	Title: Overview of documentation of the water-saving effect of the ecoBETA® dual flush solutions	Prepared by: HI Latest revision: 26 October 2015
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Purpose

The purpose of this document is to present an overview of the documentation available on the Internet and in general in relation to the effect of the ecoBETA® watersaving dual flush solutions. Please see attached overview of

Intended use

The ecoBETA® single button dual flush solution can be fitted in most toilet makes and models with a view to conserve water:

- a. Eliminates the risk of overflushing toilets in households, institutions, schools and workplaces, etc.
 - For use in water tanks in new toilets
 - For replacement of dual flush valves with 2 buttons: Minimizes the risk of user error, as users often activate the large flush when only the small flush is required
 - For conversion of a standard single flush toilet to a dual flush toilet
- b. Minimizes the risk of leakage / continuously running water due to breakage or deposit of scale.
- c. Minimizes maintenance of toilets by minimizing the risk of leakage / continuously running water

Claims in general

- a. By specifying the ecoBETA® dual flush solution, our customers gain considerable water savings.
- b. User-friendly, intuitive/easy to operate: Use of the ecoBETA® dual flush solution does not cause any discomfort for the user.
- c. Reliable: Hardly any maintenance or risk of continuously running water after fitting of the ecoBETA® dual flush solution
- d. Cost effective: The ecoBETA® dual flush solution provides high value for money water savings.

Claims in relation to the user

- e. Considerable water savings resulting in cost savings
- f. Simple to use: For the small flush, just press and release. For the large flush, hold the lever or button for 3-4 seconds. The large flush can be interrupted
- g. High level of user satisfaction
- h. Minimizes the need for maintenance due to continuously running water

References to literature, awards and recognitions, case studies and other relevant articles listed in Tables 1,2,3,4)

1-01,1-02,1-03,1-04,1-05,1-07,10-8,1-09,1-10,1-11,1-18, 1-15,1-16, 1-20,1-21,4-13,2-03,2-04,2-06,2-07,2-08,2-09,3a-02,3a-03,3a-04,3a-05,3a-06,3a-07, 3a-08,3a-09, 3a-10,3b-01,3b-02, 3b-03,3b-04,3b-05,3b-06,3b-07,3b-08, 3b-09,3b-10, 3b-11,3b-12,3b-13, 3b-14,4-02,4-03,4-04,4-05,4-06,4-07,4-08,4-09,4-10,4-11, 4-12,4-13,4-14,4-15, 4-16

1-01,1-03,1-04,1-05,4-12,3a-06,3a-09,3b-05,3b-06, 3b-13

1-03,2-04,3a-01,3a-04,3a-01,3a-06,3a-10,3b-03,3b-06,3b-13-10


1-01,1-04,1-12,4-12,4-13,2-04,3b-06,3b-14,4-03,4-04

1-01,1-04,1-11,4-13,3-07,4-04

1-01,1-03,1-04,1-05,4-12,3a-06,3a-09,3b-05,3b-06

1-01,1-04,1-05,3b-13-12,4-07

1-03, 2-05,3a-01,3a-02,3a-04,3a-06,3a-10,3b-03,3b-06,4-10

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Claims in relation to water management

- i. Significant water savings
- j. Water companies gain overall cost savings on pumping, transport and purification of wastewater as less water is required.
- k. The ecoBETA® dual flush solution constitutes a feasible option to tackle the balance between water supply and demand and security of supply in a way that is economically, socially and environmentally sustainable. This water efficiency measure should be combined with other water saving products as well as other measures including behaviour changes and awareness raising.

Technical claims

- l. Designed in several different versions for a wide range of toilet makes and models:
 - Can be supplied as a retrofit for conversion of a single flush toilet into a dual flush toilet, while retaining the existing valve: By installing an ecoBETA® dual-flush mechanism, it is possible to reduce the flush volume by up to 50% per flush when activating the half-flush.
 - In replacement of dual flush valves with 2 buttons, the ecoBETA® dual flush valve saves water by minimizing the risk of user error, as users often activate the large flush when only the small flush is required
 - For installation in new toilets
- m. The ecoBETA® dual flush solution does not affect the full flush volume – but the large flush volume can be modulated by releasing the flushing button/lever when required, thereby interrupting the flushing action.
- n. Easy installation/retrofitting by certified installer
- o. When fitted, the ecoBETA® dual flush solution is a discreet and integral part of the toilet design.
- p. The ecoBETA® dual flush solution can be operated by a lever or a button, operated upwards or downwards.
- q. The ecoBETA® dual flush solution allows easy adjustment of the small flush level to the amount of water required by the toilet bowl and the sewage system, from 2½ litres to 5 litres or more.
- r. The ecoBETA® dual flush solution is made up of only few parts. The sturdy and simple construction and functional design ensures operational reliability and minimizes the risk of malfunction due to breakage or deposits of scale.

