BRISTOL WATER

Assessment of Economic Level of Leakage

Update from 2004 Water Resources Plan

June 2007

Economic Level of Leakage Update

Executive Summary

Bristol Water supplies water to 1.1m customers in and around Bristol. The supply area is a single resource zone and has diverse sources of raw water. Approximately half of the water supplied is abstracted from rivers, one third from impounding reservoirs and one sixth from ground water sources. In 2006/07 distribution input was 286 Ml/d, and leakage at 54 Ml/d was equal to the target agreed with Ofwat.

This paper sets out an update of our assessment of the economic level of leakage (ELL) from that presented in our 2004 Water Resources Plan (WRP04). The aim of this assessment is to determine an appropriate leakage target for 2008/09 and 2009/10. The assessment follows the methodology set out in the Tripartite Report (*Best Practice Principles in the Economic Level of Leakage Calculation*) and *The Economics of Balancing Supply and Demand (EBSD) Guidelines, UKWIR.*

The assessment is based upon WRP04 forecasts of demand, headroom and water available for use. We are currently reviewing these forecasts in preparation for our Draft Water Resources plan due to be completed in December 2007. It is possible that these updated forecasts will differ substantially from those in WRP04. Key factors that could lead to such differences include:

- ONS forecasts for population and property growth are higher than those used for WRP04
- The impact on our yield assessment of using a longer climate history (back to 1829 rather than 1910). Initial indications from the longer climate record are that the frequency of droughts such as 1943/44 is higher than previously assessed.
- An assessment of the impact of climate change on available resources
- Strategic reviews on a number of key issues including metering strategy and a desire to reduce our carbon footprint

Given the potential changes, the water resources and water efficiency schemes considered in the analysis are limited to those included in the analysis of ELL for WRP04. No additional schemes have been included for this update of ELL. Although infrastructure replacement schemes (above and beyond those for maintenance) could be an important element of the upcoming Draft Water Resources Plan, they have not been included in this assessment, as they were not considered in WRP04.

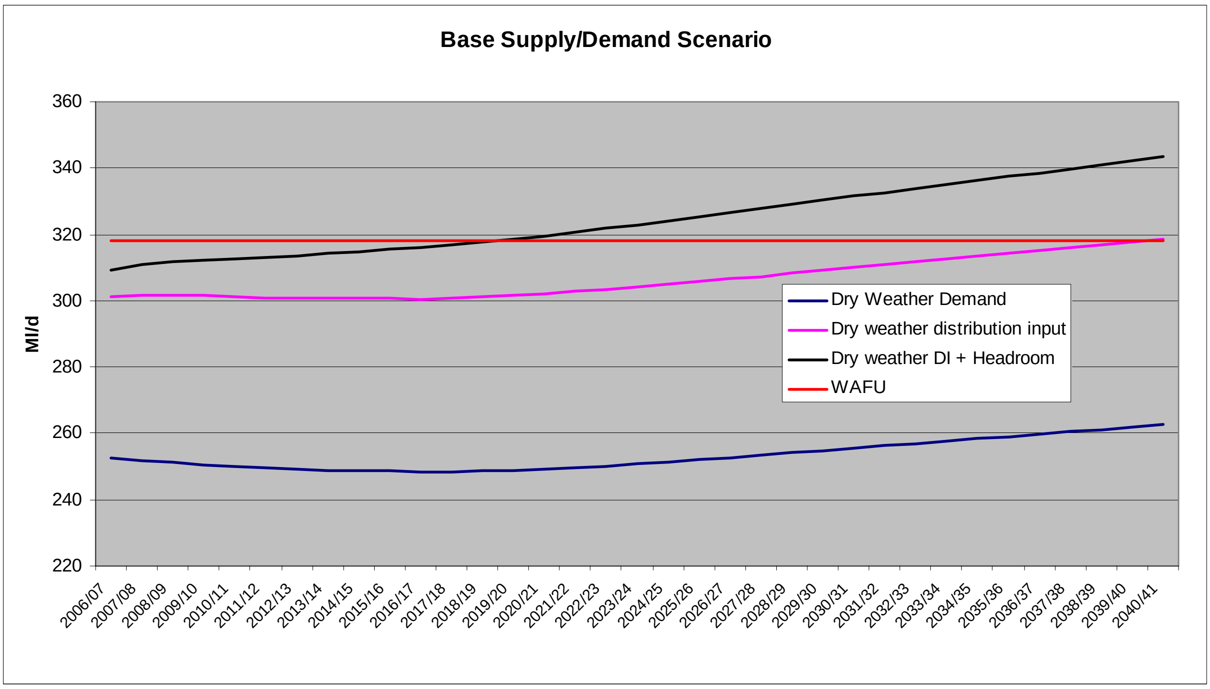
Key differences from the submission in WRP04 include:

- A new ELL analysis tool “ELLEN” with a more sophisticated leakage model
- Updated (2006/07) leakage data, schemes and costs
- Incorporation of the effects of planned infrastructure maintenance and the growth of the supply network
- Inclusion of the social costs of carbon for power use and active leakage activities

The short run ELL (referred to as variable operating cost ELL in the Tripartite Report) has been determined by comparing the cost and benefits of additional active leakage control against the marginal cost (including social costs of carbon) of the water lost. Our assessment is that the **short run ELL** for 2008/09 is 54.6 Ml/d and for 2009/10 55.0

Ml/d. This assessment is based on the current year forward wholesale market prices for power. If power costs increased by 20% the 2009/10 short run ELL would reduce by 0.6 Ml/d. If the social costs of carbon were excluded the 2009/10 short run ELL would increase by 3.3 Ml/d.

The graph below illustrates the base supply/demand balance scenario before consideration of additional resource, demand, or leakage schemes. A key difference from WRP04 is that for this base scenario the leakage in each year is assumed to be at the short run ELL. The addition of new connections and the ageing (and associated degradation) of the network result in forecast short run ELL increasing over the period from 54 Ml/d to 62 Ml/d. The graph shows that available headroom is forecast to fall below target headroom in 2020.



