefing). The updated climate change scenarios launched by UKCIP in June 2009 provide 10,000 equally possible outcomes of future temperature and precipitation (rainfall). The new projections are 'probabilistic' in that they encompass a wide range of possible changes in climate based upon the strength of evidence from observations, climate change models and expert opinion.

As such, UKCP09 provide a large amount of information on how the UK climate may change over the next 100 years in response to different levels of greenhouse gas emissions. To understand the impact of the new scenarios on our assessments of supply and demand, HR Wallingford (HRW) was engaged to develop a methodology to make the most use of the UKCP09 output data as practically possible. Further details can be found in our draft WRMP14.

However, in line with the direction from Ofwat in FD09, the impacts of climate change are not included in the supply demand balance for current reporting.

4.1 Impact on Deployable Output

Prior to the publication of the revised WRPG we had undertaken analysis of our groundwater sources based on the UKCP09 data for the 2020s. Five scenarios from the 20 were selected to assess the groundwater system sensitivity to each of the potential futures. The scenarios were selected, based on their percentiles, to focus on drier potential futures, but also to consider wetter scenarios. The percentiles used were 99, 95, 90, 50 & 10. The rainfall and temperature climate change factors for each of the five scenarios were used to generate recharge scenarios for input to Thames Water regional groundwater models within the Thames Valley. These models were then used to undertake hydrogeological analysis of the climate change impacts on the aquifers.

The groundwater level changes derived from this analysis were then used to assess the impact on groundwater Source Deployable Outputs (SDOs). The SDOs for the remainder of the twenty climate change scenarios were derived by interpolation; this used a linear relationship between SDO and Aridity Index (AI) defined for successive pairs of the five discretely defined SDO's. These data have been used in our assessment of climate change impacts in the dWRMP. Following the publication of the WRPG, work is in progress to re-assess the groundwater SDOs by looking at hindcast data as per the guidelines and evaluating the impact of the 2030 projections on these data. The results of this work will be included in the final plan.

The amended groundwater SDOs for the 2020s (as 2030s not completed) together with the rainfall, Potential Evapotranspiration (PET) and flow factors for the 2030s were input to the Water Resources Management System (WARMS) to assess the impact on the DO for London and SWOX of the 20 climate change scenarios. The results of the groundwater analysis also provided the basis for the impact assessments for the other non-conjunctive use WRZs. The flow factors derived from the HRW work for the 2030s is the basis for the impact assessment on the Fobney DO in the Kennet Valley WRZ and Shalford DO in the Guildford WRZ, which are both river abstraction sources.

The methodologies developed have then allowed us to derive uncertainties around these possible outcomes such that a target headroom can be calculated for London and the other WRZs.

Using the sub-sample of 20 climate change scenarios to assess the impact on the London DO gives a range of change by 2035/36 from −488 Ml/d (dry scenario) to +167 Ml/d (wet scenario) with a 'best estimate' of the impact of −82.2 Ml/d. This indicates that the more extreme changes could be highly significant for supply/demand long term planning. The 'best estimate' of the climate change impact has been calculated by modelling a discrete probability distribution function (pdf) using the variation in DO data and probability weightings. The target headroom model applies Monte Carlo techniques to determine the statistics from the discrete distribution and the mean impact value of -82.2 Ml/d has been calculated as the 'best estimate' by 2035.

As set out in the WRPG, the 'best estimate' of the modelled climate projection is applied as a reduction in DO and the uncertainty around this projection is handled in Headroom. The impact of the 'best estimate' scenario for each of the WRZs average DO is shown in Table 16 and for peak DO in Table 17. The target headroom methodology shows climate change to be the most significant uncertainty on the supply side. In London the direct impact on DO is around 13 Ml/d by the end of AMP5 increasing to over 80 Ml/d by the end of the period. When the uncertainty on this is taken into account the impact is around 25 Ml/d increasing to 150 Ml/d by the end of the period.

On our current forecast the impact of climate change is greatest in London.

Table 16: Climate Change Impact on DO – DYAA

WRZ	Reduction in DYAA DO due to Climate Change (Ml/d)					
	2011/12	2015/16	2020/21	2025/26	2030/31	2035/36
Guildford	0	0.01	0.03	0.04	0.06	0.06
Henley	0	0	0	0	0	0
Kennet Valley	0	0.08	0.22	0.36	0.48	0.52
London	0	13	34.6	56.3	75.4	82.2
SWA	0	0.1	0.26	0.42	0.57	0.62
SWOX	0	1.23	3.27	5.31	7.12	7.76

Table 17: Climate Change Impact on DO – ADPW

WRZ	Reduction in Peak DO due to Climate Change (Ml/d)					
	2011/12	2015/16	2020/21	2025/26	2030/31	2035/36
Guildford	0	0.01	0.04	0.06	0.08	0.09
Henley	0	0	0	0	0	0
Kennet Valley	0	0.83	2.21	3.6	4.82	5.26
London	N/A	N/A	N/A	N/A	N/A	N/A
SWA	0	0.15	0.4	0.65	0.87	0.95
SWOX	0	1.46	3.89	6.32	8.47	9.24

4.2 Impact on Demand

HR Wallingford was also commissioned to carry out a study[1] to estimate the likely impacts of climate change upon household demand. No climate change effects are assumed for other components of demand.

HR Wallingford undertook a statistical analysis of available data in order to derive empirical relationships that describe how weather and other factors affect household demand for water in our supply area.

We provided the following data sets:

- Domestic Water Use Survey (DWUS) Unmeasured PCC by property type (2000-2010)
- PCC by property type for testDWUS[2] panel (2002-2004)
- Demand data (distribution input – minimum night line, 1998 onwards)
- Climate data (temperature, rainfall and sunshine hours, 1998 onwards)

HR Wallingford used multiple linear regression to analyse data and to produce predictive equations.

Three climate variables were considered in the statistical analysis; temperature, rainfall and sunshine hours. However sunshine hours were removed as it was found to be highly correlated with temperature, and temperature provided a stronger and better understood climate change signal which would increase confidence in the model. Including both sunshine hours and temperature could have resulted in instability within the model. For the DYAA model both rainfall and temperature were included. For the ADPW model only temperature was included as an explanatory variable, this was due to insufficient data as for most years there was no rainfall in the peak period.

To estimate the impacts of climate change, the full sample of 10,000 UKCP09 climate change projections for maximum temperature and rainfall in the Thames Valley basin in the 2030s; medium emissions scenario, was used. These scenarios provide climate change factors that are applied to the regression models.

[1] HR Wallingford (2012) EX6828 Thames Water Climate Change Impacts and Water Resource Planning. Thames Water Climate Change Impacts on Demand for the 2030s
[2] testDWUS – A temporary panel of unmeasured customers used to validate DWUS

The climate change factors are reported as the change between the baseline period (1961-1990) and the future period (2021-2050). As the baseline for the WRMP is 2011 a scaling factor was calculated:

$$ScalingFactor = \frac{2035 - BaseYear}{2035 - 1975}$$

As the base year is 2011 this results in a scaling factor of 0.4, i.e. 60% of the climate change between 1975 and 2035 has already been assumed to have occurred.

These factors were then used with the regression relationships, described above, to provide estimates of PCC change due to climate change in the 2030s. The results of this gave 10,000 potential future PCC factors. The 10th, 50th and 90th percentiles of these factors were extracted to represent and lower, mid and upper estimates of impact on PCC. The mid estimate was used in the demand forecasting models while the upper and lower estimates were used in headroom modelling.

4.3 Climate Change and the Supply Demand Balance

Table 18 and Table 19 contain the Annual Average and Critical Period climate change impacts reported in the draft WRMP14 for 2012/13 and the remainder of AMP5. This is made up of the climate change impact on Deployable Output and the Target Headroom component of climate change.

It can be seen that by following the latest guidance on calculating the impacts of climate change the values for 2012/13 are zero. It means that if the impacts of climate change were reintroduced into the supply demand balance calculation, then all WRZs would remain in surplus for this reporting year, 2012/13. However, given the current surplus in London is so small, if the impacts of climate change were reintroduced into the supply demand balance calculation at the dWRMP14 proposed levels it is highly likely that London will fall into deficit in 2013/14. The dWRMP14 defines the plan to address the supply demand deficit early in the next AMP period, 2015-2020.

Table 18: dWRMP14 Annual Average Climate Change Impacts

dWRMP14 Total Climate Change Impact			
WRZ	Annual Average (Ml/d)		
	2012/13	2013/14	2014/15
Guildford	0.00	0.00	0.01
Henley	0.00	0.00	0.00
Kennet Valley	0.00	0.17	0.34
London	0.00	13.39	25.75
SWA	0.00	0.19	0.37
SWOX	0.00	0.88	1.58

Table 19: dWRMP14 Critical Period Climate Change Impacts

dWRMP14 Total Climate Change Impact			
WRZ	Critical Period (Ml/d)		
	2012/13	2013/14	2014/15
Guildford	0.00	0.00	0.01
Henley	0.00	0.00	0.00
Kennet Valley	0.00	0.45	0.88
London			
SWA	0.00	0.33	0.58
SWOX	0.00	1.08	1.90

5. Security of Supply

5.1 Target Headroom

Table 20: AMP5 Target Headroom

Target Headroom (Ml/d)		2010/11	2011/12	2012/13	2013/14	2014/15
Annual Average	Target (fWRMP09)	127.09	136.68	157.65	176.97	199.46
	Actual/*Forecast*	77.76	77.98	74.30	-	-
Critical Period	Target (fWRMP09)	131.38	140.40	164.13	182.81	205.65
	Actual/*Forecast*	82.81	84.65	82.31	-	-

Target headroom includes the key components of supply and demand uncertainty, accuracy of supply side data, risk from gradual pollution, demand uncertainty, climate change uncertainty and uncertainty around bromates. Uncertainties around leakage reductions are handled separately.

Climate change together with the demand side uncertainty is the most significant long-term risk. The security of supply risk associated with climate change is normally managed through the target headroom allowance, however in line with the direction in FD09 the target headroom analysis has been rerun for AR13 without including the uncertainty around climate change.

The target headroom methodology requires that a risk level be chosen over the planning period. In the draft final WRMP09 a pragmatic risk profile starting with 5% in AMP4, reflecting the need for low risk in the short-term, but stepping up by 5% in each subsequent 5-year AMP period, to reach 30% in AMP9 has been adopted. As we are now into a new AMP period then the risk profile will be 5% and will be consistent with AR12.

Table 21 presents the annual average target headroom requirements as reported in AR12, AR13 and 2012/13 fWRMP09 and the draft WRMP14.

Table 21: Target Headroom - Annual Average (Ml/d)

Target Headroom (Annual Average) Ml/d				
WRZ	2011/12	2012/13		
	AR12	AR13	fWRMP09	dWRMP14
Guildford	3.45	3.43	4.00	3.96
Henley	0.34	0.35	0.40	0.52
Kennet Valley	4.03	3.63	5.27	4.96
London	58.44	54.79	123.41	81.29
SWA	4.91	5.14	7.30	6.17
SWOX	6.80	6.96	17.27	8.26

Table 22 reports the equivalent for critical period.

Table 22: Target Headroom - Critical Period (Ml/d)

Target Headroom (Critical Period) Ml/d				
WRZ	2011/12	2012/13		
	AR12	AR13	fWRMP09	dWRMP14
Guildford	3.76	4.06	4.40	4.30
Henley	0.46	0.45	0.55	0.81
Kennet Valley	4.43	4.28	5.74	5.35
London				
SWA	8.46	9.53	11.75	8.21
SWOX	9.10	9.22	18.29	9.81

5.2 Current Supply Demand Balance

Due to the publication of updated climate change scenarios, UKCP09, in summer 2009, Ofwat excluded any climate change related investment in their determination of the Company's Business Plan. The regulatory targets for AMP5 do not include an allowance for this factor and the assessment of the supply demand position below therefore has climate change impacts removed from WAFU and target headroom.

The supply demand positions for annual average and critical period are shown in Table 23 and Table 24 below.

Table 23: Forecast supply demand position for each WRZ – Annual Average

Surplus / Deficit – Annual Average (Ml/d)		
WRZ	2011/12	2012/13
	AR12	AR13
Guildford	13.8	13.8
Henley	11.2	11.2
Kennet Valley	35.7	31.5
London	17.0	5.8
SWA	29.7	26.8
SWOX	38.7	33.4

Table 24: Forecast supply demand position for each WRZ – Critical Period

Surplus / Deficit – Critical Period (Ml/d)		
WRZ	2011/12 AR12	2012/13 AR13
Guildford	7.3	2.7
Henley	5.7	5.7
Kennet Valley	40.9	35.2
London	17.0	5.8
SWA	23.5	16.3
SWOX	38.9	33.9

All WRZs continue to be in surplus for both annual average and critical period conditions.

In London the increase in outage allowance of 10.23 Ml/d, a small reduction in deployable output (DO) of 2 Ml/d, and a reduction in target headroom of 3.66 Ml/d have resulted in a reduction to the surplus of 11.22 Ml/d between AR12 and AR13.

The supply demand position for annual average conditions has deteriorated in all the remaining WRZs except Henley, with the largest movements in SWOX, Kennet Valley and Slough Wycombe and Aylesbury. Reduction in deployable output in these resource zones is responsible for most of this movement and increases in outage allowance account for the rest of the changes.

Other than London, the position for critical period in all WRZs except Henley has worsened with the largest movements in Slough Wycombe and Aylesbury, with a reduction in surplus of 7.2 Ml/d since AR12, SWOX, with a reduction of 4.95 Ml/d, Kennet Valley, with a reduction of 5.72 Ml/d and Guildford, with a reduction of 4.95 Ml/d

The forecast SoSI scores that are associated with the data presented in Table 23 and Table 24 are presented in Table 25 along with the PR09 Final Determination targets.

Table 25: Forecast SoSI

SoSI		2010/11	2011/12	2012/13	2013/14	2014/15
SoSI (AA)	Target	100	100	100	100	100
	Actual/*Forecast*	100	100	100	*100*	*100*
SoSI (CP)	Target	99	99	100	100	100
	Actual/*Forecast*	100	100	100	*100*	*100*

SoSI Annual Return tables showing the calculation of SoSI are provided in Appendix for reference.

The draft WRMP14 climate change impacts on the supply demand position for the rest of AMP5 are included in Climate Change.

5.3 Changes to our plan

The activities that we are undertaking to manage the supply demand balance in each of our WRZs remain close to that defined by Ofwat's FD09. However, we have made the following changes to ensure we continue to deliver the activities that reflect the best value for money and put us in the best position to manage supply demand going forward.

Because the SWOX WRZ is comfortably in surplus, whereas the reintroduction of climate change would mean a substantial deficit in London at the start of the next planning period, we have decided to not deliver all the proposed new resource schemes in SWOX (see Section 2.1.1). Instead we have decided to outperform our regulatory leakage target of 673 Ml/d, through further leakage reductions in London. We have therefore set ourselves a leakage target of 665 Ml/d for 2014/15, and this has been incorporated within our dWRMP14 baseline forecasts.

We have also re-evaluated our progressive metering programme. The metering programme from FD09 was focused on cost effective meter installations fitted in existing boundary boxes, installed as part of the Victorian Mains Replacement (VMR) and District Mains Replacement programmes. Customers would be scattered across the region and consistency of messaging across our customer base would have been difficult and programme efficiency low. During the process of refining our roll-out strategy it has become evident that clear and consistent messaging to our customers is of paramount importance. We have therefore redeveloped our rollout programme to focus on geographic areas, providing a clearer roll out plan for customer and Borough, allowing easier communication, protecting company reputation and providing a scalable delivery plan. This means that we cannot use the VMR areas. This will make meter installs more expensive, but will deliver more demand savings per meter, as meters will be installed in areas where supply pipe leakage has not already been intensively targets, See Section 3.3 for more details.

6. Progress on the fWRMP09, dWRMP14 and Drought Plan

Publication of fWRMP09

The draft final WRMP09 was submitted to the Secretary of State in March 2012 and we received approval to publish the fWRMP09 on the 19 June 2012.

Publication of draft WRMP14

On 1st May 2013, we published, for public consultation, our draft WRMP14. The consultation runs for 12 weeks. A Statement of Response will be published by the end of October 2013.

http://www.thameswater.co.uk/about-us/wrmp

The plan demonstrates a growing deficit in supply and demand in London, the proposed solution to which includes a combination of demand reduction and resource development.

In the short-term the plan focuses heavily on demand reduction in London, driven through a combination of leakage reduction, progressive metering and water efficiency measures. In the long-term a large resource is needed.

The plan recommends:

- Reduction of leakage by a further 53Ml/d
- The rollout of household metering in London so that by 2025, ~75% of households will receive water supplies on a metered basis.
- The rollout of innovative water pricing tariffs during 2020 - 2025 to help reduce the demand for water;
- The temporary reduction of an existing bulk export (17Ml/d) and development of 7 Ml/d of groundwater supplies
- A resource scheme to secure long-term supply-resilience for London, and the wider South East of England between 2025 and 2030.
- A 150Ml/d wastewater re-use plant is proposed as the solution based on minimising cost and on the assumption it can be promoted successfully. However we propose further work on other 'long-term' options, such as reservoirs and regional transfers in the next period to help determine the most appropriate solution.
- That household metering should also be rolled out in Thames Valley to 90% but that this should be delivered over the 2020-2030 period. This reduces the cost of the Plan in the short-term and also gives a more flexible approach to future uncertainties.

Publication of Drought Plan in 2013/14

An update to the Drought Plan, incorporating the changes to the water industry's powers to restrict usage in the early stages of a drought event, following the passing into law of the Floods and Water Management Act, was published as a draft for consultation in December 2011.

A statement of response to the consultation was published on 4 April 2012 and amendments were made to the plan . A revised version was sent to the Secretary of State for approval on the 26 April 2012.

The Secretary of State required further work to address the impact of Drought Permit options. The final version and Environmental Reports were submitted to Defra on 21 March 2013 however further amendments were required.

A new completion date of the end of July 2013 has now been set.

Date: 25th June 2013
Prepared By: IP, DH, AO

Appendix 1: Security of Supply Index Table

1 Security of Supply Index - 2012/13 ANNUAL AVERAGE

Security of Supply Index - Planned level of service

Water resource zone	WAFU (EA definition) (Ml/d)	Bulk imports (Ml/d)	Bulk exports (Ml/d)	Dry year distribution input (Ml/d)	Reporting year distribution input (Ml/d)	Dry year available headroom (Ml/d)	Target headroom (Ml/d)	Surplus/ deficit (Ml/d)	Percentage deficit (Ml/d)	Zonal population	Percentage of total population with headroom deficit	Zonal index (%age deficit^2 x % population affected x 100)	Security of supply index
Guildford	64.20	0.00	2.30	44.70	44.28	17.19	3.43	13.77	28.60%	151.889	0.00%	0.000%	
Henley	24.60	0.00	0.00	13.04	12.38	11.56	0.35	11.21	83.72%	49.531	0.00%	0.000%	
Kennet Valley	135.21	0.00	0.00	100.13	97.10	35.08	3.63	31.45	30.31%	392.562	0.00%	0.000%	
London	2,097.73	0.00	12.00	2,025.17	1,987.99	60.56	54.79	5.77	0.28%	7,051.983	0.00%	0.000%	
SWA	168.55	0.00	2.08	134.54	129.03	31.93	5.14	26.79	19.18%	511.785	0.00%	0.000%	
SWOX	301.46	2.08	0.00	263.19	255.16	40.35	6.96	33.39	12.36%	1,004.424	0.00%	0.000%	
Total	2,791.75	2.08	16.38	2,580.78	2,525.95					9,162.173		0.000%	100

SoSI - planned & critical AR13 Table DRAFT v2.0.xlsx

2 Security of Supply Index – 2012/13 CRITICAL PERIOD

Security of Supply Index - critical period

Water resource zone	WAFU (EA definition) (Ml/d)	Bulk imports (Ml/d)	Bulk exports (Ml/d)	Dry year distribution input (Ml/d)	Reporting year distribution input (Ml/d)	Dry year available headroom (Ml/d)	Target headroom (Ml/d)	Surplus/ deficit (Ml/d)	Percentage deficit (Ml/d)	Zonal population	Percentage of total population with headroom deficit	Zonal index (%age deficit^2 x % population affected x 100)	Security of supply index
Guildford	70.39	0.00	2.30	61.31	49.29	6.78	4.06	2.73	4.17%	151.889	0.00%	0.000%	
Henley	25.25	0.00	0.00	19.09	15.51	6.16	0.45	5.71	29.25%	49.531	0.00%	0.000%	
Kennet Valley	158.23	0.00	0.00	118.78	102.23	39.45	4.28	35.16	28.57%	392.562	0.00%	0.000%	
London	2,097.73	0.00	12.00	2,025.17	1,987.99	60.56	54.79	5.77	0.28%	7,051.983	0.00%	0.000%	
SWA	197.36	0.00	5.00	166.50	137.15	25.86	9.53	16.33	9.28%	511.785	0.00%	0.000%	
SWOX	356.33	5.00	0.00	318.18	278.37	43.14	9.22	33.93	10.36%	1,004.424	0.00%	0.000%	
Total	2,905.29	5.00	19.30	2,709.04	2,570.53					9,162.173		0.000%	100

SoSI - planned & critical AR13 Table DRAFT v2.0.xlsx

Appendix 2: Line Commentary

The table “Environment Agency Data - Annual Average Out-turns” reports annual average data and the table “Environment Agency Data - Critical Period Out-turns” reports peak period data for each water resource zone as specified in the Annual Returns Definitions for the Environment Agency Data tables.