References to literature, awards and recognitions, case studies and other relevant articles listed in Tables 1,2,3,4)

1-01,1-02,1-03,1-04,1-05,1-07,10-8,1-09,1-10,1-11,1-12,1-15,1-16,1-20,1-214-13,2-03,2-04,2-06,2-07,2-08,2-09,3a-02,3a-03,3a-04,3a-05,3a-06,3a-07, 3a-08,3a-09, 3a-10,3b-01,3b-02, 3b-03,3b-04,3b-05,3b-06,3b-07,3b-08,3b-09,3b-13,3b-14,4-02,4-03,4-04,4-05,4-06,4-07,4-08,4-09,4-10,4-11, 4-12

3a-01,4-04

1-03,1-04,1-20, 3b-13,3b-14,4-02,4-04,4-06,4-08,4-10,4-11

1-01,1-02,1-03,1-04,1-06,1-07,1-08,1-09,1-10,1-11,1-12, 1-15,1-16,1-20,4-13,2-03,2-04,2-06,2-09, 4-07, 4-12

1-03,2-03,2-05,3a-01,3a-02,3a-04,3a-08,3a-09,3a-10,3b-05,3b-06

3b-05,4-07


1-04,1-18,3b-01,3b-02, 3b-06

1-04,3b-02

2-04

4-07

1-03,1-18,2-05,3a-01,3a-02,3a-04,3a-01,3a-06,3b-03,3b-06,4-10

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Method

The relevant search terms have been found and the relevant information was extracted from the relevant literature/articles found on the Internet, see Tables 1 and 4. Overview of awards and recognitions are listed in Table 2. Extracts of Danish and international case studies are listed in Table 3.




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Table 1: Relevant literature provided by water companies in the UK related to *ecoBETA*®


Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article
1-01	Preston Water Efficiency Initiative Final Report March 2009 Pages 7,9,12,15,17-21,30-35	Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency. As the leading authority on water efficiency in the UK, their aim is to reverse the upward trend in how much water is used at home and at work by working closely with the water industry, governments and regulators, manufacturers and retailers.	<p>The Preston Water Efficiency Initiative piloted an innovative water demand-management project that aimed to:</p> <ul style="list-style-type: none"> • Reduce levels of water consumption of tenants living in social housing; and • Provide recommendations for future retrofitting of water efficiency devices in existing stock. <p>The initiative was undertaken in Preston, Surrey, and had a number of key components:</p> <ul style="list-style-type: none"> • The installation of new dual flush toilets and water efficient showers to 160 dwellings as part of an enhanced Decent Homes programme; • The retrofitting of water efficiency devices, such as a dual flush conversion product and a leakage alarm, to 205 properties that 	<p>Demand management retrofit programme The package of measures included the following:</p> <ul style="list-style-type: none"> • Toilets: an initial check of each toilet's water level was made by the surveyor and adjustments were carried out to ensure that the level was not higher than that recommended by the manufacturer (usually a line is shown on the inside of the cistern). Each toilet was then assessed for suitability of installing an ecoBETA, which is a dual flush retrofit device that converts an existing 9-litre or 7.5-litre cistern into a dual flush cistern (e.g. typically 9/4.5 litres). <p>School and leisure centre retrofit programme The initiative also involved work with the local primary school, Epsom Downs, and the Banstead Leisure Centre, both based in Preston.</p> <p>In order to decide on which appropriate measures were necessary, a specialist contractor called Aqualogic was commissioned to undertake water saving audits at both venues. The devices were fitted by Aqualogic at the time of the survey.</p> <p>Following Aqualogic's recommendations the following water efficiency devices were installed at the school:</p> <ul style="list-style-type: none"> • Urinal controls on flushing urinals; • Push taps to replace existing taps; • Flow restrictors on feeds to hot and cold taps; • ecoBETAs in toilets to convert to dual flush; • Replacement of high level cisterns with close-coupled dual flush cisterns; and, • Water butts. <p>Water efficiency devices were installed at the leisure centre following an audit and recommendations by Aqualogic:</p> <ul style="list-style-type: none"> • Existing taps were replaced by push taps (achieved by inserting a new top to the existing tap shank); • In-line flow regulators were used to control the flow of the taps; • Urinal controls were either repaired or replaced; • ecoBETAs were installed in toilets to convert to dual flush; and • Water butts were placed. <p>Actual water savings <u>Refurbishment and retrofit programmes</u></p>