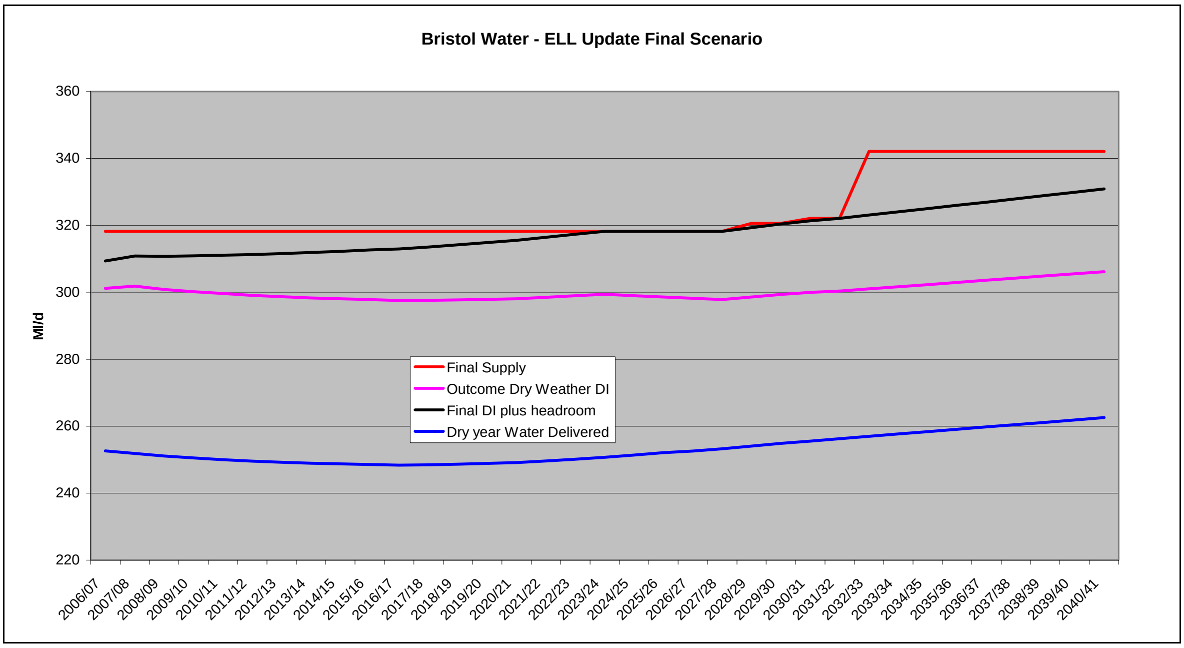
To determine the long run ELL, supply, demand and leakage schemes were investigated to obtain a programme that ensured available headroom did not fall below target headroom. Different combinations and timings were investigated until the least cost intervention programme that did not allow leakage to rise was obtained.

Key aspects of the least cost intervention programme include:

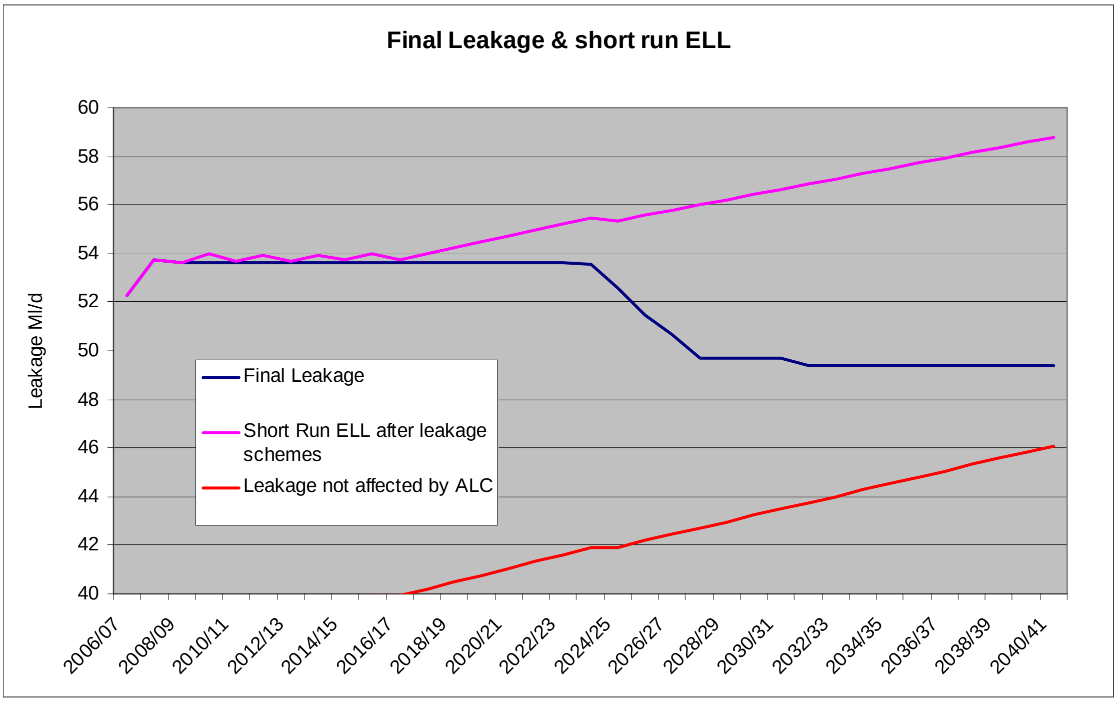
- Construction of an additional reservoir at Cheddar by 2033 – at this stage this is simply a potential option that we need to investigate further
- Honeyhurst and Gurney Slade sources brought back into operation in 2028/29 and 2030/31
- Implementation of a pressure reduction scheme in 2008/09
- Implementation of a number of additional pressure reduction schemes between 2010/11 and 2024/25.
- Additional active leakage control

The one-off social cost of carbon (associated with construction) for new resource and leakage control options has not been included in this assessment. We intend to include the impact of these costs in our December 2007 Draft Water Resources Plan submission.