All lines have been completed, whether required by exception, optional or not.

Zones that are sensitive to peak demands are the SWOX, Kennet Valley, Henley, SWA, and Guildford water resource zones. Data for these zones has been compiled for the average day peak week demand (ADPW) period. The method of calculating each line within the table is consistent with the guidance.

In Table 10, the water balance is calculated at the company level, being adjusted by the MLE to apportion the overall water balance discrepancy. However, the Environment Agency Data tables are based upon water balances for individual water resource zones, each with their own water balance discrepancy adjustments.

Critical Period

Graphs showing the daily demand profile as a rolling 7-day average and therefore showing the ADPW of the year are included in Appendix 12. To be consistent with the ADPW dry year demand, the Critical Period table was populated using the summer peak week shown in the table below.

Table 26: WRZ Summer ADPW Date and DI

WRZ	Summer ADPW (Week ending)	Summer ADPW DI (Ml/d)
Guildford	31/05/2012	49.29
Henley	28/07/2012	15.51
Kennet Valley	02/06/2012	102.23
Slough Wycombe Aylesbury	28/07/2012	137.15
SWOX	31/05/2012	278.37

To populate the critical period table (Environment Agency Data - Critical Period) we have peaked the annual average water balance components using peaking factors from the fWRMP. The peaking factors were adjusted proportionally so that the sum of the peak water balance components reconciled with the 2012/13 observed summer ADPW DI. This ensures that our approach remains consistent between these tables and the fWRMP. For a detailed discussion of our peak demand forecasting methodology, please refer to Section 3.1 of the fWRMP Main Report.

Annual Average - Line Commentary

Supply

A: Resources

Line	Description	2011/12	2012/13	Variance
1	Raw Water Abstracted	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	49.69	48.41	-1.28
WRZ 2	Henley	12.88	12.60	-0.28
WRZ 3	Kennet Valley	107.50	106.42	-1.08
WRZ 4	London	2319.74	2232.18	-87.56
WRZ 5	Slough/Wycombe/Aylesbury	135.81	132.09	-3.72
WRZ 6	SWOX	281.17	258.48	-22.69
Total	Total	2906.80	2790.19	-116.61
Line Commentary:				

Improvements previously made to the raw water abstracted methodology have been maintained this year. They include:

- Annual meter verifications for all abstraction meters. Where abstraction meters are also Distribution Input meters, meter error adjustments are applied consistently.
- Greater clarity of London and Thames Valley system mass balances, taking account of abstraction, returns to river, non-public sources and water into supply.
- Ensuring that flows identified as “returns to river” are not actually returns to a storage reservoir.

As in previous years, the values reported in Line 1 are Actual Raw Water Abstracted without any adjustment for abstraction that supplies non-public sources and returns to river. Changes in raw water reservoir levels have also not been included.

Line	Description	2011/12	2012/13	Variance
2	Raw Water Imported	Ml/d	Ml/d	Ml/d
Line Commentary:				

There are no raw water imports to Thames Water.

Line	Description	2011/12	2012/13	Variance
3	Potable Water Imports	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.00	0.00	0.00
WRZ 2	Henley	0.00	0.00	0.00
WRZ 3	Kennet Valley	0.00	0.00	0.00
WRZ 4	London	0.00	0.00	0.00
WRZ 5	Slough/Wycombe/Aylesbury	0.17	0.19	0.02
WRZ 6	SWOX	0.60	0.93	0.33
Total	Total	0.77	1.12	0.34
Line Commentary:				

Potable Water Imports (Annual Average)				
To (WRZ)	From	AR12 (Ml/d)	AR13 (Ml/d)	Change
SWA	Anglian Water	0.17	0.19	0.02
SWOX	Anglian Water	0.09	0.10	0.01
SWOX	Severn Trent	0.00	0.00	0.00
SWOX	SWA	0.50	0.82	0.32
Total		0.77	1.12	0.34

Thames Water has no potable water imports governed by formal bulk supply agreements. However, a number of small imports exist that are not covered by formal bulk supply agreements and hence not included in the fWRMP09 or in Table 10a. These include a transfer from Anglian Water to SWA and SWOX, which averaged 0.19 Ml/d and 0.10 Ml/d respectively during 2012/13. The import from Severn Trent to SWOX was not used in 2012/13.

Also included in this line is an interzonal transfer from SWA to SWOX. This averaged 0.82 Ml/d during 2012/13. A provision of 2.08 Ml/d is included in the fWRMP.

Line	Description	2011/12	2012/13	Variance
4	Raw Water Losses and Operational Use	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.25	0.14	-0.12
WRZ 2	Henley	-0.02	-0.01	0.01
WRZ 3	Kennet Valley	0.83	0.71	-0.12
WRZ 4	London	15.69	11.68	-4.01
WRZ 5	Slough/Wycombe/Aylesbury	0.03	0.13	0.09
WRZ 6	SWOX	0.84	0.55	-0.29
Total	Total	17.62	13.20	-4.42
Line Commentary:				

Raw water losses and operational use are assumed to be 10% of total process losses in London and 15% in the remaining WRZ's. Process losses are calculated as the difference between the volume of raw water entering treatment and the volume of potable water entering supply.

Additionally in London, there is an abstraction that supplies non-public sources at Crossness Nature Reserve which is used for conservation purposes. The abstraction averaged 0.12 Ml/d and is included as raw water operational use.

Negative process losses are reported in Henley. This is due to small errors, in the order of $^{+}/_{-}$ 0.2%, in the measurement of Raw Water into Treatment and Treated Water into Supply. This is well within the meter verification tolerances of $^{+}/_{-}$ 5%.

Line	Description	2011/12	2012/13	Variance
5	Raw Water Exported	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.00	0.00	0.00
WRZ 2	Henley	0.00	0.00	0.00
WRZ 3	Kennet Valley	0.00	0.00	0.00
WRZ 4	London	91.03	91.42	0.39
WRZ 5	Slough/Wycombe/Aylesbury	0.00	0.00	0.00
WRZ 6	SWOX	0.00	0.00	0.00
Total	Total	91.03	91.42	0.39
Line Commentary:				

Raw Water Exported (Annual Average)				
From (WRZ)	To	AR12 (Ml/d)	AR13 (Ml/d)	Change (Ml/d)
London	Essex & Suffolk Water	90.70	87.56	-3.14
London	Veolia Water Central	0.33	3.86	3.53
Total		91.03	91.42	0.39

There are two raw water exports, both within the London WRZ. The largest, is the export from the Lea Valley to Essex and Suffolk Water (Northumbrian South), averaged 87.56 Ml/d during the 2012/13 report year which is a reduction of 3.14 Ml/d since AR12.

The second is a transfer from the Wraysbury or Queen Mother reservoirs to the Veolia treatment works at Iver which averaged 3.86 Ml/d over the year, an increase of 3.53 Ml/d since AR12. This supply forms part of an agreement that permits Veolia to use Thames Water reservoir storage in the event of a serious pollution incident that would prevent Veolia from using their run-of-river source to Iver works. The agreement is only for the duration of the pollution but there is a provision for up to 10 Ml/d in the fWRMP as a sweetening flow in the connecting pipeline, which can be interpreted as a raw water bulk supply.

The bulk supply export to Essex and Suffolk Water is included as part of the calculation of DO for London through the WARMS model and not explicitly shown in the fWRMP tables. By including this in the fWRMP table it would double count this transfer and misrepresent the supply-demand position. We have included the data in this return for information purposes.

Line	Description	2011/12	2012/13	Variance
5.1	Non Potable Supplies	Ml/d	Ml/d	Ml/d
Line Commentary:				

Thames Water has no non-potable supplies.

Line	Description	2011/12	2012/13	Variance
6	Potable Water Exported	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	1.81	1.71	-0.10
WRZ 2	Henley	0.00	0.00	0.00
WRZ 3	Kennet Valley	0.00	0.00	0.00
WRZ 4	London	0.46	0.39	-0.07
WRZ 5	Slough/Wycombe/Aylesbury	1.10	1.11	0.01
WRZ 6	SWOX	0.01	0.02	0.01
Total	Total	3.37	3.22	-0.15
Line Commentary:				

Potable Water Exports (Annual Average)				
From (WRZ)	**To**	**AR12 (Ml/d)**	**AR13 (Ml/d)**	**Change**
London	Veolia Water Central	0.30	0.32	0.02
London	Veolia Water Central	0.16	0.07	-0.09
Guildford	Veolia Water Central	1.81	1.71	-0.10
SWA	SWOX	0.50	0.82	0.32
SWA	Anglian Water	0.60	0.28	-0.31
SWOX	Wessex Water	0.01	0.02	0.01
Total		3.37	3.22	-0.15

The bulk supply export to Affinity Water (Three Valleys Water) from the London Borough of Haringey averaged 0.32 Ml/d during 2012/13. This compares to an allowance of 10 Ml/d in the fWRMP. Another export occurs in this zone, which is not covered by formal bulk supply agreements. This is the export from Kempton Park to Affinity Water (North Surrey), which averaged 0.07 Ml/d in 2012/13.

There is also an export from Ladymead in the Guildford WRZ to Affinity Water (Three Valleys Water), which averaged 1.71 Ml/d during 2012/13. This compares to the allowance of 2.3 Ml/d in the fWRMP.

In SWA, there is an export of 0.82 Ml/d to SWOX. There is also another export of 0.28 Ml/d from Hambledon in SWA to Anglian Water which is not covered by a formal bulk supply agreement. There is an export from SWOX to Wessex Water at Ashton Keynes which is also not covered by formal bulk supply agreements. This export averaged 0.02 Ml/d in 2012/13.

Line	Description	2011/12	2012/13	Variance
7	Deployable Output	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	65.18	65.01	-0.17
WRZ 2	Henley	25.65	25.65	0.00
WRZ 3	Kennet Valley	141.58	137.06	-4.52
WRZ 4	London	2146.00	2144.00	-2.00
WRZ 5	Slough/Wycombe/Aylesbury	182.98	181.08	-1.90
WRZ 6	SWOX	322.34	316.34	-6.00
Total	Total	2883.73	2869.14	-14.59
Line Commentary:				

The changes in DO between the reporting year and last year are primarily due to a review of the Source Deployable Outputs in March 2013. The details of these updates are contained in Appendix 3.

The tables below compare the changes in the components of DO between the reporting year, last year and the fWRMP09.

Guildford

Annual Average (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP Forecast
DO	65.18	65.01	65.30
Climate Change Impacts	0.00	0.00	0.00
Network Constraints	0.00	0.00	0.00
Guildford Constrained DO	**65.18**	**65.01**	**65.30**

The changes in DO between the fWRMP, AR12 and AR13 are due to revision to the SDO's the have occurred since the fWRMP.

Henley

Annual Average (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP Forecast
DO	25.65	25.65	25.80
Climate Change Impacts	0.00	0.00	0.00
Network Constraints	0.00	0.00	0.00
Henley Constrained DO	**25.65**	**25.65**	**25.80**

There has been no change in DO between last year and the reporting year.

The change between the reporting year and, the fWRMP is due to clarification of the treatment of Harpsden and Sheeplands DO. Harpsden DO is now considered as the treated output from the site whereas the transfer of Harpsden raw water to Sheeplands for blending is now considered in the Sheeplands DO.

Kennet Valley

Annual Average (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP Forecast
DO	141.58	137.06	146.75
Climate Change Impacts	0.00	0.00	0.16
Network Constraints	0.00	0.00	0.00
Kennet Valley Constrained DO	**141.58**	**137.06**	**146.59**

The change in DO between last year and the reporting year is as a result of the review of SDO undertaken in March 2013 (see Appendix 3).

The change in DO between AR13, and the fWRMP is primarily due the fact that the DO of Mortimer (4.55 Ml/d) was previously shown as an outage due to problems with

discolouration due to iron but is now considered as a reduction in DO. Although there are currently no supply demand drivers in this WRZ, we are developing and costing solutions to address the water quality issues such that it can be considered in the future.

The removal of climate change impacts accounts for the additional difference in Constrained DO between AR13 and the fWRMP.

London

Annual Average (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP Forecast
DO	2146.00	2144.00	2167.00
Climate Change Impacts	0.00	0.00	35.36
Network Constraints	0.00	0.00	0.00
London Constrained DO	**2146.00**	**2144.00**	**2131.65**

DO has reduced by 2 Ml/d in London compared to last year as a result of the review of SDO undertaken in March 2013 (see Appendix 3).

DO is 23 Ml/d lower than in the fWRMP. This is due to an increase in the DO associated with the Thames Gateway WTW of 10 Ml/d and a reduction in the DO of the Stratford Box dewatering and Old Ford scheme of 1 Ml/d plus reviews of SDO's undertaken since the fWRMP.

The removal of climate change impacts accounts for the additional difference in Constrained DO between AR13 and the fWRMP.

Slough/Wycombe/Aylesbury

Annual Average (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP Forecast
DO	188.18	186.28	188.30
Climate Change Impacts	0.00	0.00	0.60
Network Constraints	5.20	5.20	5.20
SWA Constrained DO	**182.98**	**181.08**	**182.50**

There has been a reduction in DO of 1.9 Ml/d between last year and the reporting year as a result of the March 2013 review of SDO (see Appendix 3).

Reviews of SDO prior to AR13 account for the difference to the fWRMP. The removal of climate change impacts account for the additional difference in Constrained DO between the report year and the fWRMP.

SWOX

Annual Average (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP Forecast
DO	326.57	319.47	332.58
Climate Change Impacts	0.00	0.00	1.90
Network Constraints	4.23	3.13	8.93
SWOX Constrained DO	**322.34**	**316.34**	**321.75**

DO has reduced by 7.1 Ml/d in SWOX from last year as a result of the March 2013 review of SDO (see Appendix 3.

Reviews of SDO since the fWRMP account for the difference in the fWRMP forecast of DO. The removal of climate change impacts and the resolution of some network constraints account for the remaining difference between the AR13 and fWRMP Constrained DO.

B: Process Losses

Line	Description	2011/12	2012/13	Variance
9	Treatment Works Losses and Operational Use	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	2.26	1.22	-1.04
WRZ 2	Henley	-0.15	-0.05	0.10
WRZ 3	Kennet Valley	7.65	6.52	-1.13
WRZ 4	London	162.34	136.60	-25.74
WRZ 5	Slough/Wycombe/Aylesbury	0.82	1.13	0.30
WRZ 6	SWOX	9.07	4.94	-4.13
Total	Total	182.00	150.37	-31.63
Line Commentary:				

Treatment works losses and operational use is assumed to be 90% of total process losses in London and 85% in the remaining WRZ's. Process losses are calculated as the difference between the volume of raw water entering treatment and the volume of potable water entering supply.

Negative process losses are reported in Henley. This is due to small errors, in the order of $^{+}/_{-}$ 0.2%, in the measurement of Raw Water into Treatment and Treated Water into Supply. This is well within the meter verification tolerances of $^{+}/_{-}$ 5%.

Additionally, there are abstractions that supplies non-public sources at Sewage Treatment Works (STWs) and returns to river at Water Treatment Works (WTWs) which are included as treatment works operational use.

Non-Public Supply (Annual Average)- Treatment Works Ops Use		
Site	**WRZ**	**(Ml/d)**
Maple Cross STW	London	0.27
Mogden STW	London	3.21
Rye Meads STW	London	0.98
Juniper Pumping Station	London	0.00
Total		**4.45**
Slough STW	SWA	0.00
Iver South STW	SWA	0.00
Total		**0.00**

Non-public supply levels have increase in London from 3.94 Ml/d and reduced in SWA from 0.55 Ml/d compared to last year.

Returns to River (Annual Average)- Treatment Works Ops Use		
Site	**WRZ**	**(Ml/d)**
Ashford Common WTW	London	27.91
Beckton Desalination Plant	London	20.89
Coppermills	London	4.83
Kempton WTW	London	5.44
Walton WTW	London	7.44
Total		**66.51**
Farmoor WTW	SWOX	0.00
Fobney WTW	Kennet Valley	0.13

Returns to river have decreased by 5.0 Ml/d since AR12. The main movements were in London which reduced by 3.42 Ml/d and a reduction of 1.50 Ml/d in SWOX due to there being no returns to river during the year at Farmoor.

Line	Description	2011/12	2012/13	Variance
10	Outage Experienced	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	1.06	2.08	1.02
WRZ 2	Henley	0.01	0.00	-0.01
WRZ 3	Kennet Valley	0.00	0.02	0.02
WRZ 4	London	90.35	120.28	29.93
WRZ 5	Slough/Wycombe/Aylesbury	9.95	18.30	8.35
WRZ 6	SWOX	2.73	3.83	1.10
Total	Total	104.10	144.51	40.41
Line Commentary:				

Actual Outage is reported here in order to compare against planned outage.

Details of changes to outage in London and Thames Valley can be found in 4.

Demand

Line	Description	2011/12	2012/13	Variance
11	Distribution Input	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	44.25	44.28	0.04
WRZ 2	Henley	12.86	12.38	-0.47
WRZ 3	Kennet Valley	97.08	97.10	0.02
WRZ 4	London	2004.31	1987.99	-16.31
WRZ 5	Slough/Wycombe/Aylesbury	133.40	129.03	-4.38
WRZ 6	SWOX	259.09	255.16	-3.93
Total	Total	2550.98	2525.95	-25.04
Line Commentary:				

Distribution input has reduced by 25.04 Ml/d at Company level to 2525.95 Ml/d principally driven by the reductions in demand notably unmeasured households. This represents a reduction of almost 1.0% at Company level. Reductions were mirrored across all the Water Resource Zones with the exception of Guildford and Kennet Valley which experienced small increases.

Distribution Input is calculated from the sum of the works output plus the net balance between bulk imports and exports. Adjustments are made for meter errors (where the discrepancy with the test meter is greater than 5%) and for on-site operational use where the off take is after the meter location. The majority of the on-site operational use is directly metered. However, where metered flows are not available values are taken from a detailed study undertaken in 2000/01 which estimated the on-site operational use for each water treatment works based on the original design and best practice information to calculate values. These estimates are updated following meter replacement where the new meter is installed in a different location to the original meter.

Actual measured flows for distribution inputs come from the Control Room using arithmetic averages of daily outputs from the SCADA. Operational use also includes recharge on the North London Aquifer Recharge Scheme and boreholes run to waste for quality or testing purposes.

A number of improvements to the verification process were introduced for 2007/08 which has led to the size of the meter error adjustments reducing significantly from those used previously.

Thames Water has a specialist team to manage the verification and maintenance of regulatory flow meters, ensuring a greater focus on regulatory performance and reporting processes and this is supported with a metering web-based database developed to allow automation of performance reporting.

DI meter verification now generally takes place in the first six months of the year to allow more time for discrepancies to be addressed within the reporting year. Error adjustments have been reduced from 18.6 Ml/d in 2006/07 to just -0.16 Ml/d this year.

The DI reporting and verification process is supported with a metering Best Operating Practice manual and Quality Management Documents which are updated and maintained.

C: Consumption

Line	Description	2011/12	2012/13	Variance
19	Measured Non-Household Water Delivered	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	8.29	8.22	-0.07
WRZ 2	Henley	2.31	1.96	-0.34
WRZ 3	Kennet Valley	19.98	19.38	-0.61
WRZ 4	London	369.04	365.49	-3.55
WRZ 5	Slough/Wycombe/Aylesbury	23.17	21.93	-1.24
WRZ 6	SWOX	64.61	60.33	-4.28
Total	Total	487.40	477.31	-10.09
Line Commentary:				

At company level, measured non-household water delivered has reduced by 10.1 Ml/d. The reduction this year continues the trend of reducing non-household demand seen over recent years.