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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article																																																																										
			were not part of the Decent Homes programme;	<p>Each of the monitoring methods (as detailed in appendix 4) produced an estimated saving for both the bathroom refurbishment and the retrofit programme (table 3). These results were combined to produce an overall saving for the 2 types of programme (table 4).</p> <p>Table 3 shows that both the refurbishment and retrofit components of the programme achieved considerable savings, very close to the original forecast. The retrofit savings are slightly less than forecast, which could be due to those homes where the devices could not be fitted. <i>For example, ecoBETAs were fitted in 92% of homes, as some already had dual flush toilets.</i></p> <table><tr><th></th><th>Number of properties</th><th>Monitoring</th><th>Monitoring period</th><th>% water savings for refurbished properties</th><th>% water savings for retrofit properties</th></tr><tr><td>Individual properties</td><td>27</td><td>Fortnightly</td><td>Oct 07 – Dec 08</td><td>23%</td><td>13%</td></tr><tr><td>Block of flats</td><td>30</td><td>Monthly / 15 minute</td><td>Apr 07 – Feb 09</td><td>28%</td><td>-</td></tr><tr><td>Small Area Monitors</td><td>139</td><td>15 minute</td><td>Oct 07 – Dec 08</td><td>23%</td><td>15%</td></tr><tr><td colspan="4">Average of all methods of monitoring</td><td>24.2%</td><td>13.7%</td></tr><tr><td colspan="4">Weighted average watersavings</td><td>25.0%</td><td>13.9%</td></tr></table> <p>Table 3: Measured watersavings</p> <p>Tenants feedback: retrofits</p> <p>Questionnaires were completed with sixty-six tenants, which represents about one third of the 205 participating households who received retrofits.</p> <p>Table 10 summarises users’ attitudes to each of the water saving devises that were installed as part of the retrofit. <i>The table shows that the installation of the ecoBETA was the most popular feature, with 41% of respondents saying that they either liked or liked a lot this feature.</i> The table also shows that the leak alarm was liked or liked a lot by 21 percent of people.</p> <table><tr><th></th><th>Dislike a lot</th><th>Dislike</th><th>No opinion</th><th>Like</th><th>Like a lot</th><th>N/A</th></tr><tr><td><i>ecoBETA</i></td><td><i>9%</i></td><td><i>2%</i></td><td><i>29%</i></td><td><i>30%</i></td><td><i>11%</i></td><td><i>17%</i></td></tr><tr><td>Leak alarm</td><td>17%</td><td>5%</td><td>49%</td><td>18%</td><td>3%</td><td>3%</td></tr><tr><td>Water butt</td><td>0%</td><td>0%</td><td>2%</td><td>0%</td><td>5%</td><td>88%</td></tr></table> <p>Table 10: Opinion of the water saving devices fitted</p> <p>Table 11 shows that around 3/4 of tenants (73 percent) said that they were either happy or very happy with the overall quality of the fittings. 82 percent of tenants also said that they were either happy or very happy with the service that they had been provided by the contractors.</p> <table><tr><th></th><th>Very unhappy</th><th>Not happy</th><th>Happy</th><th>Very happy</th></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>		Number of properties	Monitoring	Monitoring period	% water savings for refurbished properties	% water savings for retrofit properties	Individual properties	27	Fortnightly	Oct 07 – Dec 08	23%	13%	Block of flats	30	Monthly / 15 minute	Apr 07 – Feb 09	28%	-	Small Area Monitors	139	15 minute	Oct 07 – Dec 08	23%	15%	Average of all methods of monitoring				24.2%	13.7%	Weighted average watersavings				25.0%	13.9%		Dislike a lot	Dislike	No opinion	Like	Like a lot	N/A	<i>ecoBETA</i>	<i>9%</i>	<i>2%</i>	<i>29%</i>	<i>30%</i>	<i>11%</i>	<i>17%</i>	Leak alarm	17%	5%	49%	18%	3%	3%	Water butt	0%	0%	2%	0%	5%	88%		Very unhappy	Not happy	Happy	Very happy					
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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article														
				<table><tr><td>Satisfaction with quality of fittings</td><td>5%</td><td>14%</td><td>58%</td><td>15%</td></tr><tr><td>Satisfaction with contractors</td><td>6%</td><td>5%</td><td>51%</td><td>31%</td></tr></table>					Satisfaction with quality of fittings	5%	14%	58%	15%	Satisfaction with contractors	6%	5%	51%	31%
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				Table 11: Opinion of standards														
				Around a third of users said that they had experienced some problems with the devices as highlighted in table 12 below. The most significant problem that 22% of respondents raised was with the leakage alarm and the other was the ecoBETA. Again the Project Team investigated the issues and took action.														
				For example, some tenants stated that the alarm kept going off; in most of these cases the tenant or Raven removed the device. One tenant stated the alarm did not go off despite a leak, whilst another said the alarm did detect a leak.														
				<i>Regarding the ecoBETA, one tenant found it difficult to obtain the full flush due to arthritis (the handle must be held down) and 2 others stated the toilet lid no longer fitted properly.</i>														
				<table><tr><td>None</td><td>ecoBETA</td><td>Leak alarm</td><td colspan="2">Other</td></tr><tr><td>68%</td><td>9%</td><td>22%</td><td colspan="2">2%</td></tr></table>					None	ecoBETA	Leak alarm	Other		68%	9%	22%	2%	
				None	ecoBETA	Leak alarm	Other											
				68%	9%	22%	2%											
Table 12: Types of problem experienced																		
Findings: practitioner experience (<i>extract</i>)																		
To evaluate practitioner experience key participants who had been involved were interviewed.																		
Full details of the responses to the semi structured questionnaires are given in appendix 7; however, the main comments can be summarised as follows:																		
<ul style="list-style-type: none"><i>The ecoBETA was the most successful retrofit product and provided the best value for money water savings</i>																		
Conclusions (<i>extract</i>)																		
<ul style="list-style-type: none"><i>The most successful retrofit device was the ecoBETA, which converts a single flush siphon to a dual flush. This device was responsible for the majority of water savings through the retrofit and was generally liked by tenants; however, it must be fitted correctly.</i><i>30% water savings were achieved in a school that received retrofitting of water efficiency devices. The measures included the fitting of urinal controls, push taps, new dual flush toilets and ecoBETAs.</i>																		
Recommendations (<i>extract</i>)																		
<ul style="list-style-type: none"><i>This trial has shown that converting an existing single flush toilet to dual flush has obtained good value for money savings and should be installed by Registered Social Landlords and other</i>																		