The graph below shows the final optimised plan scenario. The NPV of the additional expenditure required to balance supply demand is £57m. The LRMC of the plan scenario based on a 5 Ml/d increment in demand over the whole of the period is 52.7 p/m^3. A lower cost scenario is obtainable (NPV £51m) if leakage is allowed to rise during the period, but this has not been adopted for this assessment as it would result in higher leakage targets.



The graph below shows the **long run ELL** identified as a consequence of the least cost plan (that does not allow leakage to rise). This remains at 53.6 Ml/d from 2008/09 until 2024/25. It then declines to 49 Ml/d by the end of the period.



The graph shows that total leakage is approaching minimum policy leakage by the end of the period. To achieve this active leakage control costs would be around four times current costs. In practice it is likely that extending the analysis over a longer period would result in higher final leakage.

The assessment of ELL indicates that the leakage target for 2008/09 and 2009/10 should remain at 54 Ml/d (53.6 Ml/d rounded to the nearest whole Ml/d). On current information, achieving this level of leakage economically would require us to undertake the pressure reduction scheme identified for 2008/09 at an estimated cost of £261k.

Maintaining a target of 54 Ml/d beyond 2010 will become increasingly difficult and expensive given the underlying increase in short run ELL. We are considering this challenge carefully, and we plan a more detailed analysis of the issue in our draft water resources plan. This will include consideration of:

- The impact of additional mains and service pipe replacement
- A wider range of metering and water efficiency options
- Customers willingness to pay for the level of service we provide (e.g. in terms of hosepipe ban frequency)
- A more complete inclusion of environmental and social costs

Initial indications are however, that current leakage targets are not sustainable in the long term without significant increases in the level of infrastructure replacement.

Contents

Executive Summary....1
Contents....5
1 Introduction....6
2 Short Run ELL....7
2.1 Leakage Analysis....7
2.2 Leakage Costs....9
2.3 Marginal Costs....9
2.4 Short Run ELL....10
3 Supply/Demand Base Scenario....11
3.1 Demand....11
3.2 Base Leakage....11
3.3 Water Available for Use....11
3.4 Headroom....12
3.5 Base Scenario....13
4 Intervention Analysis....14
4.1 Supply Schemes....14
4.2 Demand Schemes....14
4.3 Metering Schemes....15
4.4 Leakage Schemes....15
4.5 Method of Analysis....15
5 Final Supply Demand Scenario....17
6 Conclusion....20

1 Introduction

Bristol Water supplies water to 1.1m customers in and around Bristol. The supply area is a single resource zone and has diverse sources of raw water. Approximately half of the water supplied is abstracted from rivers, one third from impounding reservoirs and one sixth from ground water sources. In 2006/07 distribution input was 286 Ml/d, and leakage at 54 Ml/d was equal to the target agreed with Ofwat.

This paper sets out an update of our assessment of the economic level of leakage (ELL) from that presented in our 2004 Water Resources Plan (WRP04). The aim of this assessment is to determine an appropriate leakage target for 2008/09 and 2009/10. The assessment follows the methodology set out in the Tripartite Report (*Best Practice Principles in the Economic Level of Leakage Calculation*) and *The Economics of Balancing Supply and Demand (EBSD) Guidelines, UKWIR.*

The assessment is based upon WRP04 forecasts of demand, headroom and water available for use. We are currently reviewing these forecasts in preparation for our Draft Water Resources plan due to be completed in December 2007.

The water resources and water efficiency schemes considered in the analysis are those included in the analysis of ELL for WRP04. No additional schemes have been included for this update of ELL. Although infrastructure replacement schemes could be an important element of the upcoming Draft Water Resources Plan, they have not been included in this assessment, as they were not considered in WRP04.

2 Short Run ELL

Short run ELL (referred to as variable operating cost ELL in the Tripartite Report) is the level of leakage at which the marginal costs of additional active leakage control equal the marginal cost of the water lost.

The Company has developed a model, “ELLEN”, that calculates short run ELL and enables an economic appraisal of supply and demand to be undertaken to determine long run ELL.

2.1 Leakage Analysis

ELLEN models leakage using a bursts and background (BABE) approach. Total leakage is separated into background leakage (i.e. from leaks too small to detect) and leakage associated with bursts (i.e. from leaks that can be detected). The amount of leakage from bursts depends upon their number, their flow rates and their run times.

ELLEN separates burst run time into:

- Awareness time – the time from initiation until the company is aware or potentially aware of the burst
- Location time – the time the company takes from awareness to react to the burst, locate it, and request a repair
- Repair time – the time from the repair request up to completion of the repair

The overall leakage from bursts can be broken down into the leakage associated with each of these stages of leakage. Using the terminology of the Tripartite report the current policy minimum leakage is the sum of background leakage, leakage during awareness time and leakage during repair time. Additional active leakage control (ALC) will reduce leakage during location time. ELLEN assumes a hyperbolic relationship between ALC expenditure and leakage arising during location time, i.e. if ALC expenditure is doubled, leakage during location time will halve.

The table below sets out a breakdown of 2006/07 leakage used for this analysis.

		Ml/d	Ml/d
Background Leakage			
	Reservoir Losses	0.8	
	Trunk Mains Losses	3.1	
	Mains Losses	4.3	
	Service Pipe and Fittings Losses	26.1	
	MLE adjustment	0.9	
Total Background leakage			35.2
Burst Leakage			
	Leakage during Awareness	2.2	
	Leakage during Location	13.7	
	Leakage during Repair	2.5	
Total Burst Leakage			18.4
Total Leakage 2006/07			53.6

ELLEN analyses leakage separately for bursts from mains, communication pipes, supply pipes, stoptaps, and fittings. It also takes account of whether bursts are reported (the leak is identified otherwise than through active leakage control) or unreported. The table below sets out a more detailed analysis of burst leakage.