Line	Description	2011/12	2012/13	Variance
20	Unmeasured Non-Household Water Delivered	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.24	0.24	0.00
WRZ 2	Henley	0.06	0.06	0.00
WRZ 3	Kennet Valley	0.34	0.33	0.00
WRZ 4	London	21.20	19.99	-1.20
WRZ 5	Slough/Wycombe/Aylesbury	0.35	0.35	0.00
WRZ 6	SWOX	0.88	0.90	0.02
Total	Total	23.05	21.87	-1.19
Line Commentary:				

At Company level, there has been a slight reduction of 1.19Ml/d this year.

The bulk of this estimate relates to assessed properties (properties that are unable to be metered directly and therefore charged on an assessed basis). There has been a small increase in the volume associated with these properties.

Licensed hydrant use and building site standpipes are included in this category as well as properties where warrants to enforce metering are issued. Although there has been little change to the number of licenses issued the calculated volume associated to them has dropped by 1.38 Ml/d as a result of fewer licenses being issued for the large volume activities such as flushing.

Line	Description	2010/11	2011/12	Variance
21	Measured Household Water Delivered	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	8.66	8.57	-0.09
WRZ 2	Henley	3.81	3.77	-0.04
WRZ 3	Kennet Valley	19.83	20.44	0.61
WRZ 4	London	229.43	235.86	6.43
WRZ 5	Slough/Wycombe/Aylesbury	26.47	26.12	-0.34
WRZ 6	SWOX	64.90	65.12	0.22
Total	Total	353.11	359.90	6.79
Line Commentary:				

This year the reported figure has increased by 6.79 Ml/d from last year, principally due to increasing numbers of metered properties. The average number of properties for the year in this category has increased from last year as a result of the continued uptake in optant metering, as well as the newly built properties.

Line	Description	2011/12	2012/13	Variance
22	Unmeasured Household Water Delivered	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	17.16	16.26	-0.90
WRZ 2	Henley	4.12	3.87	-0.25
WRZ 3	Kennet Valley	39.59	37.66	-1.93
WRZ 4	London	982.46	965.10	-17.36
WRZ 5	Slough/Wycombe/Aylesbury	56.28	53.86	-2.42
WRZ 6	SWOX	83.55	80.10	-3.44
Total	Total	1183.16	1156.86	-26.29
Line Commentary:				

The reported figure shows a reduction of 26.29 Ml/d against the value for last year. This reflects the reduction in the number of properties as well as a reduction in the estimate of per capita consumption (PCC) which reflects the impact of the drought restrictions and advertising at the start of the year and subsequent wet spring and summer.

These reductions have been partially offset by an increase in population as a result of the inclusion of the 2011 Census data.

Line	Description	2011/12	2012/13	Variance
23	Measured Non-Household - Consumption	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	8.11	8.03	-0.08
WRZ 2	Henley	2.26	1.91	-0.34
WRZ 3	Kennet Valley	19.73	19.09	-0.63
WRZ 4	London	364.24	360.77	-3.48
WRZ 5	Slough/Wycombe/Aylesbury	22.73	21.50	-1.23
WRZ 6	SWOX	63.73	59.40	-4.33
Total	Total	480.79	470.70	-10.09
Line Commentary:				

This line is calculated from subtracting line 34 from line 19.

Line	Description	2011/12	2012/13	Variance
24	Unmeasured Non-Household - Consumption	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.22	0.21	-0.01
WRZ 2	Henley	0.05	0.05	0.00
WRZ 3	Kennet Valley	0.31	0.30	-0.01
WRZ 4	London	19.12	17.96	-1.16
WRZ 5	Slough/Wycombe/Aylesbury	0.31	0.31	0.00
WRZ 6	SWOX	0.80	0.81	0.01
Total	Total	20.79	19.64	-1.16
Line Commentary:				

This line is calculated from subtracting line 35 from line 20.

Line	Description	2011/12	2012/13	Variance
25	Measured Household - Consumption	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	7.99	7.76	-0.23
WRZ 2	Henley	3.54	3.47	-0.08
WRZ 3	Kennet Valley	18.62	18.95	0.34
WRZ 4	London	215.67	220.93	5.26
WRZ 5	Slough/Wycombe/Aylesbury	24.63	24.16	-0.47
WRZ 6	SWOX	60.74	60.29	-0.45
Total	Total	331.19	335.56	4.37
Line Commentary:				

This line is calculated from subtracting line 36 from line 21.

Line	Description	2011/12	2012/13	Variance
26	Unmeasured Household - Consumption	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	14.64	13.49	-1.15
WRZ 2	Henley	3.55	3.29	-0.27
WRZ 3	Kennet Valley	35.10	32.75	-2.35
WRZ 4	London	863.09	847.17	-15.92
WRZ 5	Slough/Wycombe/Aylesbury	48.99	46.82	-2.17
WRZ 6	SWOX	73.48	69.50	-3.98
Total	Total	1038.86	1013.02	-25.84
Line Commentary:				

This line is calculated from subtracting line 37 from line 22.

Line	Description	2011/12	2012/13	Variance
29	Measured Household - PCC	l/h/d	l/h/d	l/h/d
WRZ 1	Guildford	143.44	134.57	-8.87
WRZ 2	Henley	141.39	138.06	-3.33
WRZ 3	Kennet Valley	130.61	125.77	-4.84
WRZ 4	London	141.50	134.84	-6.66
WRZ 5	Slough/Wycombe/Aylesbury	142.56	131.89	-10.67
WRZ 6	SWOX	129.30	123.21	-6.08
Total	Total	138.57	131.88	-6.69
Line Commentary:				

This line is calculated from multiplying line 25 by 1,000 and then dividing by line 49.

Line	Description	2011/12	2012/13	Variance
30	Unmeasured household - PCC	l/h/d	l/h/d	l/h/d
WRZ 1	Guildford	164.89	155.34	-9.55
WRZ 2	Henley	152.88	149.31	-3.57
WRZ 3	Kennet Valley	154.49	146.96	-7.53
WRZ 4	London	171.84	167.06	-4.78
WRZ 5	Slough/Wycombe/Aylesbury	160.34	154.14	-6.20
WRZ 6	SWOX	154.83	149.02	-5.81
Total	Total	169.14	164.10	-5.03
Line Commentary:				

This line is calculated from multiplying line 26 by 1,000 and then dividing by line 50.

Line	Description	2011/12	2012/13	Variance
31	Average Household - PCC	l/h/d	l/h/d	l/h/d
WRZ 1	Guildford	156.62	147.05	-9.57
WRZ 2	Henley	146.92	143.31	-3.61
WRZ 3	Kennet Valley	145.29	138.41	-6.87
WRZ 4	London	164.77	159.19	-5.58
WRZ 5	Slough/Wycombe/Aylesbury	153.92	145.77	-8.15
WRZ 6	SWOX	142.13	135.81	-6.32
Total	Total	160.57	154.70	-5.88
Line Commentary:				

This line is calculated from multiplying the sum of lines 25 and 26 by 1,000 and then dividing by the sum of lines 49 and 50.

Line	Description	2011/12	2012/13	Variance
32	Water Taken Unbilled	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.81	0.79	-0.02
WRZ 2	Henley	0.18	0.18	0.00
WRZ 3	Kennet Valley	1.40	1.40	0.00
WRZ 4	London	28.42	28.66	0.24
WRZ 5	Slough/Wycombe/Aylesbury	1.65	1.60	-0.05
WRZ 6	SWOX	4.70	4.80	0.10
Total	Total	37.17	37.43	0.26
Line Commentary:				

This line is calculated from subtracting lines 19, 20, 21, 22, 33 and 39 from line 11.

Line	Description	2011/12	2012/13	Variance
33	Distribution System Operational Use	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.13	0.14	0.02
WRZ 2	Henley	0.03	0.03	0.00
WRZ 3	Kennet Valley	0.20	0.21	0.00
WRZ 4	London	5.26	4.65	-0.60
WRZ 5	Slough/Wycombe/Aylesbury	0.29	0.27	-0.02
WRZ 6	SWOX	0.50	0.58	0.07
Total	Total	6.41	5.88	-0.52
Line Commentary:				

Distribution system operational use includes reservoir drain down losses, usage due to network maintenance activities, sewer jetting (within our water supply area), pump bearing cooling in the London ring main and use for capital works such as mains flushing during commissioning of new mains. As for previous years the analysis is based on records from the Job Management System (JMS) and recommended mains flushing volumes and rates, or other appropriate records and assumed use.

There has been a decrease this year of 0.52 Ml/d to 5.88 Ml/d. This decrease is due to a lower level of, primarily, clean water activities and associated flushing. This work was minimised at the beginning of the year as part of our drought actions, and then faced restrictions throughout the summer from the Olympic Games. The wetter weather experienced in the summer would also have reduced the need for some flushing activities.

This year analysis has been completed to understand the relationship between the level of clean water activities included in DSOU and the length of mains as reported in Water Mains Activities. Although there are variations due to differing reporting requirements the large decrease in the lengths of pipe flushed this year has been mirrored by the reduction in job numbers and volumes of network operational use.

This year has seen an increase in the reservoir drain down losses, London ring main use and construction, from 1.65 Ml/d in 2011/12 to 2.23 Ml/d this year.

D: Leakage

Line	Description	2011/12	2012/13	Variance
34	Measured Non-Household - USPL	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.18	0.20	0.02
WRZ 2	Henley	0.05	0.05	0.00
WRZ 3	Kennet Valley	0.26	0.28	0.02
WRZ 4	London	4.80	4.72	-0.08
WRZ 5	Slough/Wycombe/Aylesbury	0.44	0.43	-0.01
WRZ 6	SWOX	0.88	0.93	0.05
Total	Total	6.61	6.61	0.00
Line Commentary:				

Movements in measured non-household USPL reflect the movements in total Resource Zone leakage along with a general reduction in the number of properties.

Line	Description	2011/12	2012/13	Variance
35	Unmeasured Non-Household - USPL	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.03	0.03	0.00
WRZ 2	Henley	0.01	0.01	0.00
WRZ 3	Kennet Valley	0.03	0.04	0.00
WRZ 4	London	2.08	2.03	-0.05
WRZ 5	Slough/Wycombe/Aylesbury	0.04	0.04	0.00
WRZ 6	SWOX	0.08	0.09	0.01
Total	Total	2.26	2.23	-0.03
Line Commentary:				

With the exception of a very small reduction in London all areas have seen unmeasured non-household USPL remain static compared to the previous year.

Line	Description	2011/12	2012/13	Variance
36	Measured household - USPL	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.67	0.81	0.14
WRZ 2	Henley	0.27	0.31	0.04
WRZ 3	Kennet Valley	1.22	1.49	0.27
WRZ 4	London	13.76	14.93	1.17
WRZ 5	Slough/Wycombe/Aylesbury	1.84	1.97	0.13
WRZ 6	SWOX	4.16	4.83	0.67
Total	Total	21.92	24.34	2.42
Line Commentary:				

The increase in the number of measured households is the primary cause for the increase in measured household supply pipe leakage.

Line	Description	2011/12	2012/13	Variance
37	Unmeasured household - USPL	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	2.52	2.77	0.25
WRZ 2	Henley	0.57	0.59	0.02
WRZ 3	Kennet Valley	4.49	4.91	0.42
WRZ 4	London	119.37	117.93	-1.44
WRZ 5	Slough/Wycombe/Aylesbury	7.28	7.04	-0.25
WRZ 6	SWOX	10.07	10.61	0.54
Total	Total	144.30	143.85	-0.45
Line Commentary:				

In 1996, we estimated supply pipe leakage to be 25% of total leakage based on one sample area covering approximately 20,000 properties and data from the DWUS monitor. Since then, we have continued to carry our further work to assess supply pipe leakage in the DWUS monitor and have updated the percentage of total leakage to take account of the number of supply pipe leaks repaired. The figure this year is 28.12%, the same as last. We assume that the average supply pipe leakage for externally metered properties is 25% of internally metered properties.

We recognise that this is an estimate of the proportion of total leakage and that there are other methods available to make this assessment based on estimating each component of leakage. However, having reviewed these methods, and having analysed their sensitivity to assumptions that need to be made, we do not consider these to be an improvement on our current approach.

We remain convinced that the most appropriate approach of evaluating supply pipe leakage levels is one that looks to measure total supply pipe leakage, rather than estimate individual components. We have continued to measure supply pipe leakage within VMR DMAs where we have full customer metering and through the fixed network metering trials that we initiated last year. We are also extending this analysis through the Water Infrastructure Network Solutions (WINS) project by including private mains (both rural and urban) and bulk supplies. Once we have accurate assessments of supply pipe leakage within a range of DMAs, we will then need to extrapolate to the rest of the company using cohorts of pipes based on, for example, length, material, age, diameter, surrounding soil type, etc. This work is still on-going.

Line	Description	2011/12	2012/13	Variance
38	Void Properties - USPL	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.10	0.13	0.02
WRZ 2	Henley	0.03	0.03	0.00
WRZ 3	Kennet Valley	0.16	0.20	0.03
WRZ 4	London	4.17	4.47	0.29
WRZ 5	Slough/Wycombe/Aylesbury	0.26	0.26	0.01
WRZ 6	SWOX	0.44	0.50	0.05
Total	Total	5.17	5.58	0.41
Line Commentary:				

There has been an increase in the number of void properties in all areas during 2012/13 which when combined with the increase in leakage seen in most areas has resulted in a small increase in USPL for void properties.

Line	Description	2011/12	2012/13	Variance
39	Distribution Losses	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	8.95	10.06	1.11
WRZ 2	Henley	2.35	2.50	0.15
WRZ 3	Kennet Valley	15.74	17.68	1.94
WRZ 4	London	368.49	368.23	-0.26
WRZ 5	Slough/Wycombe/Aylesbury	25.20	24.89	-0.32
WRZ 6	SWOX	39.95	43.34	3.38
Total	Total	460.69	466.69	6.00
Line Commentary:				

In all areas the changes in the level of distribution losses reflect the movements in the overall leakage levels in the WRZ's during 2012/13.

Line	Description	2011/12	2012/13	Variance
40	Total Leakage	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	12.45	14.00	1.54
WRZ 2	Henley	3.27	3.48	0.21
WRZ 3	Kennet Valley	21.90	24.60	2.70
WRZ 4	London	512.68	512.31	-0.36
WRZ 5	Slough/Wycombe/Aylesbury	35.07	34.62	-0.44
WRZ 6	SWOX	55.59	60.29	4.71
Total	Total	640.95	649.30	8.35
Line Commentary:				

This line is calculated by summing lines 34 to 39.

Line	Description	2011/12	2012/13	Variance
41	Total Leakage	l/prop/d	l/prop/d	l/prop/d
WRZ 1	Guildford	198.17	221.84	23.67
WRZ 2	Henley	154.39	163.64	9.25
WRZ 3	Kennet Valley	137.44	153.93	16.49
WRZ 4	London	184.13	182.80	-1.33
WRZ 5	Slough/Wycombe/Aylesbury	171.45	168.47	-2.98
WRZ 6	SWOX	134.44	145.41	10.97
Total	Total	175.81	177.07	1.26
Line				

Total leakage expressed in terms of litres/property/day is calculated from multiplying line 43 by 1,000 and then dividing by line 48. Changes in this line reflect changes to total leakage and property numbers.

Customers

E: Properties

The derivation of properties is detailed in Appendix 9.

Property numbers in the following tables are calculated as an average of the year start and end numbers. The figures quoted in the commentary below are the total movements during the year.

Line	Description	2011/12	2012/13	Variance
43	Unmeasured Household - Properties	000's	000's	000's
WRZ 1	Guildford	32.53	31.64	-0.89
WRZ 2	Henley	8.37	8.01	-0.36
WRZ 3	Kennet Valley	83.41	80.35	-3.07
WRZ 4	London	1924.19	1899.98	-24.21
WRZ 5	Slough/Wycombe/Aylesbury	110.00	106.85	-3.15
WRZ 6	SWOX	174.27	167.82	-6.45
Total	Total	2332.78	2294.65	-38.13
Line Commentary:				

Over the reporting year the company has seen an overall reduction in property numbers in unmeasured households of 34,058. The most significant contribution is due to 32,181 customers moving from an unmeasured tariff to a metered tariff (primarily due to the Optant metering programme).

Other significant movements include 5,817 properties being removed from the billing system (i.e demolished), 4,972 properties being made void during the year and 4,805 properties being set up under the Sales Maximisation programme. This is the programme whereby properties that are not currently on the billing system but are active are captured and added to the system.

Line	Description	2011/12	2012/13	Variance
42	Measured Household - Properties	000's	000's	000's
WRZ 1	Guildford	24.75	25.81	1.06
WRZ 2	Henley	11.16	11.62	0.46
WRZ 3	Kennet Valley	64.34	67.84	3.50
WRZ 4	London	630.47	668.55	38.08
WRZ 5	Slough/Wycombe/Aylesbury	78.91	83.01	4.10
WRZ 6	SWOX	204.71	212.44	7.73
Total	Total	1014.34	1069.27	54.94
Line Commentary:				

The company has seen an overall increase of 51,267 in measured household properties during the reporting year. The main component of this was the addition of 32,181 properties, primarily through Optant metering.

Other significant movements include the addition of 23,176 newly built residential properties, 1,817 properties that were removed from the billing system (i.e. demolished) , a reduction of 2,059 properties that were made void during the year and an increase of 1,143 properties that were included under the Sales Maximisation programme.

Line	Description	2011/12	2012/13	Variance
46	Unmeasured Non-Household Properties	000's	000's	000's
WRZ 1	Guildford	0.34	0.34	0.01
WRZ 2	Henley	0.09	0.10	0.00
WRZ 3	Kennet Valley	0.57	0.58	0.01
WRZ 4	London	33.47	32.70	-0.77
WRZ 5	Slough/Wycombe/Aylesbury	0.60	0.62	0.02
WRZ 6	SWOX	1.41	1.41	0.00
Total	Total	36.48	35.75	-0.73
Line Commentary:				

At a company level, the number of unmeasured non-household properties has reduced slightly since last year, primarily as a result of a reduction in London. The bulk of these properties are assessed properties (properties that are unable to be metered directly and are therefore charged on an assessed basis).

Line	Description	2011/12	2012/13	Variance
45	Measured Non-Household - Properties	000's	000's	000's
WRZ 1	Guildford	3.88	3.84	-0.04
WRZ 2	Henley	1.17	1.14	-0.03
WRZ 3	Kennet Valley	7.96	7.84	-0.12
WRZ 4	London	128.86	129.37	0.51
WRZ 5	Slough/Wycombe/Aylesbury	11.13	11.04	-0.09
WRZ 6	SWOX	25.40	25.10	-0.30
Total	Total	178.40	178.33	-0.07
Line Commentary:				

There has been a slight reduction in numbers of properties across all Water Resource Zones except London.

Line	Description	2011/12	2012/13	Variance
44	Void Household - Properties	000's	000's	000's
WRZ 1	Guildford	0.94	1.05	0.11
WRZ 2	Henley	0.26	0.27	0.01
WRZ 3	Kennet Valley	2.20	2.33	0.13
WRZ 4	London	47.94	53.34	5.40
WRZ 5	Slough/Wycombe/Aylesbury	2.81	2.93	0.12
WRZ 6	SWOX	5.84	5.98	0.14
Total	Total	59.99	65.90	5.91
Line Commentary:				

In the report year there has been an increase in void household properties of 5,910 properties at Company level. The largest movement was in London which shows an increase of 5,400 properties. The remaining areas saw minor movements.

Line	Description	2011/12	2012/13	Variance
47	Void Non-Household - Properties	000's	000's	000's
WRZ 1	Guildford	0.41	0.40	-0.01
WRZ 2	Henley	0.11	0.12	0.01
WRZ 3	Kennet Valley	0.85	0.87	0.03
WRZ 4	London	19.34	18.61	-0.73
WRZ 5	Slough/Wycombe/Aylesbury	1.08	1.06	-0.02
WRZ 6	SWOX	1.85	1.88	0.03
Total	Total	23.64	22.95	-0.69
Line Commentary:				

Overall there has been a slight reduction in the number of void non-household properties. There have been minor changes across all zones, the largest of which was in London where there was a reduction of 730 properties.

Line	Description	2011/12	2012/13	Variance
48	Total Properties	000's	000's	000's
WRZ 1	Guildford	62.85	63.09	0.24
WRZ 2	Henley	21.16	21.25	0.10
WRZ 3	Kennet Valley	159.32	159.80	0.47
WRZ 4	London	2784.27	2802.54	18.27
WRZ 5	Slough/Wycombe/Aylesbury	204.53	205.52	0.99
WRZ 6	SWOX	413.49	414.64	1.15
Total	Total	3645.62	3666.85	21.23
Line Commentary:				

This line is calculated by summing lines 42, 43, 44, 45, 46 and 47.