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				<i>housing providers</i> . A number of retrofit toilet devices are on the market and the one used in this initiative was the ecoBETA. Most successful part of project (<i>extract</i>) <ul style="list-style-type: none">• <i>Best value water saving from ecobeta toilet retrofit device</i> The Way Forward (<i>extract</i>) <ul style="list-style-type: none">• <i>look for quick wins – need to fit water saving devices like ecoBETAs when visiting houses for other purposes (e.g. gas inspections)</i>• <i>ecoBETAs most cost effective part of project</i>					
1-02	United Utilities Final Water Resources Management Plan September 2009 Main Report Page 96	United Utilities holds a license to provide water and sewage services to around 7 million people in North West England	UU takes an active role in promoting the efficient use of water by all types of household and non-household customers.	The following paragraphs summarise UU’s water efficiency policies and activities in respect of each of the ten good practice headings identified in Water Efficiency Initiatives - Good Practice Register (Ofwat, 2007). Toilet retrofit In 2007 UU conducted over 400 “visit and fix” home audits using qualified plumbers. Amongst other activities, the plumbers fitted “ecoBeta” dual flush conversion devices. <i>These devices are an effective method of converting a single flush toilet into a dual flush appliance, potentially saving an average of 20 litres per property per day. In total around 200 devices were fitted.</i>					
1-03	Using Science to Create a Better Place Delivering water neutrality: Measures and funding strategies Resource Efficiency Science Programme October 2009 Pages 24, 39, 89	The Environment Agency is the leading public body protecting and improving the environment in England and Wales.	The aims and main tasks of this study are to identify and assess options relating to the implementation and financing of water neutrality, particularly relating to ‘offsetting’ new water use by retrofitting existing homes, buildings and nondomestic water use.			Water savings (litres/property/day)			Number in sample
					Water efficiency measure	Max	Min	Mean	
	Toilets	Cistern displacement devices	34.60	0.01	11.47	16			
		Dual-flush replacement (social housing)	145.29	61.32	103.31	2			
		Dudley turbo 88 retrofit dual-flush	24.39	4.19	16.23	6			
		ecoBETA retrofit	53.49	5.73	21.16	8			
		Ecoflush (variable flush device)	22.14	16.90	19.52	2			
		Variflush (variable flush device)	24.00	22.14	23.37	3			
	Showers	Shower timer	26.05	0.23	4.32	8			
		Shower flow restrictor	6.18	6.18	6.18	1			
		Shower heads	39.50	1.14	12.40	11			
		Bath measure	4.44	4.44	4.44	1			
		Replacing bathing with showering	39.46	37.31	38.39	2			
	Taps	Tap inserts and restrictors	24.89	2.07	10.19	9			
		Tap washers (repairing dripping taps)	13.08	0.47	7.54	5			
		Turning tap off when brushing teeth	29.75	10.31	21.55	4			
	Outdoor	Water butts	4.76	1.58	2.65	4			
		Hose guns	1.58	0.28	1.13	8			
		Soil crystals	0.02	0.02	0.02	1			
		Efficient washing machines	26.79	26.79	26.79	1			