	Bursts	Leakage Rate	Awareness Time	Location Time	Repair Time	Total Time	Total Leakage
	Nr	l/hr	d	d	d	d	Ml/d
Distribution Mains reported	634	5,500	0.5	1.8	1.4	3.7	0.8
Distribution Mains unreported	205	4,813	1	5	2.5	8.5	0.6
Stoptaps reported	859	230	60	17.28	2.8	80.1	1
Stoptaps unreported	219	191	130	162	3.3	295.3	0.8
Fittings reported	251	2,780	3	5.4	3.8	12.2	0.6
Fittings unreported	120	1,696	3	81	3.1	87.1	1.2
Communication Pipes reported	858	1,805	3	9	2.6	14.6	1.5
Communication Pipes unreported	229	2,159	3	81	2.9	86.9	2.8
Supply Pipes reported	1,328	956	3	72.36	14.3	89.7	7.5
Supply Pipes unreported	266	956	3	81	14.3	98.3	1.6
Total Leakage Ml/d			2.2	13.7	2.5		18.4

The base data for the table above was obtained as follows:

- Number of bursts was obtained from our SAP works management system for 2006/07
- Leakage rates are based on a sample of leaks where the flow rate has been directly measured or determined from a nightline analysis.
- Awareness times have been estimated based on an analysis of the minimum time the Company could be aware a leak has occurred.
- Repair times have been determined directly from our SAP works management system.
- Total run times are based on a sample of leaks where the duration has been determined from nightline analysis.

The numbers obtained have had to be adjusted such that the total leakage from bursts matches that observed for 2006/07. Where adjustments have been made they have been to location time, the most uncertain parameter and the most critical for determining ELL.

Awareness times are generally low as night flow data from DMA loggers is downloaded daily. This allows larger leaks to be identified immediately, and smaller leaks to be potentially identified within a few days. The Company has DMA coverage over 98% of properties

Supply pipe leakage obtained from the model is 12.9 Ml/d compared to 8.9 Ml/d (pre MLE) in our 2007 June Return (JR07). This difference represents a change in the balance between distribution losses and service pipe losses, it does not affect the overall leakage reported. In JR07 we noted that work with Tynemarch on supply pipe leakage was progressing and that initial indications were that supply pipe leakage may be higher than reported but that further work was required to substantiate this. This work is still ongoing, however we felt it was appropriate to reflect these higher estimates in the forward looking ELL assessment.

2.2 Leakage Costs

For this assessment the key leakage costs are the variable costs of active leakage control. This consists principally of the leakage inspectors' salaries and transport costs. For 2006/07 this expenditure was £416k.

The social costs of carbon associated with the travel of leakage inspectors has been included in the analysis by assuming that the number of miles driven by inspectors is proportional to the total expenditure on ALC. The value obtained for this social cost was 0.109 t/£k ALC expenditure (£4k in total).

Underlying leakage (as measured by night flow analysis) increased between 2005/06 and 2006/07. This may indicate that ALC costs in 2006/07 are not sufficient to maintain stable leakage and that higher expenditure would have been required to achieve this. We have not adjusted costs upwards to reflect this for this assessment, but we are reviewing the data carefully and may make such an adjustment in our Water Resources Plan submission.

The cost of repairing bursts has not been included in this assessment. Changes in active leakage control affect only the time to repair bursts and not the number of bursts to be repaired and thus the costs of burst repair will not change. Burst repair costs will be included in our Draft Water Resources plan submission, as this will include additional infrastructure maintenance schemes that will affect the number of bursts.

2.3 Marginal Costs

The marginal costs of lost water are based upon power use, power costs, and chemical costs for 2006/07. The marginal cost for 2006/07 was 6.2 p/m^3.

Marginal costs for future years are calculated assuming that power intensity (kwh/m^3) and chemical costs (p/m^3) remain constant. Power costs for 2007/8 are based on current contract costs. Power costs for 2008/09 and beyond are based on the current market 1 year ahead wholesale price of £38.5 per MWh. This results in marginal costs of 6.5 p/m^3 for 2007/08 and 5.8 p/m^3 from 2008/09 onwards.

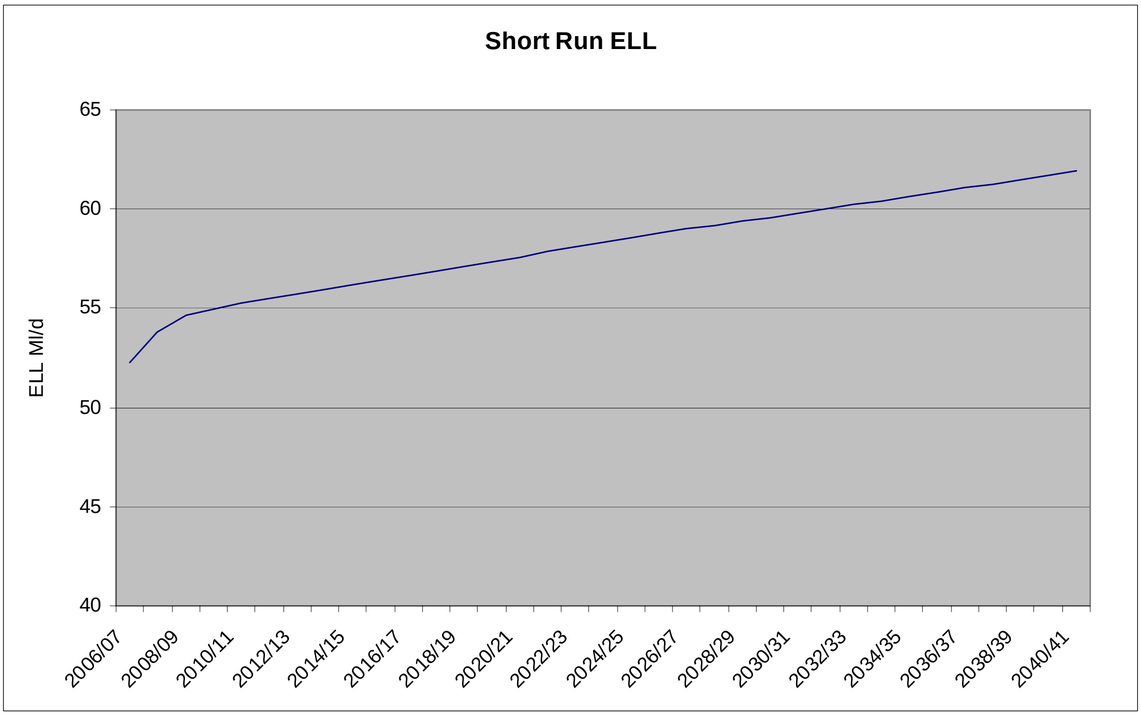
The social costs of carbon associated with power have been included assuming a social cost of carbon of £89.4 per tonne carbon for 2006/07. This value is taken from the central forecast of *"Greenhouse Gas Policy Evaluation and Appraisal in Government Departments"*, April 2006, DEFRA) adjusted to 2006/07 price base. The increasing social cost of carbon in subsequent years has also been obtained from this source. It has been assumed that because of the climate change levy, power costs already include £4.3 per MWh of carbon social costs and the additional social cost of carbon associated with power has been adjusted to reflect this.