F: Population

The derivation of properties is detailed in Appendix 9.

Line	Description	2011/12	2012/13	Variance
50	Unmeasured Household - Population	000's	000's	000's
WRZ 1	Guildford	88.80	86.85	-1.95
WRZ 2	Henley	23.23	22.01	-1.22
WRZ 3	Kennet Valley	227.18	222.82	-4.36
WRZ 4	London	5022.75	5071.17	48.42
WRZ 5	Slough/Wycombe/Aylesbury	305.58	303.79	-1.79
WRZ 6	SWOX	474.58	466.35	-8.23
Total	Total	6142.12	6172.99	30.87
Line Commentary:				

All areas except London have seen a reduction in unmeasured population. Changes due to customers moving from an unmeasured tariff to a metered tariff, (primarily due to the Optant metering programme), have been offset by incorporating the latest 2011 Census data. In London, the use of this data has resulted in a net increase in unmeasured population.

Line	Description	2011/12	2012/13	Variance
49	Measured Household - Population	000's	000's	000's
WRZ 1	Guildford	55.68	57.66	1.98
WRZ 2	Henley	25.07	25.12	0.05
WRZ 3	Kennet Valley	142.53	150.68	8.15
WRZ 4	London	1524.20	1638.48	114.28
WRZ 5	Slough/Wycombe/Aylesbury	172.76	183.15	10.40
WRZ 6	SWOX	469.77	489.32	19.54
Total	Total	2390.01	2544.42	154.41
Line Commentary:				

Increases in population reflect the both the increase in property numbers and the changes in WRZ population estimates as a resulting of incorporating the latest 2011 Census data.

Line	Description	2008/09	2009/10	Variance
29	Unmeasured Non-Household Population	(000's)	(000's)	(000's)
Line Commentary:				

As assumed in previous years this remains as zero for all WRZs. This is consistent with the fWRMP.

Line	Description	2011/12	2012/13	Variance
51	Measured Non-Household - Population	000's	000's	000's
WRZ 1	Guildford	7.47	7.37	-0.09
WRZ 2	Henley	2.50	2.40	-0.09
WRZ 3	Kennet Valley	19.11	19.06	-0.05
WRZ 4	London	338.40	342.33	3.93
WRZ 5	Slough/Wycombe/Aylesbury	24.72	24.84	0.12
WRZ 6	SWOX	48.81	48.76	-0.05
Total	Total	441.01	444.76	3.75
Line Commentary:				

The movements in the measured non-household populations reflect the relative movements in the overall resource zone population splits on which they are based.

Population is derived from the sum of two components:

- Population in communal establishments (obtained from 2001 census data);
- Metered subsidiary population – derived from regulatory finance accounts listing properties with domestic size pipes supplying them.

Population in communal establishments has remained the same. Metered subsidiary population has increased from 331,158 to 334,911 following updates to the numbers of residential metered subsidiary properties.

Line	Description	2011/12	2012/13	Variance
53	Total Population	000's	000's	000's
WRZ 1	Guildford	151.95	151.89	-0.06
WRZ 2	Henley	50.79	49.53	-1.26
WRZ 3	Kennet Valley	388.82	392.56	3.74
WRZ 4	London	6885.36	7051.98	166.63
WRZ 5	Slough/Wycombe/Aylesbury	503.06	511.78	8.73
WRZ 6	SWOX	993.16	1004.42	11.26
Total	Total	8973.14	9162.17	189.03
Line Commentary:				

This line is calculated by summing lines 49, 50, 51 and 52.

G: Occupancy

Line	Description	2011/12	2012/13	Variance
55	Unmeasured Household - Occupancy Rate	h/pr	h/pr	h/pr
WRZ 1	Guildford	2.73	2.75	0.02
WRZ 2	Henley	2.78	2.75	-0.03
WRZ 3	Kennet Valley	2.72	2.77	0.05
WRZ 4	London	2.61	2.67	0.06
WRZ 5	Slough/Wycombe/Aylesbury	2.78	2.84	0.07
WRZ 6	SWOX	2.72	2.78	0.06
Total	Total	2.63	2.69	0.06
Line Commentary:				

This line is calculated from dividing line 50 by line 43.

Line	Description	2011/12	2012/13	Variance
54	Measured Household - Occupancy Rate	h/pr	h/pr	h/pr
WRZ 1	Guildford	2.25	2.23	-0.02
WRZ 2	Henley	2.25	2.16	-0.09
WRZ 3	Kennet Valley	2.22	2.22	0.01
WRZ 4	London	2.42	2.45	0.03
WRZ 5	Slough/Wycombe/Aylesbury	2.19	2.21	0.02
WRZ 6	SWOX	2.29	2.30	0.01
Total	Total	2.36	2.38	0.02
Line Commentary:				

This line is calculated from dividing line 49 by line 42.

H: Metering

Line	Description	2011/12	2012/13	Variance
56	Total Household Metering Pentration (excl. Voids)	%	%	%
WRZ 1	Guildford	43.21%	44.92%	1.72%
WRZ 2	Henley	57.13%	59.20%	2.07%
WRZ 3	Kennet Valley	43.55%	45.78%	2.23%
WRZ 4	London	24.68%	26.03%	1.35%
WRZ 5	Slough/Wycombe/Aylesbury	41.77%	43.72%	1.95%
WRZ 6	SWOX	54.02%	55.87%	1.85%
Total	Total	30.30%	31.79%	1.48%
Line Commentary:				

This line is calculated from dividing line 42 by the sum of lines 42 and 43.

Line	Description	2011/12	2012/13	Variance
57	Total Household Metering Penetration (incl. Voids)	%	%	%
WRZ 1	Guildford	42.51%	44.12%	1.61%
WRZ 2	Henley	56.39%	58.40%	2.01%
WRZ 3	Kennet Valley	42.91%	45.07%	2.17%
WRZ 4	London	24.22%	25.50%	1.27%
WRZ 5	Slough/Wycombe/Aylesbury	41.16%	43.06%	1.90%
WRZ 6	SWOX	53.20%	55.00%	1.81%
Total	Total	29.77%	31.18%	1.40%
Line Commentary:				

This line is calculated from dividing line 42 by the sum of lines 42, 43 and 44.

Critical Period - Line Commentary

Note that for the London WRZ, Annual Average is equivalent to the Critical Period. This is because London has a large volume of raw water storage reservoirs that can be drawn on to meet peak week demand and sufficient treatment capability. Thus, short-term peaks in demand can be met by treating more stored water. Therefore in London the critical period remains the annual average. Conversely, in the Thames Valley WRZs, where there is relatively little raw water storage, there is a greater risk to supply during times of peak demand during a dry year.

Supply

A: Resources

Line	Description	2011/12	2012/13	Variance
1	Raw Water Abstracted - Critical Period	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	56.58	52.69	-3.89
WRZ 2	Henley	15.17	14.25	-0.92
WRZ 3	Kennet Valley	118.63	113.23	-5.40
WRZ 4	London	2319.74	2232.18	-87.56
WRZ 5	Slough/Wycombe/Aylesbury	148.40	138.14	-10.26
WRZ 6	SWOX	300.66	383.09	82.42
Total	Total	2959.19	2933.59	-25.61
Line Commentary:				

Critical period raw water abstracted is the average abstraction made during the summer peak demand week (DI) for each WRZ. Similar to Annual Average, the values reported in Line 5 are Actual Raw Water Abstracted without any adjustment for abstraction that supplies non-public sources and returns to river. Changes in raw water reservoir levels have also not been included.

Line	Description	2011/12	2012/13	Variance
2	Raw Water Imported - Critical Period	Ml/d	Ml/d	Ml/d
Line Commentary:				

There are no raw water imports to Thames Water.

Line	Description	2011/12	2012/13	Variance
3	Potable Water Imported - Critical Period	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.00	0.00	0.00
WRZ 2	Henley	0.00	0.00	0.00
WRZ 3	Kennet Valley	0.00	0.00	0.00
WRZ 4	London	0.00	0.00	0.00
WRZ 5	Slough/Wycombe/Aylesbury	0.17	0.17	-0.01
WRZ 6	SWOX	1.05	1.35	0.30
Total	Total	1.23	1.52	0.29
Line Commentary:				

Potable Water Imports (Critical Period)				
To (WRZ)	**From**	**JR12 (Ml/d)**	**JR13 (Ml/d)**	**Change**
SWA	Anglian Water	0.17	0.17	-0.01
SWOX	Anglian Water	0.01	0.02	0.02
SWOX	Severn Trent	0.12	0.00	-0.12
SWOX	SWA	0.92	1.33	0.41
Total		**1.23**	**1.52**	**0.29**

Critical period potable water imports are the actual imports made during the summer peak demand week (DI) for each WRZ.

Thames Water has no potable water imports governed by formal bulk supply agreements. However, a number of small imports exist that are not covered by formal bulk supply agreements and hence not included in the fWRMP or in Table 10a. These include a transfer from Anglian Water to SWA and SWOX, which averaged 0.17 Ml/d and 0.02 Ml/d respectively during the summer peak week in 2012/13. The import from Severn Trent to SWOX was not used in the 2012/13 peak week.

There is also an interzonal transfer from SWA to SWOX. This averaged 1.33 Ml/d during the summer peak week in 2012/13. A provision of 5.0 Ml/d is included in the fWRMP.

Line	**Description**	**2011/12**	**2012/13**	**Variance**
4	Raw Water Losses and Operational Use – Critical Period	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.09	0.13	0.03
WRZ 2	Henley	-0.08	-0.14	-0.07
WRZ 3	Kennet Valley	0.71	0.91	0.20
WRZ 4	London	15.69	11.68	-4.01
WRZ 5	Slough/Wycombe/Aylesbury	-0.10	-0.15	-0.05
WRZ 6	SWOX	0.80	-1.11	-1.91
Total	Total	17.12	11.32	-5.80
Line Commentary:				

Raw water losses and operational use are assumed to be 10% of total process losses in London and 15% in the remaining WRZ's. Process losses are calculated as the difference between the volume of raw water entering treatment and the volume of potable water entering supply.

Negative process losses are reported in Henley, SWA and SWOX. This is due to errors, in the order of $^{+}/_{-}$ 4.79%, $^{+}/_{-}$ 0.55%, $^{+}/_{-}$ 2.01% respectively, in the measurement of Raw Water into Treatment and Treated Water into Supply. These are all within the meter verification tolerances of $^{+}/_{-}$ 5%.

Line	Description	2011/12	2012/13	Variance
5	Raw Water Exported – Critical Period	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.00	0.00	0.00
WRZ 2	Henley	0.00	0.00	0.00
WRZ 3	Kennet Valley	0.00	0.00	0.00
WRZ 4	London	91.03	91.42	0.39
WRZ 5	Slough/Wycombe/Aylesbury	0.00	0.00	0.00
WRZ 6	SWOX	0.00	0.00	0.00
Total	Total	91.03	91.42	0.39
Line Commentary:				

The only raw water exports we operate are in the London WRZ, which remains as per the Annual Average.

Line	Description	2011/12	2012/13	Variance
5.1	Non Potable Water Supplied – Critical Period	Ml/d	Ml/d	Ml/d
Line Commentary:				

Thames Water has no non-potable supplies.

Line	Description	2011/12	2012/13	Variance
6	Potable Water Exported – Critical Period	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	1.88	1.79	-0.09
WRZ 2	Henley	0.00	0.00	0.00
WRZ 3	Kennet Valley	0.00	0.00	0.00
WRZ 4	London	0.46	0.39	-0.07
WRZ 5	Slough/Wycombe/Aylesbury	1.25	1.76	0.50
WRZ 6	SWOX	0.01	0.02	0.01
Total	Total	3.59	3.95	0.36
Line Commentary:				

Potable Water Exports (Critical Period)				
From (WRZ)	**To**	**JR12 (Ml/d)**	**JR13 (Ml/d)**	**Change**
Guildford	Veolia Water	1.88	1.79	-0.09
SWA	SWOX	0.60	1.47	0.87
SWA	Anglian Water	0.65	0.29	-0.37
SWOX	Wessex Water	0.01	0.02	0.01
Total		**3.13**	**3.56**	**0.43**

Critical period potable water exports are the actual exports made during the summer peak demand week (DI) for each WRZ. Please refer to the Annual Average Commentary for potable water exports from London WRZ.

There is an export from Ladymead in Guildford WRZ to Affinity Water which averaged 1.79 Ml/d during the summer peak week of 2012/13. This is compared to an allowance of 2.3 Ml/d in the fWRMP.

There are two transfers from SWA i.e. an export of 1.47 Ml/d to SWOX and 0.29 Ml/d from Hambledon in SWA to Anglian Water.

There is also a bulk transfer from SWOX to Wessex Water of 0.02 Ml/d

Line	Description	2011/12	2012/13	Variance
7	Deployable Output – Critical Period	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	75.68	71.20	-4.48
WRZ 2	Henley	26.30	26.30	0.00
WRZ 3	Kennet Valley	165.80	160.08	-5.72
WRZ 4	London	2146.00	2144.00	-2.00
WRZ 5	Slough/Wycombe/Aylesbury	215.11	209.89	-5.22
WRZ 6	SWOX	377.14	371.21	-5.93
Total	Total	3006.03	2982.68	-23.35
Line Commentary:				

Guildford

Critical Period (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP09 Forecast
DO	75.68	71.20	76.70
Climate Change Impacts	0.00	0.00	0.00
Network Constraints	0.00	0.00	0.00
Guildford Constrained DO	**75.68**	**71.20**	**76.70**

DO has reduced by 4.48 Ml/d since AR12 in Guildford due to the March 2013 revision of SDO (see Appendix 3).

Compared to the fWRMP DO has reduced by 0.8 Ml/d at Dupdune due to abstraction pump performance and by 0.22 Ml/d as a result of small changes at sites within the resource zone as part of the JR10 SDO review.

Henley

Critical Period (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP09 Forecast
DO	26.30	26.30	26.65
Climate Change Impacts	0.00	0.00	0.00
Network Constraints	0.00	0.00	0.00
Henley Constrained DO	**26.30**	**26.30**	**26.65**

There have been no changes in DO since AR12 in Henley.

Compared to the fWRMP, DO has reduced by 0.15 Ml/d as result of booster pump performance constraining output and 0.2 Ml/d due to clarification of Harpsden and Sheeplands DOs. Harpsden DO is now considered as the treated output from that site whereas the transfer of Harpsden raw water to Sheeplands for blending is now considered in the Sheeplands DO.

Kennet Valley

Critical Period (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP09 Forecast
DO	165.80	160.08	177.55
Climate Change Impacts	0.00	0.00	3.70
Network Constraints	0.00	0.00	0.00
Kennet Valley Constrained DO	**165.80**	**160.08**	**173.85**

There has been a reduction of 5.72 Ml/d in the DO of Kennet Valley since AR12 due to the March 2013 revision of SDO (see Appendix 3).

Critical period DO has reduced by further 11.75 Ml/d since the fWRMP. The significant reductions are:

- A reduction in DO of 4.3 Ml/d at East Woodhay due to power restrictions at East Woodhay limiting borehole pumping capacity.
- The peak DO of Mortimer (4.55 Ml/d) was previously shown as an outage but is now assessed as disused as there are no plans to re-commission the source.
- The reduction in the Bishops Green DO (2.20 Ml/d) is due to reconsideration of deepest advisable pumping water level (DAPWL) based on fissure zone in ABH3.
- A reduction of 0.2 Ml/d due to power restrictions at East Woodhay preveting both borehole pumps being run together.
- The remaining difference is the result of minor adjustments across a number of other sources.

The removal of climate change impacts accounts for the additional difference between AR13 and the fWRMP Constrained DO.

Slough/Wycombe/ Aylesbury

Critical Period (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP09 Forecast
DO	220.31	215.09	223.61
Climate Change Impacts	0.00	0.00	0.64
Network Constraints	5.20	5.20	5.20
SWA Constrained DO	**215.11**	**209.89**	**217.77**

There has been a 5.22 Ml/d reduction in DO in Slough/Wycombe/Aylesbury since AR12 due to the March 2013 revision of SDO (see Appendix 3).

Critical period DO is a further 3.3 Ml/d lower than the fWRMP. This is due to Dorney source deepest advisable pumping level being redefined and a revision of the WTW disinfection capability at Hampden.

The removal of climate change impacts accounts for the additional difference between AR13 and the fWRMP Constrained DO.

SWOX

Critical Period (All figures in Ml/d)	2011/12	2012/13	
	Actual (AR12)	Actual (AR13)	fWRMP09 Forecast
DO	381.88	373.85	384.29
Climate Change Impacts	0.00	0.00	2.26
Network Constraints	4.23	2.64	9.59
SWOX Constrained DO	**377.65**	**371.21**	**372.44**

There has been a reduction in DO of 8.03 Ml/d in SWOX since AR12 due to the March 2013 revision of SDO (see Appendix 3).

Critical period DO has reduced by 10.44 Ml/d from the forecast in the fWRMP. This year's review of Source Deployable Outputs (SDOs) which has reduced DO significantly in SWOX has counteracted some of the previous increase resulting from the enhanced Gatehampton/Compton licence transfer scheme delivery in 2010/11, reviews of Source Deployable Outputs (SDOs) undertaken in July 2009 and March 2010 and amendments to the peak DO's of the Chinnor and Britwell groundwater sources reducing from the increase due to the Gatehampton/Compton licence transfer scheme.

The removal of climate change impacts and the resolution of some network constraints account for the remaining difference between the AR13 and fWRMP Constrained DO.

B: Process Losses

Line	Description	2011/12	2012/13	Variance
9	Treatment Works Losses and Operational Use	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	0.85	1.14	0.28
WRZ 2	Henley	-0.70	-1.29	-0.59
WRZ 3	Kennet Valley	6.37	8.27	1.90
WRZ 4	London	162.34	136.60	-25.74
WRZ 5	Slough/Wycombe/Aylesbury	-0.37	-1.37	-1.00
WRZ 6	SWOX	12.05	-9.99	-22.04
Total	Total	180.55	133.36	-47.18
Line Commentary:				

Treatment Works losses and operational use are assumed to be 90% of total process losses in London and 85% in the remaining WRZ's. Process losses are calculated as the difference between the volume of raw water entering treatment and the volume of potable water entering supply.

Negative process losses are reported in Henley, SWA and SWOX. This is due to errors, in the order of +/- 4.8%, +/- 0.6%, +/- 2.0% respectively, in the measurement of Raw Water into Treatment and Treated Water into Supply. These are all within the meter verification tolerances of +/- 5%.

There were no abstractions, during the summer peak week, that supply non-public sources at Sewage Treatment Works (STWs) which are included as treatment works operational use.

Non-Public Supply (Critical Period) - Treatment Works Ops Use		
Site	**WRZ**	**(Ml/d)**
Slough STW	SWA	0.00
Iver South STW	SWA	0.00
Total		**0.00**

There were returns to river at Fobney Water Treatment Works during the summer peak week.

Returns to River (Critical Period)- Treatment Works Ops Use		
Site	**WRZ**	**(Ml/d)**
Farmoor WTW	SWOX	0.00
Fobney WTW	Kennet Valley	0.13

Line	Description	2011/12	2012/13	Variance
10	Outage Experienced	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	1.06	2.08	1.02
WRZ 2	Henley	0.01	0.00	-0.01
WRZ 3	Kennet Valley	0.00	0.02	0.02
WRZ 4	London	90.35	120.28	29.93
WRZ 5	Slough/Wycombe/Aylesbury	9.95	18.30	8.35
WRZ 6	SWOX	2.73	3.83	1.10
Total	Total	104.10	144.51	40.41
Line Commentary:				

Annual average actual outage is reported here. Please refer to the annual average commentary.

Demand

Line	Description	2011/12	2012/13	Variance
11	Distribution Input	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	53.41	49.29	-4.12
WRZ 2	Henley	15.77	15.51	-0.26
WRZ 3	Kennet Valley	109.73	102.23	-7.50
WRZ 4	London	2004.31	1987.99	-16.31
WRZ 5	Slough/Wycombe/Aylesbury	146.87	137.15	-9.72
WRZ 6	SWOX	286.01	278.37	-7.64
Total	Total	2616.09	2570.53	-45.55
Line Commentary:				

Critical Period DI for the Thames Valley WRZs is derived by calculating average day peak week (ADPW) for each WRZ. This is done by calculating a rolling seven-day average of measured DI and taking the highest weekly average during the summer.