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				<p>Table 3.2 Water savings from interventions</p> <p>Intervention measures that constitute mitigation strategies to achieve water neutrality are described in this appendix. Details included here represent current understanding of the evidence of their effectiveness in making water savings. Trials in many parts of the country are ongoing and it is hoped that evidence will continue to be gathered and analysed.</p> <p>Water efficiency measures for toilets:</p> <ul style="list-style-type: none"> • Cistern displacement devices, such as a Hippo or Save-a-Flush • <i>Retrofit dual-flush devices, such as the ecoBETA</i> • Retrofit interruptible flush devices, such as the Interflush • Replacement dual-flush toilets • Replacement low-flush toilets <p>The changes in the Water Supply (Water Fittings) Regulations in 1999 set a mandatory maximum flush of 6 litres for any toilet installed after January 2000. This policy driver has been successful in reducing the water used for toilet flushing. There remain, however, a large number of large volume cisterns in operation throughout the UK and these are responsible for a major proportion of per capita consumption.</p> <p><i>Dual-flush toilets are often considered to be more efficient than single-flush systems. They allow a main flush (long flush) of between 4 to 6 litres, with a smaller flush (short flush) button that uses around 2 to 4 litres. It is possible for dual-flush systems to be retrofitted into single-flush toilets with minimal effort. There is however now growing evidence that many dual-flush mechanisms can fail which can result in leakage. As well as risk of the mechanism jamming and the valves leaking (which go undetected due to the internal overflow) there is also evidence that the user does not know how to operate the dual-flush system properly. Often only the higher flush is used, or sometimes when the smaller flush is used at the wrong time this necessitates a double flush which wastes water. Current devices on the market are not always intuitive and are not usually clearly labelled. Regulations could be amended to improve the labelling of all water-efficient products.</i></p> <p><i>One of the main reasons for targeting toilets to reduce demand management is that they will always be used daily, and the yield is more accurate than other devices as it is an engineered defined solution and does not have a behavioural component. There is not a time component of this water use - one flush is one flush and this hopefully will not change over time. Toilet retrofits would reduce annual average demand, but not peak demand.</i></p>