Including the social costs of carbon, the marginal cost of water is 9.1 p/m^3 in 2006/07 falling to 8.8 p/m^3 by 2009/10.

The additional carbon associated with the production of chemicals has not been included in this analysis. It will be included for the Draft Water Resources plan submission.

2.4 Short Run ELL

The short run ELL is obtained by setting the level of active leakage control (ALC) so that the costs of additional ALC are equal to the marginal value of the water saved. The figure below shows the short run ELL obtained between 2006/07 and 2040/41.



The steep short run ELL increase between 2006/07 and 2008/09 reflects the anticipated reduction in power costs from the amount the Company currently pays to the level of current market forward prices. The longer term increase in short run ELL reflects the impact of the addition of new properties to the network and the net effect of infrastructure maintenance on leakage.

For 2008/09 and 2009/10 the short run ELL is 54.6 and 55.0 Ml/d respectively.

The short run ELL is sensitive to power costs and the social costs of carbon:

- Increasing wholesale power costs by 20% reduces 2009/10 ELL by 0.6 Ml/d
- Excluding the social costs of carbon increases 2009/10 ELL by 3.3 Ml/d

3 Supply/Demand Base Scenario

To determine the long run ELL it is necessary to consider leakage in terms of the overall supply/demand balance.

3.1 Demand

In 2006/07 water delivered to households and non-households was 238.5 Ml/d, just 0.9 Ml/d higher than forecast in WRP04. Given this close agreement, the WRP04 demand forecast has been used for this assessment. For the period between 2030 and 2041 (not included in WRP04) demand has been assumed to increase in line with the trend at the end of the WRP04 forecast. The additional allowance for demand in dry weather was also the sane as that used in WRP04.

The 2006/07 outturn figures were used for water taken legally unbilled, water taken illegally unbilled, distribution operational use, and water delivered at non-standard rates. These were assumed to remain unchanged in the future.

Property numbers were based on 2006/07 outturn, using the WRP04 forecast of additional properties for future years. For the period between 2030 and 2041 property additions were based on the trend at the end of the WRP04 forecast.

Although demand in 2006/07 was similar to that forecast in WRP04, household demand is significantly higher than forecast. This additional household demand has been offset by a greater than expected reduction in non-household demand. We are currently reviewing our demand forecast in preparation for our Draft Water Resources plan due to be completed in December 2007. It is possible that this updated forecast will differ substantially from that in WRP04. Key factors that could lead to such differences include:

- ONS forecasts for population and property growth are higher than those used for WRP04
- Our previous forecast anticipated a reduction in per capita consumption (pcc). Over the last 15 years average pcc has been constant, and we do not now anticipate a significant fall in pcc.

3.2 Base Leakage

Leakage for the base scenario has been set at the short run ELL before the effect of any leakage reduction schemes. This increases from 54 Ml/d in 2007/08 to 62 Ml/d in 2040/41.

3.3 Water Available for Use

Water available for use is 318.2 Ml/d, identical to the assumption in WRP04.

We are currently reviewing our forecast of WAFU in preparation for our Draft Water Resources plan. It is possible that this updated forecast will differ substantially from that in WRP04. Key factors that could lead to such differences include:

- The impact on our yield assessment of using a longer climate history (back to 1829 rather than 1910). Initial indications from the longer climate record are that the frequency of droughts such as 1943/44 is higher than previously assessed.
- Reductions in yield to account for raw water quality issues
- Changes to the target level of service based on customers' willingness to pay for a different level of service

3.4 Headroom

The target headroom used for WRP04 has been used for this assessment, rolled forward from 2002/03 to 2006/07. Headroom between 2033 and 2041 has been extrapolated based on the trend at the end of the WRP04 forecast.

The target headroom used in WRP04 included an allowance for the impact of climate change based on our understanding at the time. We have not updated our assessment of headroom, demand or WAFU to reflect the latest UKWIR recommended approach and climate adjustment factors. We plan to do this for the Draft Water Resources Plan submission.

3.5 Other Factors

The amount of infrastructure maintenance undertaken can have a significant impact on leakage. For the base scenario we have assumed that mains replacement activity up to 2010 continues at current levels, and that from 2010 onwards the rate of replacement increases sufficiently to maintain a stable burst rate on mains.

The rate of replacement of communication pipes is forecast at to remain at current levels up to 2010 and then increase, to reflect some additional replacement associated with the higher level of mains replacements.