There are decreases in DI in all zones for 2011/12 which reflects the less warm and significantly wetter weather experienced in during the year than was the case in 2011/12.

Sections C-H, Lines 19-57

To populate the remaining lines the annual average water balance components have been peaked using peaking factors derived from 2012/13 data. To reconcile the peak water balance components with the 2012/13 observed ADPW DI, the peaking factors were adjusted downwards proportionally. This ensures that our approach remains consistent between these tables and the fWRMP.

Confidence Grades:

There are no confidence grades associated with this table.

Appendix 3: AR13 Deployable Output Update

London's Deployable Output for AR13 Update April 2013

An update of the review of the Deployable Output (DO) for London for the Annual Return 2013 has been undertaken which reflects the latest information from a variety of sources across the Company. This analysis has been undertaken to the nearest 1 Ml/d for London.

The review has assessed the following scenarios:

	Steps	Ave. D.O. Ml/d	Description
1	AR12 DO Update	2146	Annual Return 2012
2	March 2013 SDO Updates	2144	Groundwater SDOs reviewed

1. The DO of 2146 Ml/d is the starting point for this update. This DO was used in the Annual Return 2012.

2. The Water Modelling Groundwater Team completed reviews of Source Deployable Outputs (SDOs) in April 2013. Putting these into WARMS decreases London DO by 2 Ml/d

Note: the step change in DO will not necessarily be even as with changes to schemes or assumptions. This is because the analysis is dependent upon the steps of the demand forecasts, the level of demand, the assumptions within the Lower Thames Operating Agreement and other factors used to produce the DO.

SWOX (Swindon, North & South Oxon.) Deployable Output

	Steps	Ave. D.O. Ml/d	Peak DO Ml/d	Description
1	AR12	326.6	381.9	Annual Return 2012
2	SDO Updates March 2013	319.5	373.9	Groundwater SDOs reviewed

1. The DOs as submitted in the Annual Return 2012 and used in the dWRMP14 is the starting point for the update.

2. The Water Modelling Groundwater Team completed reviews of Source Deployable Outputs (SDOs) in March 2013.

SWOX Average DO changes:

The following changes have occurred in the SWOX WRZ:

- Manor Road (Wantage) is now back online with an Average DO of 2.7 Ml/d following installation of a nitrate removal plant.
- Watlington Average DO has increased by 0.27 Ml/d due to a contact tank upgrade.

However these increases have been counteracted by a number of Average DOs reducing due to hindcasting the impact of drought conditions with the most significant of these being losses of 3.3 Ml/d at Cleeve and 2.0 Ml/d at Childrey Warren. Bibury average DO has also decreased by 3.2 Ml/d due to a review of the licence and analysis of spring flow together with hindcasting of drought conditions.

SWOX Peak DO changes:

There have been 3 increases in SWOX Peak DOs:

- Ashdown Park has increased by 0.67 Ml/d, which means that under drought conditions both boreholes will operate together.
- Watlington has increased by 0.27 Ml/d due to a contact tank upgrade.
- Manor Road (Wantage) is now back online with a Peak DO of 2.7 Ml/d following installation of a nitrate removal plant.

All other SWOX Peak DO changes have been reductions, mostly minor, mainly due to hindcasting drought conditions. The largest reductions are at Ashton Keynes (-3.1 Ml/d), Latton (-4.7 Ml/d), Cleeve (-3.3 Ml/d), Childrey Warren (-2.0 Ml/d) and Bibury (-3.2 Ml/d).

Thus the overall change in the SWOX DO position from the AR12 submission to the AR13 submission is a decrease of 7.1 Ml/d to 319.5 Ml/d Average DO and a decrease of 8 Ml/d to 373.9 Ml/d Peak DO. Note there is not a 1 to 1 reduction in overall peak DO for SWOX due to the interaction of groundwater with the Farmoor reservoir system and circulation of water around the catchment to meet demand.

Summary of DO changes

In addition to the changes in London and SWOX there are changes in Kennet Valley, SWA and Guildford water resource zones but not Henley.

The summary of the Dry Year Annual Average (DYAA) DO's is as follows:

Supply (Ml/d)	London	SWOX	Kennet Valley	Henley	SWA	Guildford
DYAA DO 2011-12	2146	326.6	141.6	25.7	188.2	65.2
DYAA DO 2012-13	2144	319.5	137.1	25.7	186.3	65.0
DO Difference	-2	-7.1	-4.5	0.0	-1.9	-0.2

DYAA Notes:

Kennet Valley
Pangbourne Average DO has reduced by 4.45 Ml/d due to hindcasting the impact of drought conditions. There has also been a minor decrease at Ufton Nervet due to accounting for process water losses. In total Kennet Valley DYAA DO decreases by 4.5 Ml/d.

Slough, Wycombe & Aylesbury
Bourne End Average DO has been reduced slightly due to a minor correction to the flow rate required to be maintained in the Abbotsbrook plus Radnage has been

reduced by 0.55 Ml/d and Hawridge by 1.24 Ml/d due to modification of their drought curves and hindcasting reducing their potential yield. In total SWA DYAA DO decreases by 1.9 Ml/d.

Guildford
Minor reductions have been made to Netley Mill, Brook, Cotterells Farm & Shere Heath due to process losses being taken into account. Mousehill has marginally decreased due to reduced abstraction pump capacity. There is a minor decrease in Guildford's DYAA DO of 0.2 Ml/d.

The summary of the Dry Year Critical Period (DYCP) is as follows:

Supply (Ml/d)	London	SWOX	Kennet Valley	Henley	SWA	Guildford
DYCP DO 2011-12	N/A	381.9	165.8	26.3	220.3	75.7
DYCP DO 2012-13	N/A	373.9	160.1	26.3	215.1	71.2
DO Difference	N/A	-8.0	-5.7	0.0	-5.2	-4.5

DYCP Notes:

Kennet Valley
Pangbourne Peak DO has reduced by 4.45 Ml/d due to hindcasting the impact of drought conditions and there are other minor reductions at Bishops Green, Ufton Nervet and Fognam Down. In total these reduce Kennet Valley DYCP DO by 5.7 Ml/d

Slough, Wycombe and Aylesbury
Resources with the greatest DO changes are as follows:

- Dorney has reduced by 2.3 Ml/d following revised summary diagram due to review of data.
- Hawridge has reduced by 1.24 Ml/d due to reassessment of the drought curve and hindcasting reducing the potential yield.
- Hampden has reduced by 1.08 Ml/d due to hindcasting plus the pump intake limiting DO.
- There are other minor changes at Datchet, Bourne End, Radnage and Dancers End which in total reduce SWA DYCP DO by 5.2 Ml/d.

Guildford
Ladymead DO has decreased by 2.4 Ml/d due to reassessment of the drought curve and revised DAPWL; hindcasting reduced potential yield plus the DO being limited by pump. Mousehill has reduced by 1.14 Ml/d as a result of reduced abstraction pump capacity. Minor decreases in DO have been made to Dapdune, Netley Mill, Brook, Cotterells Farm & Shere Heath due to process losses being taken into account.

The only increase in DO of 0.05 Ml/d has been at Millmead due to reassessment of treatment capability. Overall Guildford DYCP DO decreases by 4.5 Ml/d.

Appendix 4: Summary of Thames Water Outages for 2012-2013

1. Introduction

The Company reports on "Actual Outages" in the Annual Return to the Environment Agency and "Outage Allowance" in the Security of Supply Index Annual Return. This allows Actual Outage to be compared with the Outage Allowance, the planned outage. Information has been collated for the period from April 2012 to the end of March 2013 and an assessment of the Actual Outage for 2012-13 has been made together with an update of the Outage risk assessment; the Outage Allowance.

2. London Outage

The collated events for London are summarised in Table 27 below. The impact of these outages on the major Water Treatment Works are assessed using WARMS and input as a cumulative impact across the year. This is because the outages at the various works occur at different times throughout the year and influence how water is supplied to Thames Water customers. The result is an outage of 13 Ml/d, which when added to the outages at the smaller works gives a total London Outage of 120.3 Ml/d, which is an increase in Actual Outages for London over the reporting period of 30 Ml/d compared to last year's figure of 90.4 Ml/d.

3. Thames Valley Outage

The collated events for Thames Valley are summarised in Table 28. The largest of the Outages has occurred in Slough, Wycombe & Aylesbury (SWA) with 18.3 Ml/d as a result of the refurbishment of Pann Mill. There are a number of events that have contributed to outage in SWOX with a number of sites being re-furbished. Overall there has been a little change in the level of outages in the reminder of the Thames Valley over the reporting period.

Table 27: London Outages 2012-2013

London Outages 2012-2013

Thames Valley WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Battersea	Ammonia Levels	365	6.90
Honor Oak	Planned Work	365	1.75
Merton	Engineering	365	2.27
Nonsuch	Borehole issues - turbidity	365	1.77
Epsom / Railway borehole	Borehole issues - turbidity	365	13.20
Streatham	Plant Failure	335	4.58
		Total	30.47

South East WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Bell Green	Sample failure	81	3.46
Crayford	Site upgrade	167	6.05
Horton Kirby	Planned Work	191	2.69
Lady Well Fields	WQ issues and inspection by regulator	38	1.00
North Orpington	Burst pipe on the chemical feed tank linked to membranes.	12	0.27
Orpington	Issues with site operation	16	0.43
Sundridge	Site upgrade	365	1.36
West Wickham	Turbibity	365	8.20
Westerham	Site upgrade	202	0.32
		1	
		Total	23.79

Lee Valley WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Waltham Abbey	treatment process issues - awaiting site recommissioning	306	9.56
Wanstead	treatment process issues - awaiting site recommissioning (inc.	365	5.38
Coppermills Clear Water Pumps	Clear water pumps require cooling feed	129	11.31
ELRED (East Ham)	Treatment process issues at East Ham	365	15.30
Stratford Box	Water quality issues	365	11.47
		Total	53.02

London Major Water Treatment Works	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Chingford	Process Issues	365	
Coppermills	All high lift pumps tripped	2	
Coppermills	Spring Algal Blooms impact	110	
Hornsey	Site being re-furbished	365	
Ashford	TWRM isolation valve fault	9	
Ashford	Treatment process	4	13.00
Hampton	SSF's poor bacti results on two beds	6	
Kempton	Low lift pump issues & SSF bed outages	11	
Kempton	Planned outage due to project and maintenance activity	45	
Kempton	Reduced output from Slow sand filters	82	
Walton	Water quality issues	365	

Total London Outage for 2012-13		120.28

Table 28: Thames Valley Outages 2012-2013

Thames Valley Outages 2012-2013

Swindon WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Ashdown Park	Maintenance	16	0.12
Dovedale	Sheafhouse which treats water from this site needs refurbishment	365	0.69
Blockley	Sheafhouse which treats water from this site needs refurbishment	365	0.92
Swindon Total			1.73

North Oxon WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Farmoor	Acid plant dosing failure	0.46	0.04
Farmoor	Maintenance - repair of main to RGF	0.58	0.08
Farmoor	Planned work - mains repair DAF-RGF	0.79	0.09
Farmoor	Power failure - mains supply	0.50	0.05
Farmoor	Treatment failure - coagulant dosing	0.29	0.02
Swinford	Power failure - mains supply	0.42	0.03
North Oxon Total			0.30

South Oxon WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Britwell	Planned re-furbishment	365	1.31
Chinnor	Planned re-furbishment	119	0.48
Watlington	Maintenance	1	0.00
South Oxon Total			1.80
		SWOX Total (Swindon + NOXON + SOXON)	**3.83**

Kennet Valley WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
East Woodhay	Maintenance	1	0.02
Kennet Valley Total			0.02

Henley WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
No outages			0.00
Henley Total			0.00

Slough, Wycombe & Aylesbury WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Dancers End	Water quality	365	1.49
Radnage	Maitenance	3	0.01
Pann Mill	Planned re-furbishment	365	16.80
SWA Total			18.30

Guildford WRZ	Reason for Outage	Total No. Days Outage	Weighted Outage (Ml/d)
Millmead	Maintenance	1	0.01
Sturt Road, Haslemere	Water quality	365	2.07
Guildford Total			2.08

4. Results

The difference between the “Outage Risk” and the “Actual Outage” that has occurred over the period 2006-07 to 2012-13 across the Company area is shown in Table 29 and Figure 3. Whilst there are changes in Outages year on year the total Actual Outage for the Thames Water area is 144.5 Ml/d, which is an increase from last years and the highest on record. An update of the Outage Risk assessment is also presented, which shows an increase in Outage Risk primarily as a result of the number of outages last year off-setting the reduction in risk from extending the available record, i.e. if there were no outages in any year the risk would be reduced as another year has gone by.

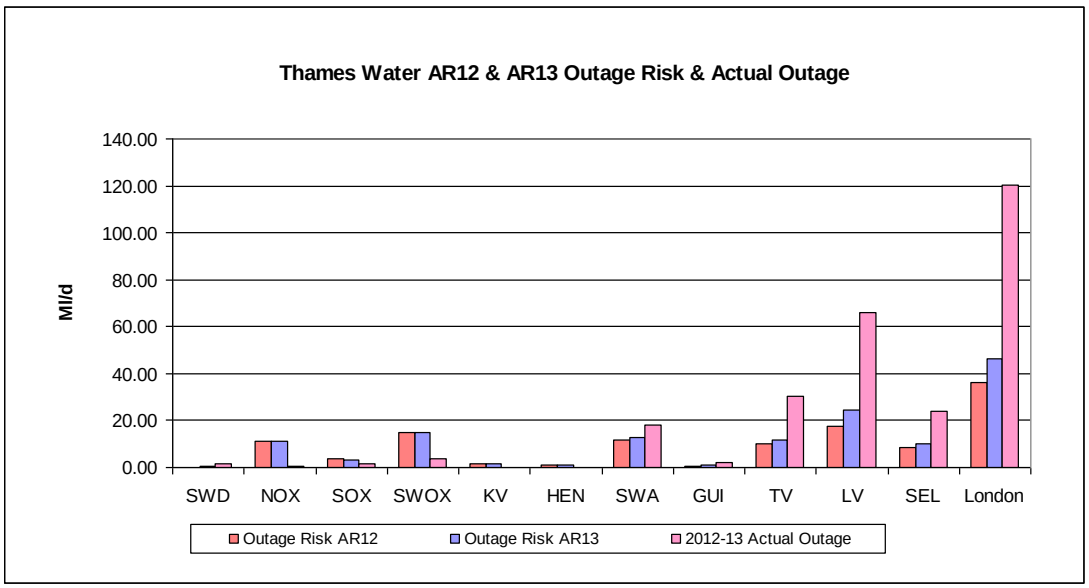
Table 29: Outage Assessment for inclusion in AR13

Outage Assessments for Inclusion in AR13 (Ml/d) -- Outage Risk @ 5%

Resource Zone	SWD	NOX	SOX	SWOX	KV	HEN	SWA	GUI	TV	LV	SEL	London	Total
Outage Risk dWRMP08	0.99	9.19	0.43	10.61	1.60	1.07	3.00	0.38	1.13	3.34	7.07	11.53	28.22
Outage Risk WRMP09/JR08	0.91	9.06	0.66	10.62	1.68	1.05	3.06	0.38	1.06	5.73	7.97	14.76	31.57
Outage Risk Update 2009	0.49	9.12	3.72	13.33	2.18	1.06	9.53	0.64	2.45	6.98	8.53	17.97	44.70
Outage Risk JR10	0.25	9.46	3.43	13.14	1.79	1.06	9.71	0.65	4.70	11.43	8.34	24.47	50.82
Outage Risk JR11	0.23	11.55	3.51	15.28	1.78	1.06	10.84	0.62	9.23	16.92	8.42	34.57	64.15
Outage Risk AR12	0.18	11.36	3.50	15.04	1.77	1.08	11.97	0.78	10.00	17.42	8.61	36.04	66.67
2006-7 Actual Outage	0.08	0.00	0.50	0.58	0.00	0.00	0.11	0.03	55.77	0.00	4.21	60.0	60.7
2007-8 Actual Outage	0.93	1.03	2.31	4.27	4.50	0.00	0.00	0.00	3.45	11.00	4.21	18.7	27.4
2008-9 Actual Outage	0.93	0.34	10.65	11.92	4.55	0.61	10.65	1.13	13.90	9.70	31.20	54.8	83.7
2009-10 Actual Outage	0.15	3.62	1.09	4.86	0.02	0.00	5.52	0.00	32.98	21.95	3.89	58.8	69.2
2010-11 Actual Outage	0.00	9.93	1.66	11.59	0.00	0.00	10.97	0.00	59.25	46.43	7.62	113.3	135.9
2011-12 Actual Outage	0.02	1.31	1.41	2.73	0.00	0.01	9.95	1.06	19.53	63.41	7.41	90.4	104.1
2012-13 Actual Outage	1.73	0.30	1.80	3.83	0.02	0.00	18.30	2.08	30.47	66.02	23.79	120.3	144.5
Outage Risk AR13	0.30	11.15	3.44	14.88	1.85	1.05	12.53	0.81	11.63	24.43	10.21	46.27	77.39

Note: the table above and the chart below include WRZ's and their sub-areas.

Figure 3: AR12 & AR13 Outage Risk & Actual Outage



5. Discussion

An assessment of the Outage for 2012-13 has been made and an update of the Outage Risk (at 5%) has been re-assessed. The Actual Outage may well be larger than Outage Risk but depends on the nature and the number of events that have occurred in the year as well as the duration.

The level of risk also depends on the length of record available over which to assess the risk, currently we have twelve years of record from 2001. Outage Risk is calculated from the product of the magnitude of the outage; the frequency of occurrence from the probability density function (pdf); and the duration from its pdf. The period of time that an Actual Outage has occurred in any year is also taken into consideration, as the source may still be available for much of the year.

The Actual Outage for 2012-13 remains larger than the outage risk as the length of record on which these assessments are made is relatively short and the full range of Outages that could occur has yet to be experienced..

6. Summary of Outage Impacts

WR Zone	Comment on Actual Outage	Comment on Change to Outage Risk
SWOX	Outage is of the same order of magnitude as last year with refurbishment of a couple of sources in the South OXON area.	Outage Risk is of the same order of magnitude as AR12 and minor variability is seen as a result of the Monte Carlo sampling and timing of outages in the year.
Kennet Valley	Only one minor outage reported	Outage Risk remains at the expected level.
Henley	No issues within the year.	Outage Risk remains at the expected level.
Slough, Wycombe & Aylesbury	Engineering work and water quality investigations have again influenced Actual Outage this year.	The issues have resulted in a marginal increase in the Outage Risk.
Guildford	Water quality issues a Sturt Road has resulted in the main outage over the year.	Outage Risk remains at the expected level.
London	Actual Outage continues to be greater than the Outage Risk.	The increased level of Actual Outage has resulted in an increase in Outage Risk.

Appendix 5: Inset Appointments

Insets in Thames Water's Region						
Year	Inset Provider	Site	No of properties	Services	Max Demand (m³/year)	Status
2009	SSE Water	Kennet Island Phase 5&6 (see phase 7&8)	1600	Water and waste	see phase 7&8	Appointed
	SSE Water	Hale Village	300	Water and waste	206,992	Appointed
2010	SSE Water	Bromley Common, Kent	650	Water and waste	58,458	Appointed
	IWN	The Bridge, Dartford	900	Water and waste	134,000	Appointed
	SSE Water	Park Views, Epsom*	350	Water and waste	421,000	Appointed
	IWN	Berryfields (Phase 1), Aylesbury	3600	Water and waste	657,000	Appointed
	IWN	Kings Cross, London	2500	Water and waste	1,300,000	Appointed
	SSE Water	Kingsmere, Bicester	400	Water only	29,200	Appointed
2011	SSE Water	Great Western Park, Didcot	3300	Water and waste	421,000	Appointed
	SSE Water	New South Quarter, Croydon	370	Water and waste	40,400	Appointed
	SSE Water	Barking Riverside	660	Waste Only	n/a	Appointed
	SSE Water	Kennet Island Phase 7&8	650	Water and Waste	110,000	Appointed
2012	SSE Water	Marine Wharf	550	Water and Waste	65,000	Appointed
	SSE Water	Riverlight	752	Water and Waste	82,000	Appointed
2013	IWN	Berryfields (Phase 2)	see Berryfields Phase 1	Water and Waste	see Berryfields Phase 1	Appointed

Appendix 6: Sustainability Reductions

AMP3 Sustainability Reductions

A number of schemes remain from AMP3 and outstanding issues have been completed in the last year. The actions to complete these schemes are summarised below at a resource zone level.