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1-04	Water Efficiency Project End of Year 1 Report: 2008-2009 Pages 3-5, 9-11, 17, 26-27	Environment Agency RADIANT is an award winning organisation providing nearly 21000 affordable homes in Berkshire, Buckinghamshire, Dorset, Hampshire, Isle of Wight, Surrey, Sussex and Wiltshire	<p>The Water Efficiency Project is being undertaken by Radian in partnership with the Environment Agency from March 2008-2010 and researches how best to tackle water efficiency in new-build and existing homes. Recommendations are provided based on the first year's findings.</p> <p>The South East of England, including South Hampshire, has been identified as a region of severe water stress: the region has low rainfall, a high population density and each individual is consuming high volumes of water. South Hampshire is a new growth point area with 80,000 new homes proposed over 2006-2026 which will put further pressure on water resources. To accommodate the proposed growth in the sub-region, there needs to be sustainable demand management of water in the PUSH area</p>	<p>Research undertaken in year 1 <u>Existing Homes</u></p> <ul style="list-style-type: none"> • Data collection meters were installed in 28 existing homes to monitor water consumption levels (the homes were built in 1977). • <i>Retro-fitting of 8 existing homes with ecoBETA dual flush toilet devices.</i> • Collecting 28 surveys about household behaviour in existing homes. • 300 save-a flush bags were distributed within Radian properties and offices. <p>Findings from year 1 <u>Existing Homes</u></p> <ul style="list-style-type: none"> • <i>Retrofitting the ecoBETA device reduced water consumption by 21%, from an average of 137 litres per person per day to 108 litres per person per day – 29 litres, achieving Defra's target of 130 litres.</i> • <i>At the moment only water companies can purchase ecoBETAs and each ordinarily costs around £10 although this depends on how many devices are ordered. Labour to fit the 8 devices cost £320.</i> • <i>It is estimated that one resident, who was on a meter and had an ecoBETA installed, is saving £18 a month.</i> • <i>Generally residents gave positive feedback about using the ecoBETA, however some residents commented that they had to flush twice.</i> <p>Recommendations Significant water savings are made when new homes are built to Code for Sustainable Homes Levels 3 and 4 such as the homes in Liss and Alton. <i>Significant savings can also be made in the existing housing stock if existing homes were retro-fitted with ecoBETA dual flush toilet devices. It is important to note that increased water efficiency is required in the existing housing stock to facilitate growth and enable water neutrality to be achieved.</i></p> <p><i>Raising awareness on the importance of water conservation alongside fitting water efficient devices is required as the way water is used also contributes to further reducing water consumption.</i></p> <p>Additionally, reducing usage of hot water in the home also contributes to lower fuel bills alongside traditional energy efficiency measures such as insulation.</p> <p>The ecoBETA</p>

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			<p>with the aim of water neutrality</p>	<div> <p>Figure 6: Eco beta retrofit device Figure 7: Installing an eco-beta device</p> </div> <div>   </div> <div> <p>Figure 8: Paul Sansby, Portsmouth Water and David Leach, Radian Services fitting an eco-beta device</p> </div> <div>  </div> <div>  </div> <div> <p>Figure 9: After the ecoBETA device has been fitted</p> </div> <p><i>It was found that to install the ecoBETA device, which included drilling a hole in the toilet siphon, took about 15 minutes.</i> However 15% of the toilets were more difficult to fit because they had a more modern flush system. One toilet was found to have an old and large toilet cistern where the ecoBETA could not be fitted. Therefore an order was raised to replace the toilet with a new dual flush toilet, as part of standard maintenance works.</p> <p>For the first year, the main aim was to trial the ecoBETA device. To determine a clear-cut result for this, it was necessary to use a quantitative approach. At the start of the project most households paid their water bills on a rateable basis. For the purpose of this project, Portsmouth Water installed water meters that collect data on how much water each household uses. However, the households continued to pay their water bill as they were doing before, unless they requested otherwise. To determine the impact of the ecoBETA, water consumption before and after the installation of the device was compared. Table 4 shows the figures for the set-up of this existing homes project.</p> <p>Similar to the new homes project a qualitative approach, in the form of a short questionnaire, was also used to find out what devices were already in their properties and about residents behaviour with these water appliances.</p> <p><u>The Cost</u></p>