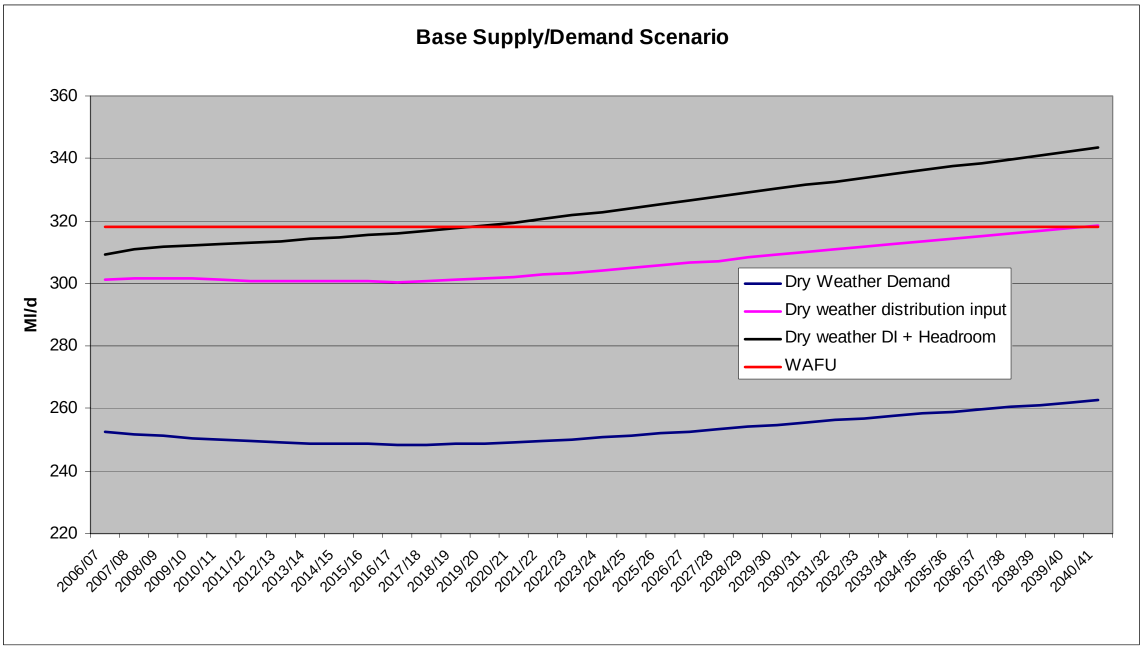
Supply pipe replacements are assumed to continue at the present (low) rate.

To incorporate the impact of infrastructure maintenance on leakage, account has been taken of the effect of maintenance on burst rates and background leakage. A key assumption is that background leakage will increase as infrastructure ages, with the rate of increase in line with the difference in burst rate between new mains and mains on average compared to the average age of mains. Additional work is underway to improve the robustness of our understanding of such relationships and we expect to incorporate the findings into our draft resources plan submission.

For this assessment we have assumed an annual efficiency improvement in ALC of 1% per annum, and a reduction in awareness time of 1% per annum. The impact of an increasing proportion of plastic mains on ALC is also taken into account.

3.6 Base Scenario

The graph below shows the supply/demand base scenario. The graph shows that available headroom will fall below target headroom in 2019/20 in the absence of any additional leakage, supply or metering schemes.



4 Intervention Analysis

To determine the long run ELL it is necessary to find the lowest cost programme of interventions that ensure available headroom is above target headroom in all years.

4.1 Supply Schemes

Five resource schemes were considered. These are summarised in the table below.

Scheme	Yield	Capex	Annual Opex	AIC
	Ml/d	£m	£m	p/m^3
Honeyhurst	2.4	1.7	0.2	41.5
Gurney Slade	1.5	1.7	0.2	61.4
Chew - Cheddar Link	5.0	12.4	0.2	60.3
Purton Bankside Reservoir	25.0	140	0.7	102.2
Cheddar New Reservoir	20.0	110	0.2	94.7

These schemes were all included in WRP04. The costs and yields of the schemes are as included in WRP04 (updated to 2005/06 price base) apart from Purton Bankside Reservoir. An additional £20m (in 2002/03 prices) has been added to the cost of this scheme to reflect the additional network capacity required to properly utilise the scheme.

Two schemes included in WRP04 have been excluded:

- Avon Chew transfer has been excluded as we understand Wessex currently intend to use the Avon to address their low flow sustainability reductions
- Additional capacity at Banwell Spring Treatment works. The AMP4 scheme to address raw quality problems at Blagdon reservoir will make the Banwell Spring treatment works redundant.

Environmental costs of the schemes have been included as for WRP04. The social cost of carbon associated with the construction of these schemes has not been included for this analysis. We intend to include such costs in our Draft Water Resources plan later this year.

4.2 Demand Schemes

A scheme to install grey water recycling in 5,000 households per year has been included in the options list as per WRP04. However, the AIC of this scheme at over £3 per m^3 makes it significantly more expensive than other options.

We are currently reviewing a range of possible water efficiency schemes for including in our Draft Resources Plan.

4.3 Metering Schemes

A scheme to install meters on change of occupier was included in the options list as per WRP04. The costs and savings from change of occupier metering were the same as used in WRP04 updated for inflation. The AIC of this scheme at over £6 per m^3 makes this significantly more expensive than other options.

We have been reviewing the costs and benefits of metering on change of occupier carefully, and were involved in a WRc project (CP222A) to investigate the economics of this.

We will be reviewing in detail our metering strategy for the 25-year strategic direction statement and Draft Water Resources plan including the potential impact of Government guidance on metering.

4.4 Leakage Schemes

A wide range of additional leakage schemes has been considered. These are summarised in the table below.