London WRZ – River Darent

The final delivery of the Darent resource replacement scheme and further developments is complete delivering the resource replacement for the full 27 Ml/d through the new abstraction boreholes. The construction of the WTW is complete and commissioning successfully undertaken. Abstractions from Horton Kirby and Eynsford have been reduced to meet conditions set out in the Lane End licence, with the full 27 Ml/d reductions being used during the more significant low flow periods.

At PR04, Ministerial Guidance considered that compensation costs for the revocation or variation of abstraction licences are an essential component of the Environment Agency's (EA) water resource management function, and as such they should be met through the EA's Scheme of Abstraction Charges. This scheme involves all abstractors with chargeable licences funding the compensation payments.

Thames Water and the EA agreed a value for the compensation payment and the EA made the Payment to Thames Water in February 2013. At the same time the final amendments to the Eynsford and Horton Kirby abstraction licences were made so completing stage 2 of the Darent scheme.

Slough/Wycombe/Aylesbury WRZ - Mill End and New Ground

The Mill End scheme has been completed and allowed abstraction at Mill End to cease from the Autumn of 2010.

The New Ground source has also been closed and abstraction has ceased. An emergency licence is still held for this source although it cannot be recommissioned in the short term. It is not needed in a state of readiness any longer as a solution has been installed to improve the resilience of the Hawridge source which previously required New Ground as a back-up source.

AMP4 Sustainability Reductions, Investigations and Options Appraisal

All AMP4 sustainability reductions have been completed, all investigations associated with the RSAP were carried out jointly with the EA and are now complete, and the options appraisals arising as requirements in AMP4 have been completed. Details of these have been reported in previous returns.

AMP5 Sustainability Reductions

Sustainability Reductions or mitigation solutions to address low flow issues are required for two cases in AMP5. These are for Speen groundwater source and for

Thatcham Reedbeds Special Area of Conservation (SAC). These schemes were funded under the FD.

Speen

This scheme is underway and the solution has been developed through project implementation stage to detailed design and site investigation. The solution is for a pipeline from Theale to Crookham Common to bring water in from the Reading area to support Newbury when the Speen licence is reduced. The scheme is due to be delivered by March 2014 and is on track.

Thatcham Reedbeds

The Thatcham Reedbeds scheme is to deliver a mitigation solution to protect the Thatcham Reedbeds Special Area of Conservation (SAC) which is designated under the European Habitats Directive.

The originally identified solution of mitigation through drilling of boreholes to allow for augmentation of the reedbeds underwent options appraisal and it was identified that this option had high risk of contamination due to landfill contamination in the area. All potential options were reviewed and the option selected for implementation was development of an abstraction from the River Kennet. The preferred option has been agreed with the Environment Agency and Natural England and is being progressed by the Thames Water Capital Delivery team.

The solution delivery date was projected to be March 2014 but this under review by the Capital Delivery team.

Axford and Ogbourne

A licence reduction is also required at our Axford source in SWOX in order to mitigate potential adverse environmental impact on the River Kennet SSSI. This option was not funded in the FD. The scheme will also require closure of the Ogbourne source following an investigation and options appraisal into the Ogbourne abstraction. The scheme is due to be funded through the payment of compensation through the Environment Agency's abstraction charging scheme as in the case for the Darent scheme (see section 1.2.4 below). However, the funds to enable delivery of the scheme have not yet been made available and so the scheme has not commenced although Thames Water has undertaken network modelling and outline design work and developed a provisional programme and best estimate of cost. Thames Water continues to work closely with the Environment Agency to resolve this funding issue so that the scheme can be progressed. Thames Water also continues to work on option development for the Axford solution on the basis that a funding solution will be confirmed in the near future through agreement with the EA on release of funds.

AMP5 Investigations

A number of investigations have been undertaken in the AMP5 period. These are shown in Table A5.1.

Table 30: RSAP Investigations in AMP5

Investigation name	River or water body	Completion Date	WRZ	EA Region
Lower Thames	River Thames and Thames Tideway	31/03/2013 **Complete**	London	Thames
Waddon	Waddon Ponds	31/03/2013 **Complete**	London	Thames
Mousehill & Rodborough	Royal Brook	31/03/2013 **Complete**	Guildford	Thames
Pann Mill	River Wye	31/03/2013 **Complete**	Slough/ Wycombe/ Aylesbury	Thames
Manor Road, Wantage	Letcombe Brook	31/03/2013 **Complete**	SWOX	Thames

These investigations were completed by March 2013 with indicative results provided to the EA for potential sustainability reductions in August 2012 to feed in to the draft WRMP14.

Options Appraisal arising from AMP5

In addition a number of options appraisals are required in the AMP5 period following investigations in AMP4 or AMP3. These are listed in Table A5.2. These options appraisals are not funded through the regulatory process or Environmental Improvement Unit Charge (EIUC) and they have therefore been funded by Thames Water.

Table 31: Options Appraisal required in AMP5

Options Appraisal	River or water body	Completion Date	WRZ	EA Region
Ogbourne	River Og	31/03/2013 **Complete**	SWOX	Thames
Farmoor	Oxford Watercourses	31/03/2013 **Final report under review**	SWOX	Thames
Orpington & North Orpington	River Cray	31/03/2013 **Final report under review**	London	Southern
River Lee at New Gauge	Amwell Magna Loop	31/03/2013 **Final report under review**	London	Thames
Childrey Warren	Letcombe Brook	31/09/2013 **Ongoing**	SWOX	Thames

Thames Water is undertaking these options appraisals and they were either completed in March 2013 or are at final report review stage, with the exception of Childrey Warren which will be undertaken in summer 2013.

The Environment Agency has also requested that Thames Water complete options appraisals for the Pann Mill and Waddon following completion of the AMP5 investigations.

Appendix 7: Estimation of Dry Year demand had 2012 been unconstrained

Figure 4 shows the London annual average (AA) demand risk curve levelled to the DI observed in 2012/13. The curve shows the relative position of the overall demand as modelled based on weather data from the last 66 years. London DI for 2012/13 has been just above the normal year (a 1 in 2 year), and below the dry (a 1 in 10 year), being ranked 34th of the 66 available years in terms of average demand. Normal and dry year demands are highlighted in green and yellow respectively.

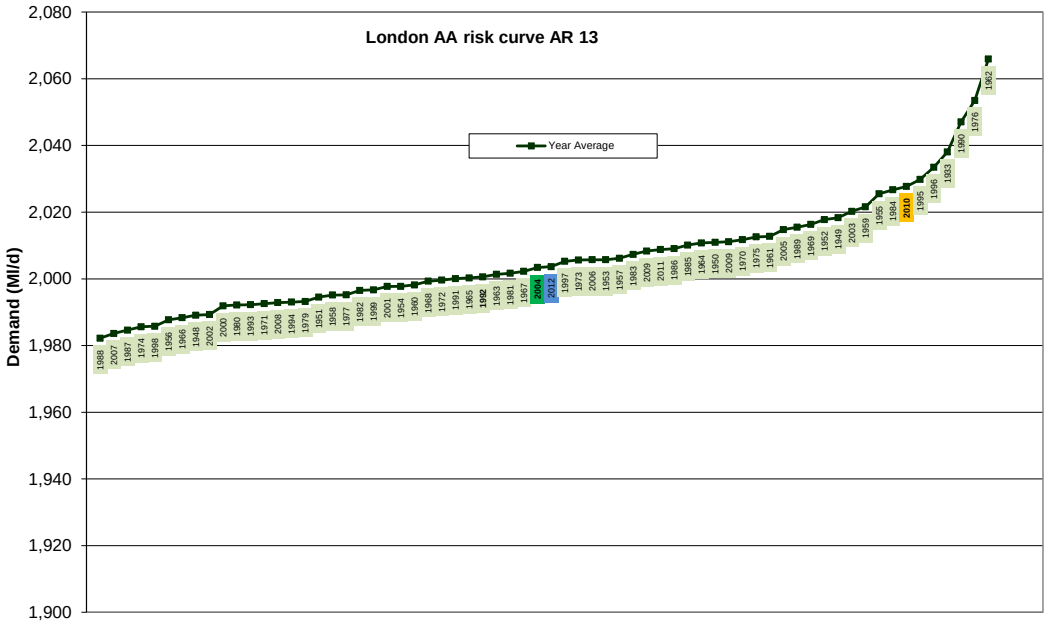


Figure 4: London annual average risk curve

Last year we refined the risk curve to disaggregate usage and leakage. Figure 5 below shows how 2012 ranked in terms of leakage and usage. The ranking of 2012 in terms of usage and leakage can be seen to be quite different (16th and 51st of 66 respectively). This reflects the abnormally dull and wet summer weather and the relatively harsh prolonged winter conditions. The two opposite extremes tend to cancel each other out when considering the overall AA position for DI shown in Figure 4.

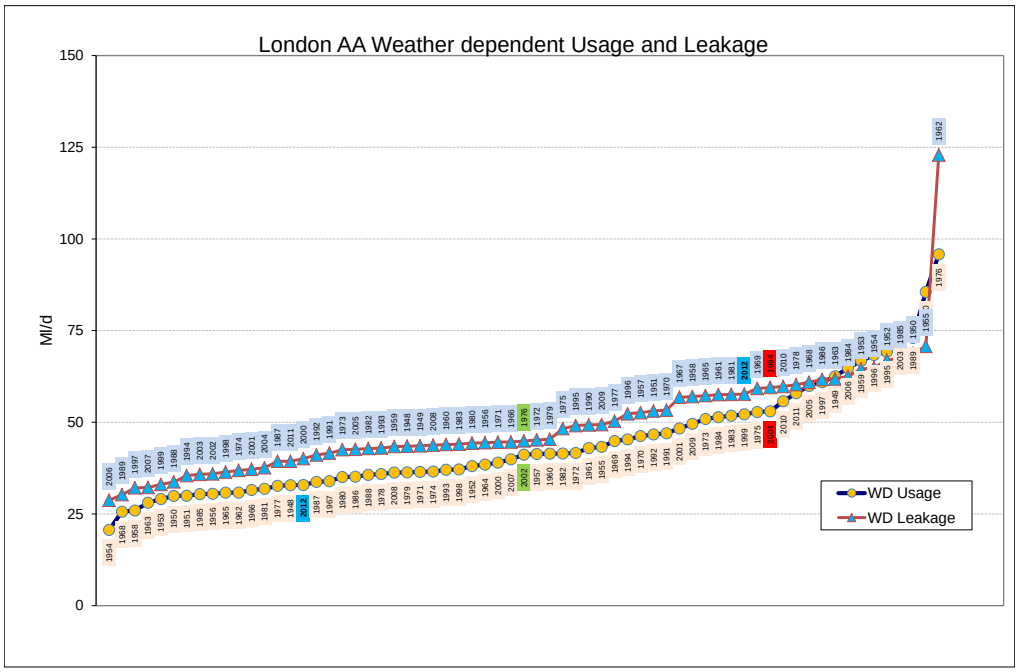


Figure 5: London annual average risk curve split into Leakage and Usage

The equivalent AA risk curve for the Thames Valley (including the Critical Period), is shown in Figure 6. Thames Valley's modelled AA for 2012/13 is ranked 7th of 45 available years. The peak week occurred in late May and was below both the 1 in 10 and in the 1 in 2 year coming in 16th of the 45 available years. This plot shows a similar pattern to that from London however, the influence of leakage on DI is less pronounced in the TV hence the AA is more dependent on the relative severity of the weather in the summer months.

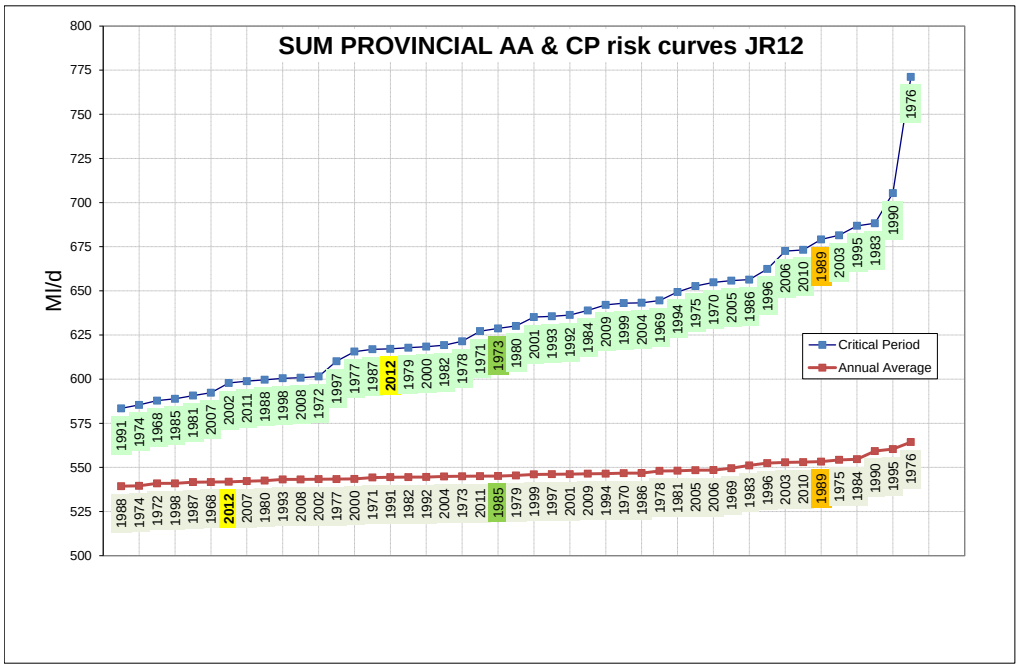


Figure 6: Thames Valley demand risk curve for Annual Average and Critical Period

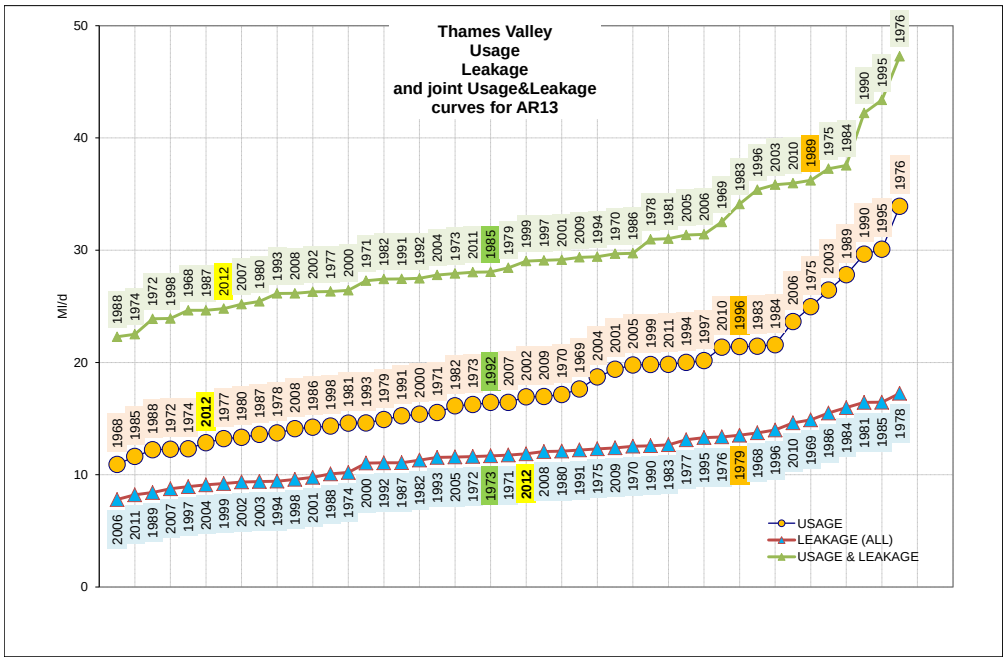


Figure 7: Thames Valley Annual Average usage and leakage risk curves

If we consider 2012 as an unconstrained year, the dry year figures could be calculated using the usual steps of uplifting the observed AA for AR13 to the reference year. This would equate to the 1 in 10 DI prior to AR12, to the sum of 1 in 5 usage and 1 in 5 leakage from AR12 onward as shown in Table 32.

Table 32: Uplift from observed DI AR13 to Unconstained Normal/Dry years (for reference only)

* Unconstrained Dry Year DI (Ml/d)		2012/13			2011/12
WRZ		FOR REFERENCE ONLY			AR12 Dry Year DI
		Measured DI	Dry Year Uplift	Dry Year DI	
London	AA	1988.0	31.8	2019.8	2022.5
	CP				
SWOX	AA	255.2	4.3	259.5	263.8
	CP	278.4	60.8	315.9	319.1
Kennet Valley	AA	97.1	1.9	99.0	100.1
	CP	102.2	20.9	118.0	118.7
Henley	AA	12.4	0.4	12.8	13.0
	CP	15.5	6.8	19.2	19.0
SWA	AA	129.0	2.3	131.3	134.3
	CP	137.1	35.3	164.4	166.1
Guildford	AA	44.3	1.1	45.4	44.8
	CP	49.3	18.2	62.5	61.6
Thames Valley total	AA	538.0	10.2	548.3	556.1
	CP	575.9	139.6	677.6	683.0

The data presented in Table 32 should not be used to estimate the Normal/Dry Year DI for the following reasons:

1. It is not at all clear how valid the assumption that AR13 was “unconstrained” i.e. demand was not artificially lowered as a result of the demand restrictions in place at the beginning of the period. There is some evidence that demand appeared to be constrained during parts of AR13.
2. The weather was extremely atypical. While the procedure described above is designed to compensate for observed weather patterns, demand may have been artificially supressed because of the relatively low Soil Moisture Deficit (SMD) through the summer.
3. The Olympics may have affected demand during the summer months in a complex and one-off way.

The first two issues dominate the decision to not to attempt to use the AR13 data. Disentangling the impacts of point 1 and 2 is complex and full of supposition. The following Appendix 8 presents some evidence suggesting that demand may have been constrained during the summer of 2012 and is presented for completeness. The Dry Year figures for AR13 shall be based on those presented in the draft WRMP14 for 2012/13.

Appendix 8: Estimation of Dry Year demand had 2012 been constrained

For JR07 (following the drought and associated hosepipe ban of 2006) we enhanced the dry year methodology to cope with constrained years. The process required the impact of restrictions to be estimated before the observed (constrained) demand was scaled up to an unconstrained level i.e. to the level it could have been had the restrictions not been imposed. The unconstrained demand was then fed through the standard process of uplift using the demand-risk curves shown in Figure 4 and Figure 6 in Appendix 7.

The process of estimating the impact of the restrictions was detailed, but in summary required the following two stages:

1. **Estimation of the impact of restrictions on weather dependent demand.**
   Hosepipe bans are designed to reduce irrigation during hot & dry conditions. A weather dependent model of demand (calibrated to unconstrained years) was used as a reference signal to look for evidence that observed demand rose less quickly during these conditions. A good model would track summer variability in demand during unconstrained years but would over-estimate rises in constrained years. In 2006 this approach was very successful and showed that constrained demand rose under the same conditions, but at about half the rate as it did in unconstrained years. The analysis in this step is most simply represented by comparing observed demand year on year against the unconstrained model of demand and plotting the gradient of the best fit line (using linear regression) through the scatter or daily points. In years where the model tracked observed demand, the regression line would have a gradient of 1 with low uncertainty in the estimate of the gradient. The gradients of these best-fit regressions have been plotted in Figure 8 for London, and Figure 9 for the Thames Valley for the summer period (May – August). The line passes through the central estimate of the gradient, the error bars show the 95% confidence interval on the gradient.

2. **Estimation of the impact of restrictions on weather independent (base) demand**
   Having tracked the weather dependent signal, an estimate of the impact restrictions on underlying demand could be made by looking at the residuals between measured DI and a combination of factors that would normally explain measured DI (including a constrained weather model derived in step 1).