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				<p><i>Portsmouth Water provided the ecoBETAs free of charge.</i> At the moment, only water companies can purchase ecoBETAs. Ordinarily an ecoBETA costs about £10, but this depends on how many devices are ordered. The total cost of the labour to fit the devices was £320.</p> <p><u>Raising awareness in new and existing homes</u></p> <p><i>Further, it was found that in some of our new homes where water efficient technology was installed, residents felt that they were more aware of the way they use water.</i></p> <p>Existing Homes Project</p> <p><i>It would be expected that the older homes would be less efficient and therefore consume large volumes of water. However it was found that, without making any changes, the average water consumption for the properties is 129.3 litres per person per day and the average occupancy is 1.7 people per property.</i> This meets Defra’s target of 130 litres per person per day. This figure is surprisingly low in comparison with the assumed average for the South East of England of 160 litres per person per day. One reason for this may be because of the requirement Radian has, under the Decent Homes standard, to refurbish bathrooms so the appliances may not be as old and inefficient as other existing homes.</p> <p><i>8 properties have so far had ecoBETAs fitted. The feedback has been mixed; although most comments have been positive, a few residents found that they had to flush the toilet twice.</i> These properties will be visited to find out the problems. <i>One resident said that ecoBETA means that “[the toilet] uses less water, but working on the original lever rather than pressing a smaller knob to flush the loo makes it a lot easier!”</i> However one resident found that “[they had] to keep pushing [the] handle loads of times before it flushes”.</p> <p><i>As shown in table 11, before installing the ecoBETAs into the 8 properties, average water consumption was 137 litres per capita per day. After installing the ecoBETAs the average water consumption reduced to 108 litres per person per day. This means that an average of 29 litres of water has been saved per person per day in each of the 8 properties. This works out to be a saving of about 12,200 litres a month. Clearly, over a year, if the devices continue to work, a substantial amount of water could be saved.</i></p> <table><tr><th>Properties participating in existing homes project</th><th>Average consumption(litres pcc)</th></tr><tr><td>All properties in project</td><td>129.3</td></tr><tr><td><i>Properties with dual flush toilets</i></td><td><i>144.8</i></td></tr><tr><td>Other properties</td><td>139.9</td></tr><tr><td><i>Properties with ecoBETA fitting</i></td><td></td></tr></table>	Properties participating in existing homes project	Average consumption(litres pcc)	All properties in project	129.3	<i>Properties with dual flush toilets</i>	<i>144.8</i>	Other properties	139.9	<i>Properties with ecoBETA fitting</i>	
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				<table><tr><td><i>Average consumption before ecoBETA was fitted</i></td><td><i>137</i></td></tr><tr><td><i>Average consumption after ecoBETA was fitted</i></td><td><i>108.2</i></td></tr><tr><td><i>% reduction of average consumption 21%</i></td><td><i>21%</i></td></tr><tr><td><i>Estimated average water saving per person per day</i></td><td><i>29</i></td></tr></table>	<i>Average consumption before ecoBETA was fitted</i>	<i>137</i>	<i>Average consumption after ecoBETA was fitted</i>	<i>108.2</i>	<i>% reduction of average consumption 21%</i>	<i>21%</i>	<i>Estimated average water saving per person per day</i>	<i>29</i>																																			
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				<u>Financial savings for residents</u> As most residents are not on metered water bills, they have not yet received any financial benefit from installing the ecoBETA. <i>It is estimated that one resident, who was on a meter and had an ecoBETA installed, is saving £18 a month</i>																																											
1-05	Essex & Suffolk Water Final Water Resources Management Plan 2010-2035 Pages 157, 178-183, 192-193, 223,227,416,484-485	Part of Northumbrian Water Group providing water in eastern England.	This Final Water Resource Management Plan has been produced in accordance with statutory requirements and follows the Environment Agency’s Guidance document. All of the components of demand and supply have been reviewed for this plan and the majority reworked using specific guidance or industry best practice methodologies.	A range of other devices have been distributed free on request and through projects as follows: <table><tr><td></td><td colspan="6">Number Sent Out</td></tr><tr><td>Item</td><td colspan="2">2004/5</td><td colspan="2">2005/6</td><td colspan="2">2006/7</td><td colspan="2">2007/8</td></tr><tr><td></td><td>Mailing</td><td>Through audits</td><td>Mailing</td><td>Audit projects</td><td>Mailing</td><td>Audit projects</td><td>Mailing</td><td>Audit projects</td></tr><tr><td><i>ecoBETA dual flush device</i></td><td></td><td></td><td></td><td></td><td><i>37</i></td><td><i>1010</i></td><td></td><td><i>898</i></td></tr></table> H2eco In a change to previous projects the quantity of products available to each customer was virtually unlimited. For example with the ecoBETA, if the customer stated that they had seven toilets then seven toilet products were made available to them. In cases where the product ordered was unsuitable, an alternative was offered, (if available). Where no alternative product was suitable advice was given to the customer on what action to take next. Where a choice of product was available to address one water use e.g. the ecoBETA and Save-a-flush for wcs, the workbook first offered the primary water saving product, then the alternative, then where neither if applicable, advice specific to that water use. The table below summarises the results from the project: <table><tr><th colspan="2">Key Result</th></tr><tr><td>Total customers invited to participate</td><td>7,524</td></tr><tr><td>Applications received</td><td>1,582 (21% of mailing)</td></tr><tr><td>Metered vs. unmeasured</td><td>Of those that applied 62% were Metered (930) 38% were Unmeasured (565)</td></tr></table>			Number Sent Out						Item	2004/5		2005/6		2006/7		2007/8			Mailing	Through audits	Mailing	Audit projects	Mailing	Audit projects	Mailing	Audit projects	<i>ecoBETA dual flush device</i>					<i>37</i>	<i>1010</i>		<i>898</i>	Key Result		Total customers invited to participate	7,524	Applications received	1,582 (21% of mailing)	Metered vs. unmeasured	Of those that applied 62% were Metered (930) 38% were Unmeasured (565)
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				Audits completed	1,495	
				Product	Quantity Fitted	Water saved l/property/day
				ecoBETA	903	48.3
				Aerated shower head	301	36.8
				Save-a-flush	524	13.8
				Tap inserts	635	19.6
				Kitchen tap insert	573	13.7
				Tap re-washing	159	10.6
				Bath measure	535	4.94
				Shower timer	1,495	2.45
				Water butt (standard)	985	1.90
				Hose gun	1,026	1.51
				Crystals	1,263	0.02
				Children detective kit	684	Undetermined
				Shower flow bag	1495	Undetermined
				Savings	30.55 l/prop/day	
				In May 2008, 7,306 customers in a different area of Chelmsford were mailed and invited to take part in the project. 1,439 customers took part in the project having water-saving products delivered and/or installed, representing a return rate of 20%. The same method of calculating the savings was used as described in Phase 1 (meter reads taken at all externally metered properties, 200 loggers installed and measurement by proxy). All participating properties saved on average 17.38 litres per property per day.		
				The table below shows the number of products installed through delivering the project:		
				Product	Number delivered and/or installed	
				ecoBETA	370	
				Save-a-flush	427	
				Aerated showerhead	169	
				Tap inserts	209	
				Miracle Tap Adaptor	314	
				Tap re-washing service	121	
Bath measurWater butte	578					
Water saving crystals	1094					
Hose gun	1168					
Children’s activity pack	991					