Scheme	Saving Ml/d	Capex £k	Annual Opex £k	AIC p/m^3	Properties Affected % all props
Pressure Reduction Scheme 1	1.14	261	4.9	6.5	6.8%
Pressure Reduction Scheme 2	0.65	174	2.2	7.1	3.6%
Pressure Reduction Scheme 3	0.59	175	2.5	8.1	3.5%
Pressure Reduction Scheme 4	0.52	169	2	8.7	3.0%
Pressure Reduction Scheme 5	0.57	164	2.7	8.0	4.4%
Pressure Reduction Scheme 6	0.42	211	2.4	13.2	2.8%
Leak noise loggers ALC freq/year > 5	0.11	32	2.1	14.2	N/A
Extension of free repair to all households	0.57	0	117	56.0	N/A
Permanent WWMD logging	0.31	95	4.5	9.9	N/A

Each pressure scheme in the table above consists of 10 areas where pressure reduction would be applied. The pressure reduction schemes were grouped starting with the areas with the highest reductions in background leakage.

4.5 Method of Analysis

The EBSD guidelines set out three possible modelling frameworks and two possible selection routines. For the purposes of this analysis we have used the "Basic Modelling Framework" and a manual iteration version of the "Mixed Integer Programme".

The approach to discounting is consistent with that set out in "*Economic analysis for the Water Framework Directive, Discounting and the calculation of the present value*", Oxera – prepared for Defra:

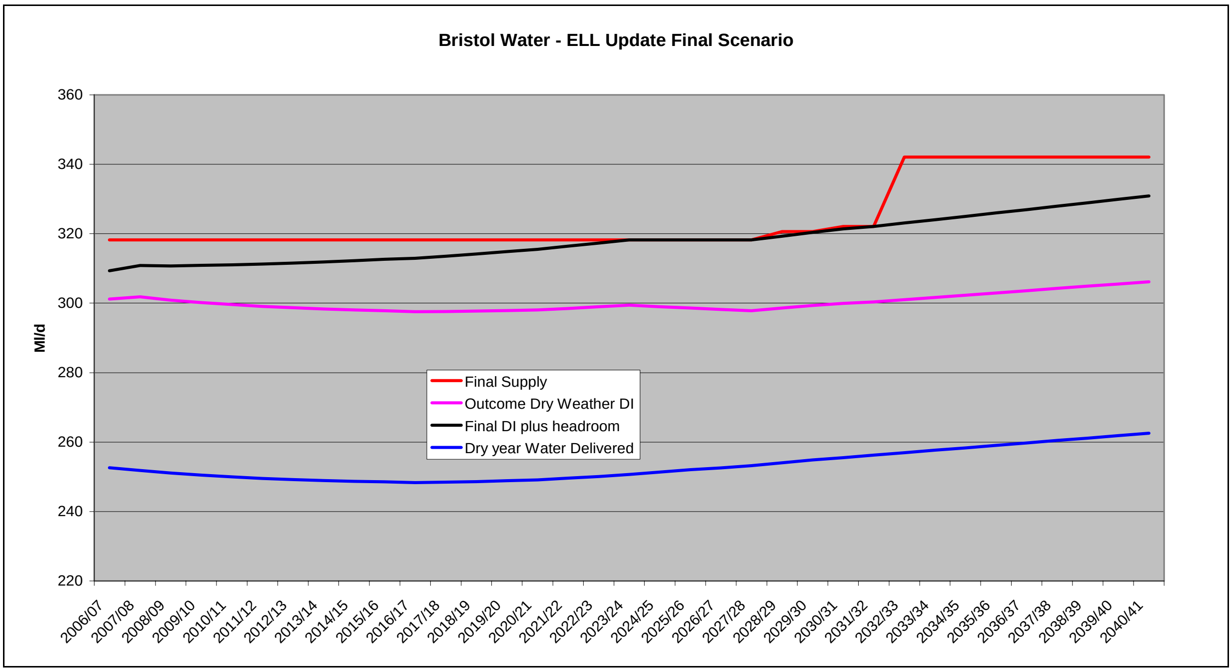
- All capital type costs are annualised
    - Company capital costs are annualised using the Company PR04 post tax cost of capital (5.7%)
    - All other capital costs are annualised using HM Treasury time preference rate (3.5%)
- The annualised cash and benefits flows are discounted using the time preference rate (3.5%)

Combinations of supply, leakage and demand schemes were investigated and the least cost option identified.

Whether leakage is allowed to increase or not has a significant impact upon the analysis. For the purposes of this submission we have assumed that leakage will not be allowed to rise.

5 Final Supply Demand Scenario

The graph below shows the final supply/demand scenario.

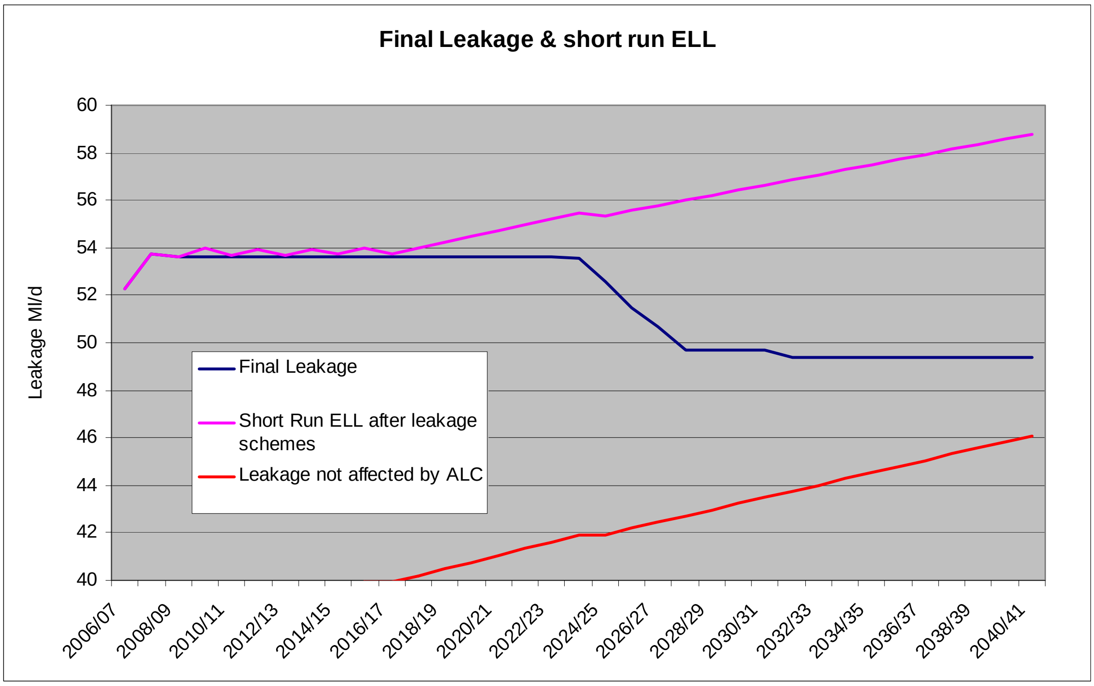


The key points are:

- Honeyhurst and Gurney Slade sources are brought into operation in 2028/29 and 2030/31
- The new Cheddar reservoir is brought into service 2032/33
- The first pressure reduction scheme is implemented in 2008/09
- The other pressure reduction schemes are implemented in 2010/11, 2012/13, 2014/15, 2016/17, and 2024/45

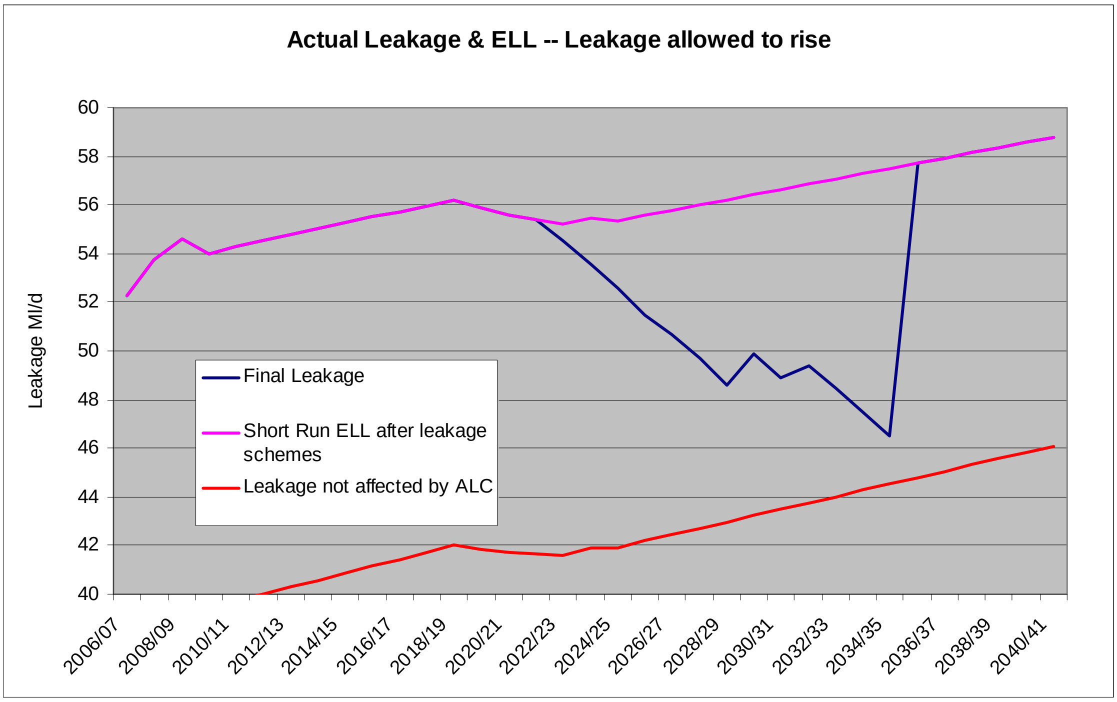
Change of occupier metering and grey water recycling were not found to be cost effective interventions.

The graph below shows the outturn long-run ELL, the short run ELL and the forecast policy minimum leakage. The calculated ELL for 2008/09 and 2009/10 is 53.6 Ml/d.



The figure shows that actual leakage is approaching the policy minimum leakage by the end of the period. ALC costs to achieve this are estimated to be £1.6m per annum (four times current expenditure). Such levels of expenditure are unlikely to be sustainable, and it is possible that an analysis over a longer time period would result in a higher ELL, reflecting the increasing difficulty of not allowing leakage to rise.

The NPV of the optimum scenario was £57m (£35m based on 34 years of annualised costs). If leakage is allowed to rise to the fully economic level, a significantly lower cost scenario can be obtained with an NPV of £51m (£26m of annualised costs). The outturn leakage for this scenario is shown in the figure below.



The large increase in leakage in 2035/36 reflects the completion of a major new source, following which leakage reductions are no longer required to ensure sufficient headroom is available. The leakage profile shown is clearly not practical. However the difference in cost between the scenario allowing leakage to increase and that not allowing an increase shows that not allowing leakage to rise is sub-optimal. Customers will end up with higher bills if leakage is not allowed to rise.

The long run marginal costs (LRMC) of the scenario were determined by finding the additional costs required if demand was increased over the period by 5 Ml/d. The LRMC obtained was 52.7 p/m^3.

No other sensitivity analyses have been undertaken for this update. A wider range of scenarios will be considered in the Draft Water Resources Plan.

6 Conclusion

The Company has updated its assessment of ELL taking into account leakage data and costs for 2006/07, expected power costs, and incorporating the social costs of carbon for power use. The analysis has been undertaken using a different model to that used for the Water Resources Plan submission in 2004 (WRP04).

The long run ELL for 2008/09 and 2009/10 is 53.6 Ml/d. This is coincidently the same as the level submitted in WRP04.

We propose to continue with our (rounded) target of 54 Ml/d up until 2010.

The analysis identified a pressure reduction scheme that would be optimally undertaken in 2008/09. We will instigate implementation of this scheme.

Our Draft Water Resource Plan is due to be submitted at the end of this year. This may differ significantly in its assessment of ELL and required investment from that in the current analysis.