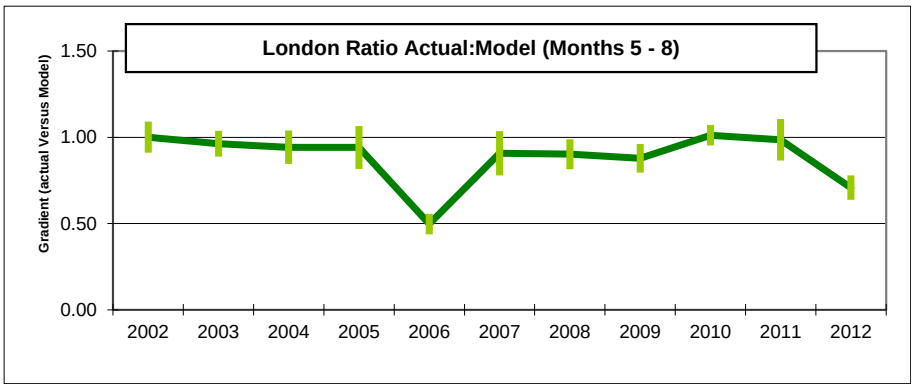


Figure 8: London year on year relationship between measured and modelled demand

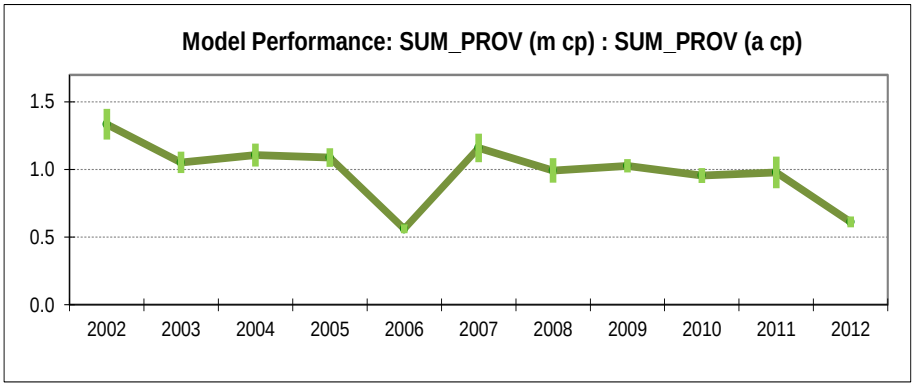


Figure 9: Thames Valley year on year relationship between measured and modelled demand

Both London and the Thames Valley charts show the gradient dropping significantly in 2006 when the restrictions were put in place. After 2006, the relationship between modelled and measured rises again giving some insight into 'bounce-back' or the rate of return to normal usage patterns once the restrictions were lifted.
Both plots also show a drop in the gradient for summer 2012. This provides some evidence that demand during the summer of 2012 was indeed restricted to a degree. Care must be taken interpreting this graph as, because the weather was generally dull, the cloud of (daily) pairs of observed and modelled demand did not cover the extreme highs usually associated with drought conditions.

Following the first step of the process adopted in 2006, the impact of the restrictions in 2012 on weather dependent demand can be estimated by scaling back the unconstrained model by the amount required to return the relationship to a 1 to1. An example for London is shown in Figure 10 below.

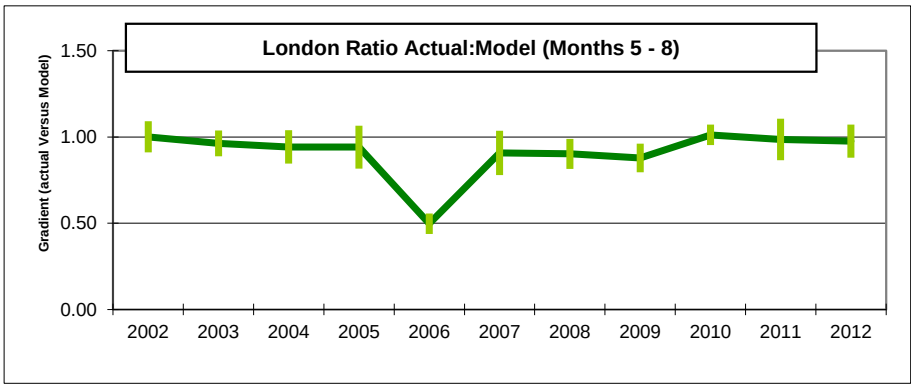


Figure 10: Modelled demand in London reduced to 70% of normal levels in 2012 to better match observed summer use between May and August 2012.

In London's case, this requires the modelled demand to be scaled back to 70% (the central estimate of the gradient of the regression line in Figure 8) altering the AA modelled demand by 9.87 Ml/d (0.4%). In the Thames Valley, the modelled constrained relationship is only 61% of usual unconstrained levels altering the demand by 5.16Ml/d (1.0%). These adjustments only handle the first step of the mechanism for un-constraining demand. The second step relies on the constraint

holding across the summer. In 2006 this figure was estimated to be approximately 1.3% of DI. In 2012, analysis of the impact of restrictions on "base" demand has been complicated both by the short duration of the restrictions (raising the possibility of within-year bounce-back) and the very wet conditions (testing the validity of the model under abnormal levels of summer SMD). It is for these reasons that we do not consider the process of unconstraining observed DI in AR13 then uplifting to the dry year as valid, stable or as simple as retaining the estimates from the draft WRMP14.

Table 33: Uplift from observed DI AR13 to Constrained Normal/Dry years (for reference only)

* Constrained Dry Year DI (Ml/d)		2012/13			2011/12
WRZ		FOR REFERENCE ONLY			AR12 Dry Year DI
		Measured DI	Dry Year Uplift	Dry Year DI	
London	AA	1995.9	31.8	2027.7	2022.5
	CP	0.0	0.0	0.0	
SWOX	AA	257.7	4.3	262.0	263.8
	CP	281.2	60.8	318.5	319.1
Kennet Valley	AA	98.1	1.9	100.0	100.1
	CP	103.3	20.9	118.9	118.7
Henley	AA	12.5	0.4	12.9	13.0
	CP	15.7	6.8	19.3	19.0
SWA	AA	130.3	2.3	132.6	134.3
	CP	138.5	35.3	165.6	166.1
Guildford	AA	44.7	1.1	45.9	44.8
	CP	49.8	18.2	62.9	61.6
Thames Valley total	AA	543.4	10.2	553.6	556.1
	CP	581.7	139.6	683.0	683.0

Note: A "Normal " year is a 1 in 2 year and a "Dry" year is a 1 in 10 year.

Appendix 9: Per Capita Consumption Methodology

Population

Table 34: Population figures ('000s)

Population ('000s)			
WRZ	2011/12	2012/13	
	AR12	AR13	fWRMP09
Guildford	151.95	151.89	145.42
Henley	50.79	49.53	47.64
Kennet Valley	388.82	392.56	381.62
London	6885.36	7051.98	6706.94
SWA	503.06	511.78	482.41
SWOX	993.16	1004.42	989.26

Whole water supply area

Our total population estimate for water supply is 189,029 (2.1%) higher than in AR12.

Our methods are essentially unchanged, but the following should be noted.

ONS population estimates are now based on 2011 Census (with an estimate of the change between March and June), rather than 2001 Census (with an estimate of several years' change).

We have updated our "Popsys" system for deriving estimates for our areas from the ONS estimates. It now uses the corporate GIS, and so uses the latest boundary and address data. The principles of the calculation are unchanged. Estimates at company level are hardly affected by this change.

New estimates of "hidden and transient population" have been obtained from Edge Analytics. For the "transient" components, estimates of short-term residents from overseas, and of people with working second addresses, are based on the 2011 Census.

To update from mid-2011 to 2011/2012 average we have used the Experian September 2012 trend based projection.

The relative significance of the various changes between AR12 and AR13 is shown in this analysis of the total reported population growth.

Revision to official mid 2011 population (as a result of using 2011 Census)	152,261
Change to projected growth (mid-2011 to 2011/12 average)	8,306
Growth from 2011/12 to 2012/13 (trend based)	111,163
Update of hidden and transient populations	- 82,701
	189,029

Water Resource Zones

At Resource Zone level, we estimate that there has been some population growth in all zones except Guildford and Henley. The changes in reported population reflect the changes from using the 2011 Census data which has increased the total population and updated the geographical split moving more population into London.

Measured and Unmeasured Non-Household Population

The non-household measured population is derived from the sum of two components:

- Population in communal establishments (obtained from 2001 census data)
- Metered subsidiary population – derived from regulatory finance accounts listing properties with domestic size pipes supplying them

Population in communal establishments has remained the same. Metered subsidiary population has increased from 331,158 to 334,911 following updates to the numbers of residential metered subsidiary properties.

The non-household unmeasured population remains at zero.

Measured and Unmeasured Household Population

Total household population is derived by subtracting the total non-household population from the total population.

The population split between measured and unmeasured households uses data obtained from occupancy questionnaires which were sent to 49,028 households during JR10, both unmeasured and measured, of which 11,482 were returned with valid data. All responses could be classified by property type, metering type, ethnicity and region so we were able to gross-up responses according to the effective sampling rates of each category. We could then compare the resulting profile of occupancy classes with profiles obtained from the Census for regions roughly corresponding to our London and Thames Valley regions and thus quantify the response bias of each occupancy class.

Using these to adjust the proportions of each occupancy class, for each of the categories above, we obtained estimates of the population for unmeasured and measured households for JR10.

For the update of the population splits this year we have simply used the movement in properties, with reductions in unmeasured properties as customers opt for a meter, and increases in measured properties associated with the optants and also newly built properties. For this update of population split it is assumed that the occupancy of the additional measured properties is the same as the occupancy of the existing measured properties. The residual movement in population is assumed to be in the unmeasured population base.

Property Numbers

Company level property numbers by type (measured/unmeasured, household/non-household, voids household/void non-household) are derived from Customer Information System (CIS). They include adjustments to the unmeasured and measured household and non-household figures for missing properties. They also take account of properties that have moved from a measured tariff due to optant metering as well as the addition of new properties to the count on measured households.

The numbers of properties within each WRZ are then calculated using the Table 7 dataset and cross-matching this with the property numbers from Netbase. Netbase takes property information from CIS and geo-references it, firstly to District Meter Areas (DMAs), then Flow Monitoring Zones (FMZs) and finally to WRZs. This allows Annual Return Table 7 property numbers to be split by applying Netbase WRZ distribution percentages.

Table 35: Property figures ('000s)

Properties ('000s)			
WRZ	2011/12	2012/13	
	AR12	AR13	fWRMP09
Guildford	62.851	63.090	63.048
Henley	21.159	21.254	20.870
Kennet Valley	159.322	159.797	158.526
London	2784.271	2802.545	2805.557
SWA	204.527	205.518	204.394
SWOX	413.486	414.641	426.467

Occupancies

Occupancies for each property type are calculated by dividing population by properties.

Measured Household Billed Measured Volume

Metered household properties are extracted from CIS for the June Return with household properties defined as those with a chargeable pipe size of 12 mm or less that are not parent properties (i.e. do not have subsidiary properties). Accruals are then calculated for each bill to give the volume of water used in the period 2012/13 and total volumes are reconciled against financial values. The bills for these

properties are then matched against the Household/Non Household lists to get the volumes split by Household and Non Household.

The accruals process used this year is the same as the improved methodology employed in JR11 i.e. with the accrual volume calculated at each account level and split between household and non-household to give the appropriate accrual to each.

As with property numbers, total TWUL billed measured volumes are split between WRZ using data obtained from Netbase which geo-references the billing data from CIS.

Measured Household PCC

The measured household PCC is calculated by subtracting supply pipe leakage for externally metered properties and then dividing through by the measured household populations.

Unmeasured Household PCC

The unmeasured household PCC for each resource zone is derived from the Domestic Water Use Study (DWUS) which examines the water use in volunteer households which have a meter fitted for monitoring purposes but which continue to pay for their water on the unmeasured tariff. This study follows the best practice criteria defined in the UKWIR/EA report (Demand Forecasting Methodology).

DWUS results are weighted by property type, occupancy, ethnicity and region to determine an overall value for unmeasured household consumption. The sample is not designed to be specifically representative of the company unmeasured households but to include a sufficient number of households within each category to allow their results to be used to produce robust estimates at region and company level.

The average number of DWUS properties contributing valid data to estimates of PCC per month in AR13 was 1320, compared with 1464 in AR12. This reduction is largely associated with either volunteer households opting to pay their bill as a measured customer or moving house and increasing logger failures.

A logger replacement programme was undertaken during AR13 to offset the increasing failure rate of the DWUS loggers. This has resulted in approximately 1600 new SMS loggers being installed over the period.

We proactively try to recruit any households which move into the properties to minimise the impact of people moving house. There has been a particular focus on recruiting flats this year, due to their relatively low sample numbers, which has resulted in 55 flats joining DWUS.

Meter Location for the volunteer properties

Meters are installed externally, as we consider that this is less intrusive and less likely to influence water use behaviour.

Assessing Property Type

We determine property types of all households supplied by Thames using Ordnance Survey Master Map (OSMM) data. The OSMM data represents each property as a polygon on a map, and each can be classed as detached, semi-detached or terraced based on the number of adjacent polygons. End-terrace houses are distinguished from semi-detached houses by looking at the type of the adjacent property. Ordnance Survey Address Layer 2 (OSAL2) data associates x, y co-ordinates with every postal address so these can be classified based on the total number of postal address points its property/polygon contains to identify flats (1 = non-flat, 2-5 = FSB (flat in small block of flats), 5+ = FLB (flat in large block of flats)). Combining the two classifications we classify properties as one of five different types: detached, semi-detached, terraced, FSB or FLB. In London terraced houses are also split into large and small depending on the area of the dwelling.

This methodology has been used to find the property types of DWUS households and the property type distribution of all unmeasured households in each WRZ.

Assessing Occupancy of DWUS

To ensure that the monitor reflects the latest occupancy information, a questionnaire is mailed to all monitor panel members once a year to request updates on their details. We send out a reminder to try to obtain as many responses as possible and provide incentives to respondents in the form of a rebate on their water bills and prize draws. New occupants within the existing DWUS properties are invited to join the study panel, both as part of the annual update and as part of routine tracking of occupancy changes over the year.

Assessing Impact of Ethnicity

Thames Water has a large and varied Supply Area that contains London Boroughs with some of the most densely populated and ethnically-diverse communities in the UK. As DWUS is under-representative of those of Asian origin, this means that DWUS average PCC under-estimates PCC of the unmeasured population. We therefore correct for recruitment bias by estimating and applying different usages for household members on the basis of the households' estimated ethnicity.

As before, we then apply the following rigorously estimated adjustments to Asian household usage:

a) Because of the "cultural dilution" effect – DWUS Asians in areas of lower Asian density uses less water than average Asians, and DWUS has a bias to the former – we make an addition of 2.8 litres/person/day to Asian households.

b) Because the Asian households in DWUS contain a higher proportion of adults than the average for Asian households in our region, and adults use more water than children, the households' average personal usage is slightly higher than if they had the average proportion. We have made corresponding adjustments to Asian PCC: -1.36 litres/person/day in London and -5.05 in Thames Valley.

Data Validation

Data validation is carried out to ensure that the quality of the data is robust prior to its inclusion within our analysis software (DWUSView). Once logger data have been downloaded, they are validated using software that we have developed.

If any data value fails any of the following checks, it is automatically flagged and excluded from subsequent analysis:

- Time check. This verifies that the data recording frequency is every 15 minutes and that there is no overlap with data previously held for each household. It also checks that there is no data after the current date.
- Repetitive Value check. 96 consecutive identical non-zero readings (i.e. one day).
- Empty property checks. 2,688 consecutive zero readings (i.e. 28 days).
- Leakage check. 480 consecutive readings (i.e. five days) greater than 0.0011 litres/sec (i.e. 4 litres per hour).
- Negative Data check.
- Instantaneous High Flow check. Single flow values greater than 1 litre/sec.
- Meter reading check. This compares the water use recorded by the logger with the volume given by the meter at the time of manual download. Data are flagged if there is greater than 5% discrepancy.

Properties with stopped meters and with suspected underground supply pipe leakage are excluded from the analysis. Properties where occupants are temporarily absent or where there are plumbing losses (for a period of less than five days), apparent or otherwise, are not excluded. Householders can be away for up to four weeks before we consider the property is considered to be empty.

Identifying Wastage in Unmeasured PCC

Wastage is defined as loss of water that occurs after the internal stop valve that is not 'normal' usage. It can include leaking cisterns, overflowing ball-cock valves, continuous dripping taps, etc. Therefore this loss of water should not be included in the overall estimate of leakage, but rather, it should be incorporated as a legitimate component of per capita consumption (PCC) and domestic night use estimates.

Water use in unmeasured households is estimated by surveying a selection of properties which are charged on an unmeasured basis, but where consumption is metered – the DWUS panel. Members of the DWUS panel are volunteers and are aware that they are being monitored.

In 2006 we completed a study of almost 2000 unmeasured detached, semi-detached and terraced properties and concluded that a volume of 35 litres/property/day (11.9 litres/head/day) should be added to PCC for these property types to properly account for wastage. This change was introduced in JR06.

A separate investigation into wastage in flats in 2007 resulted in four estimates of wastage by flat type (purpose built or 'other') and region (London/Thames Valley). These wastage estimates were incorporated into estimates of PCC in JR09.

Appendix 10: Water Efficiency activities undertaken in 2012/13

	DESCRIPTION	UNITS	DP		REPORTING YEAR 2012-2013
A	**Household and non household cistern displacement devices**				
1	Number of CDDs distributed	nr	0		71,851
2	Number of CDDs installed	nr	0		49,363
3	Total savings assumed	Ml/d	2		1.03
B	**Retrofit devices**				
4	Number WC devices assumed installed	nr	0		2,041
5	Number tap devices assumed installed	nr	0		45,164
6	Number shower devices assumed installed	nr	2		93,136
7	Total savings assumed	Ml/d	2		2.72
C	**Outdoors**				
8	Number of water butts distributed to households and non households	nr	0		2,029
9	Number of trigger guns/ crystal packs distributed	nr	0		12,658
10	Total savings assumed	Ml/d	2		0.01
D	**Additional activity**				
11	Total savings assumed				0.00
E	**Behavioural change**				
12	Total savings assumed	Ml/d	2		0.93
F	**Other non household activity**				
13	Total savings assumed	Ml/d	2		0.77
G	**Totals**				
14	Total savings assumed	Ml/d	2		5.460
15	Total cost of initiatives	£m	0		2.23
16	Total savings assumed carried forward from previous year(s)	Ml/d	2		2.01
H	**Sustainable economic level of water efficiency**				
17	Savings claimed in the report year to meet selwe targets	Ml/d	2		0.99
18	Total cost of initiatives	£m	0		0.205

A: Household and non-household cistern displacement devices

A total of **71,851** CDDs have been distributed in 2012/13.

- **67,280** CDDs were distributed via partnership projects and direct customer requests and
- **4,571** CDDs were distributed by Water Regulations inspectors

Based on the methods of distribution stated in the table above, it is assumed (using Ofwat installation rates) that 49,363 CDDs have been installed. 4,169 were installed in non-household properties and 45,194 in domestic properties, resulting in an assumed saving of 1.025 Ml/d.

B: Retrofit devices

A total of **2,041** WC devices have been assumed installed in 2012/13, all were installed via partnership projects. These devices were EcoBetas and provided an assumed saving of **0.096 Ml/d**

A total of **45,164** tap devices have been distributed via partnership projects and direct customer requests. These tap devices provided an assumed saving of **1.03 Ml/d**.

A total of **93,136** shower devices have been distributed via partnership projects and direct customer requests. These were a mix of water-saving showerheads, flow restrictor devices, shower timers and provided an assumed saving of **1.59 Ml/d**.

C: Outdoors

A total of **2,029** water butts were sold and distributed to Thames Water customers in 2012/13 (575 x 100litre water butts, 144 x 95litre water butts, 645 x 190litre water butts, 665 x 200litre water butts) resulting in a saving of **0.0062 Ml/d.**

A total of **1,056** hose trigger guns and **11,602** crystal packs were distributed by partnership projects and direct customer requests, providing an assumed water saving of **0.002 Ml/d** and **0.005 Ml/d** respectively.

D: Additional Activity

There are no savings to report in this section.

E: Behaviour Change

48,905 customers were engaged by behaviour change activities resulting in **0.93 Ml/d** savings. A wide variety of behaviour change activities were delivered resulting in savings as follows:

- **0.1 Ml/d** from household and non-household audits
- **0.001 Ml/d** from activities in the community including roadshows and speaker events
- **0.82 Ml/d** from website activity including use of the water efficiency calculator
- **0.003 Ml/d** from responses to leaflets

F: Other non-household activity

A total of **1,491** water efficiency audits have been delivered by the Water Regulations team, with reportable savings of **0.77 Ml/d**. Water efficiency audits and advice have been integrated in Water Regulations Inspections at high risk premises where there is considered to be a high risk of contamination from backflow or high water usage. The audits consist of identifying water savings that could be achieved through:

- implementing enforceable changes
- recommending additional changes
- identifying any leaks which can be confirmed as plumbing losses
- providing behaviour change guidance to the customer
- delivering CDDs to the properties.

Identified changes to save water are confirmed as being completed through a subsequent inspection or via an approved plumber visit. Within block F, we have only included savings from the enforceable and recommended changes, CDDs and

behaviour change savings have been reported in blocks A and E respectively.

G: Totals

Total savings of **5.46 Ml/d** were achieved in 2012/13 at a cost of **£2.43m**. As part of the preparations made by Thames Water leading up to the Temporary Use Ban, Thames purchased considerable stocks of water efficient products. This one -off cost is not reflected in the water efficiency cost estimates in this report.

H: Sustainable Economic Level of Water Efficiency

0.987 Ml/d savings were delivered towards the SELWE target for 2012/13 at a cost of **£0.2m**.

The savings were achieved by specific projects:

- **Save Water Swindon:** Thames Water has continued to deliver the Save Water Swindon project as the primary delivery agent, working in partnership with Swindon Borough Council and contracted suppliers. It is a large scale water efficiency retrofit and behavioural campaign which aims to:

  - provide a replicable case study for large scale water efficiency
  - achieve measurable demand savings
  - support residents to gain an understanding of the link between their water use and the local natural environment, energy use, and potential financial savings.

  A total of **7,246** products were distributed to **6,798** properties in 2012/13, mainly through free products ordered through our website. The project continues to provide useful insights into customer attitudes towards their water use and the effectiveness of different methods of engagement.

- **Swindon Schools project:** The Swindon Schools project took place in 2012/13 and provided AMR meters, water audits, and retrofits to reduce water consumption in schools across the region. Products installed in schools have been reported towards the SELWE target for 2012/13, whilst AMR data will be submitted in 2013/14.

- **British Gas/Dyno Rod project:** The British Gas Dyno Rod project involved Dyno Rod engineers promoting and installing free water saving products during pre-arranged visits to fix heating, plumbing or drainage problems. A total of 5,098 products were installed in 1,342 properties in 2012/13. The high product to property ratio is as a result of the installation process.

Appendix 11: Process Losses Calculation

Process losses are calculated as the difference between Public Raw Water into Treatment and Treated Water into Supply after taking into account adjustments for flow meter errors.

Public Raw Water into Treatment is calculated from Raw Water Abstracted after removing abstraction that supplies non-public sources, returns to river and changes in raw water reservoir levels. Raw Water Exported (Line 5) is also removed and Raw Water Imported (Line 2) is added.

As last year the effect of net rainfall/evaporation from raw water storage reservoirs has been included in the calculation. If rainfall is less than the estimated evaporation from the reservoir, then the net amount of water into treatment is reduced. If rainfall is greater than evaporation then the opposite is true. The net effect has increased for the reporting year as a result of higher levels of rainfall than average and stands at 21.45 Ml/d in London and 1.71 Ml/d in SWOX (-ve representing more evaporation than rainfall).

ANNUAL AVERAGE							
All figures in Ml/d	Guildford	Henley	Kennet Valley	London	SWA	SWOX	Total
Raw Water Abstracted (Line 1_{AR})	48.41	12.60	106.42	2232.18	132.09	258.48	2790.19
Non-Public Supply	0.00	0.00	0.00	-4.65	0.00	0.00	-4.65
Returns to River	0.00	0.00	-0.13	-66.51	0.00	0.00	-66.64
Storage Reservoir Change	0.00	0.00	0.00	2.17	0.00	7.55	9.73
Raw Water Exported (Line 5_{AR})	0.00	0.00	0.00	91.42	0.00	0.00	91.42
Raw Water Imported (Line 2_{AR})	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Rainfall/Evaporation	0.00	0.00	0.00	21.45	0.00	1.71	23.16
Public Raw Water into Treatment	**48.41**	**12.60**	**106.30**	**2093.22**	**132.09**	**267.74**	**2660.36**
Treated Water into Supply	47.05	12.66	99.09	2016.30	130.84	262.31	2568.25
Flowmeter Error	0.00	0.00	0.10	-0.20	0.00	-0.05	-0.16
Process Losses (k)	**1.36**	**-0.06**	**7.11**	**77.12**	**1.25**	**5.49**	**92.27**
% of Total Raw Water into Treatment	2.8%	-0.4%	6.7%	3.5%	0.9%	2.1%	3.3%

Total raw water losses (raw water losses plus raw water operational use) are assumed to be 10% of the process losses for Thames Valley. In London, total raw water losses are assumed to be 15% of the process losses due to a more extensive raw water movement system including intake tunnels, reservoirs and significant transmission pipe work. Total treatment works losses (treatment works losses plus treatment works operational use) are assumed to be 85% and 90% of the process losses for London and Thames Valley respectively.

Lines	Description	2011/12	2012/13	Variance
4 and 9	Process Losses	Ml/d	Ml/d	Ml/d
WRZ 1	Guildford	2.51	1.36	-1.16
WRZ 2	Henley	-0.16	-0.06	0.11
WRZ 3	Kennet Valley	8.28	7.11	-1.17
WRZ 4	London	104.08	77.12	-26.95
WRZ 5	Slough/Wycombe/Aylesbury	0.31	1.25	0.95
WRZ 6	SWOX	8.41	5.49	-2.92
Total	Total	123.41	92.27	-31.14

As Process Losses are calculated by subtracting one large volume from another large volume, both of which have standard metering uncertainties, the resulting value will have a large uncertainty. These uncertainties need to be considered when reviewing the reported losses. Based on the mass balance studies in North East, West and South London (98.8% of London by volume of Public Raw Water into Treatment), the metering uncertainty associated with the process losses for London of 61.0 Ml/d is approximately ± 56 Ml/d (92%). A similar mass balance study of the large WTWs in Thames Valley (99.8% of Thames Valley by volume of Public Raw Water into Treatment) results in a metering uncertainty of ± 11 Ml/d (174%). These uncertainties need to be considered when reviewing the reported losses.

Critical Period Process Losses

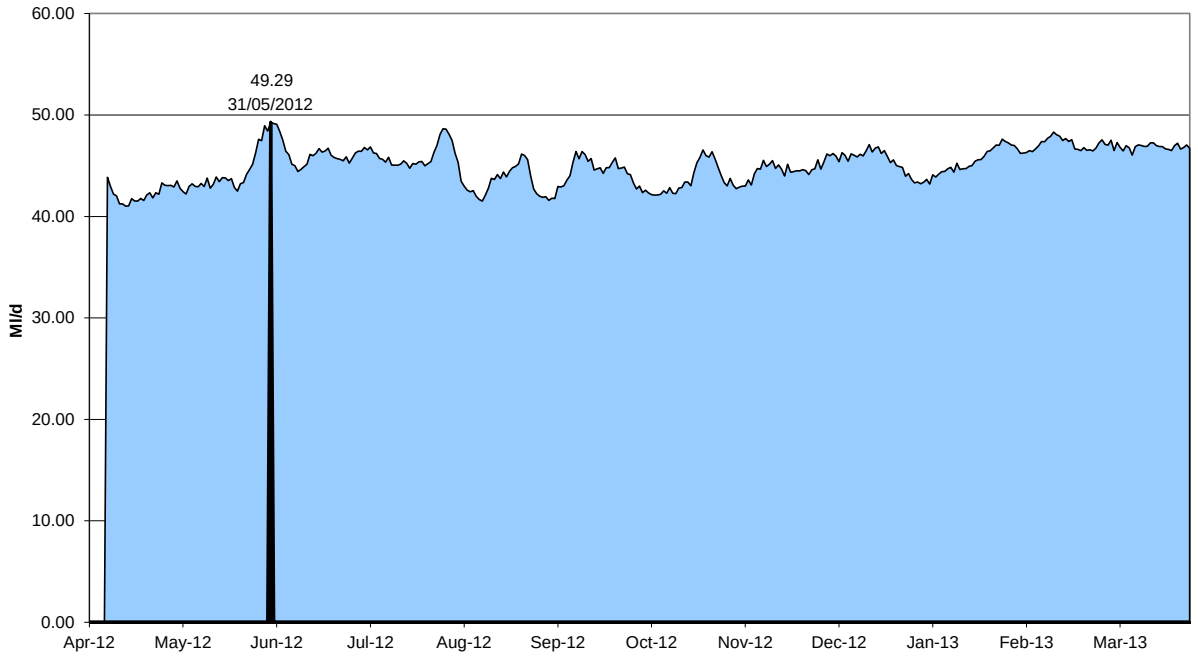
Critical Period process losses are calculated in a similar way as annual average process losses except that the Public Raw Water into Treatment during the summer peak demand week and Treated Water into Supply during the summer peak demand week are used instead of the annual average values. For the London WRZ, values remain as per the Annual Average.

CRITICAL PERIOD							
All figures in Ml/d	**Guildford**	**Henley**	**Kennet Valley**	**London**	**SWA**	**SWOX**	**Total**
Raw Water Abstracted (Line 1_{AR})	52.69	14.25	113.23	2232.18	138.14	383.09	2933.59
Non-Public Supply	0.00	0.00	0.00	-4.65	0.00	0.00	-4.65
Returns to River	0.00	0.00	-0.08	-66.51	0.00	0.00	-66.59
Storage Reservoir Change	0.00	0.00	0.00	2.17	0.00	-113.71	-111.54
Raw Water Exported (Line 5_{AR})	0.00	0.00	0.00	91.42	0.00	0.00	91.42
Raw Water Imported (Line 2_{AR})	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Rainfall/Evaporation	0.00	0.00	0.00	21.45	0.00	1.71	23.16
Raw Water into Treatment	**52.69**	**14.25**	**113.16**	**2093.22**	**138.14**	**271.08**	**2682.54**
Treated Water into Supply (Ml/d)	51.43	15.69	104.05	2016.30	139.67	282.18	2609.31
Flowmeter Error (Ml/d)	0.00	0.00	0.00	-0.20	0.00	0.00	-0.20
Process Losses (Ml/d) (k)	**1.26**	**-1.43**	**9.10**	**77.12**	**-1.52**	**-11.10**	**73.44**
% of Total Raw Water into Treatment	2.4%	-10.1%	8.0%	3.6%	-1.1%	-2.9%	2.6%

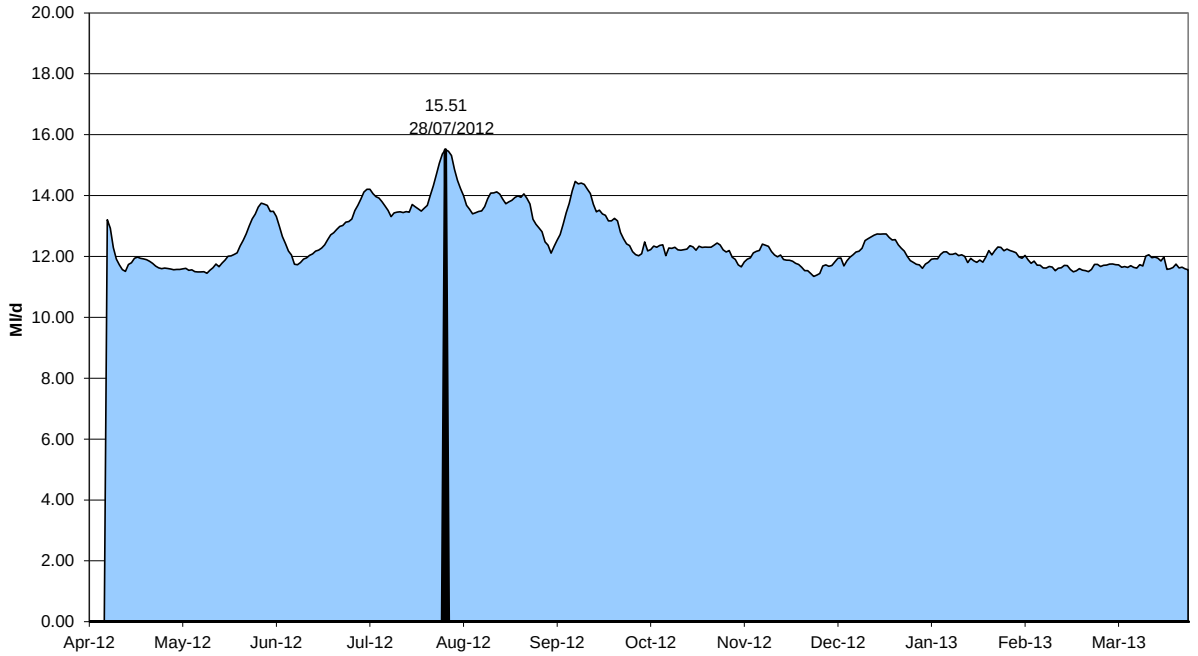
Critical Period total raw water losses are assumed to be 10% of the process losses for Thames Valley. Critical Period total treatment works losses are assumed to be 90% of the process losses for Thames Valley.

Appendix 12: Daily Demand Profiles

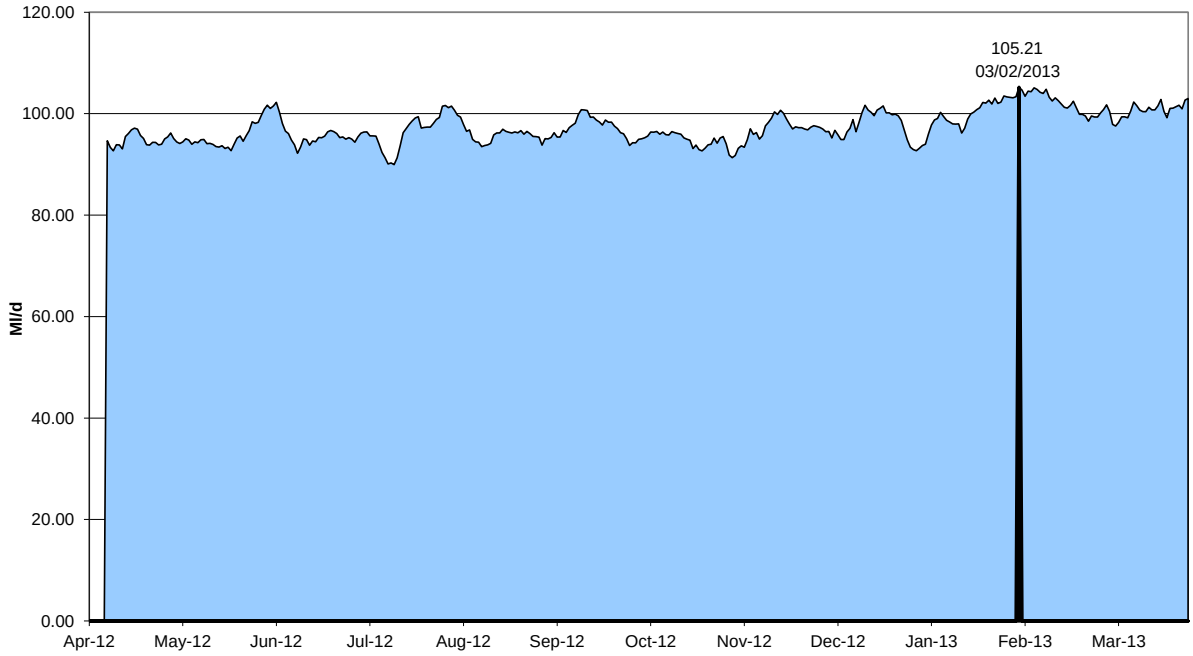
Guildford Rolling 7 Day Demand 2012/13



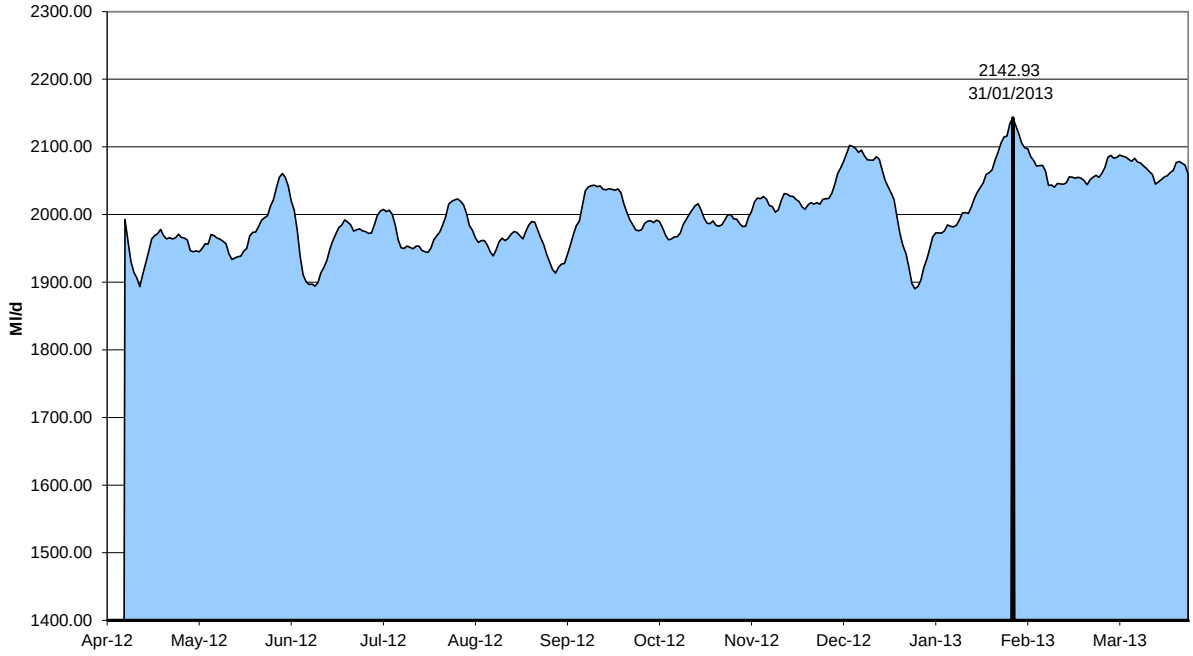
Henley Rolling 7 Day Demand 2012/13



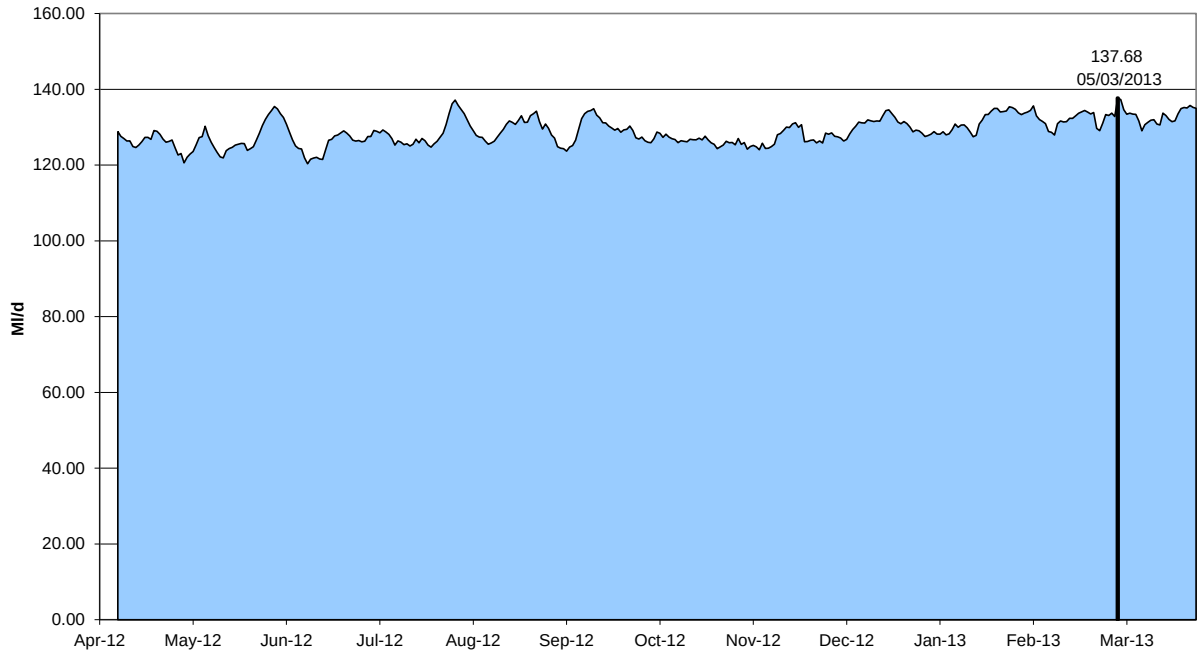
Kennet Valley Rolling 7 Day Demand 2012/13



London Rolling 7 Day Demand 2012/13



SWA Rolling 7 Day Demand 2012/13



SWOX Rolling 7 Day Demand 2012/13