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				<table><tr><td>Shower flow bags</td><td>756</td></tr><tr><td>Shower timers</td><td>7306</td></tr></table>	Shower flow bags	756	Shower timers	7306	
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				<p>Both Phase 1 and Phase 2 were deemed great successes by the customers and the results/recommendations have been taken forward to influence the phase 3 trial currently being carried out.</p> <p><u>Phase 3 trial</u></p> <p><i>This innovative approach will provide a number of benefits. It will allow the plumber to encourage the customer to have more products fitted. An area of concern in previous projects has been that customers are put off having products such as the ecoBETA and the tap inserts fitted due to the need to involve plumbing system changes. This new approach will allow the plumber to demonstrate the devices to the customer and discuss any concerns, ultimately increasing the number of products we can fit whilst visiting.</i></p> <p>ecoBETA</p> <p><i>In September 2006 Essex & Suffolk Water were given the opportunity to trial a dual flush retrofit device designed by a Danish company called ecoBETA. The device (called ecoBETA dual flush) transforms a standard siphon single flush toilet into a dual flush toilet.</i></p> <p><i>A total of 37 ecoBETA dual flush devices were installed in 15 households in Suffolk. The water consumption of each household participating in the trial was monitored throughout the course of the project (ESW, 2006a).</i></p> <p><i>There were a few households which had been selected to have an ecoBETA device installed but the device was unable to be installed because of problems with the toilets. One of the reasons why the device could not be installed was because the toilet cistern was too narrow. Since this trial the ecoBETA dual flush device has been designed to allow it to be installed in narrower cisterns.</i></p> <p><i>Customer follow up questionnaires were sent to all who took part. This questionnaire asked a range of questions about the device. The questionnaire also gave the opportunity to find out if there was any reason (other than the device being installed) why the households’ water consumption may have changed over the last few weeks. Very positive feedback was received with 100% of customers left happy with the device and saying they would recommend it to others.</i></p> <p><i>Consumption from each property was monitored using logger and meter data for a period before and after the devices were installed. From this data an average per property per day saving of 35 litres was recorded.</i></p>					


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				<p><i>With such a high saving, it was appropriate that we undertake a larger project to confirm that these results were repeatable. .</i></p> <p>Chelmsford ecoBETA</p> <p>Following a successful trial of the ecoBETA dual flush device carried out in Suffolk in October 2006, it was decided to roll out the offer of the device to customers living in the Chelmsford area of Essex. As well as installing the dual flush device for customers we wanted them to also think about their overall water use so we also delivered a self audit packs at the same time as the retrofit. This way, the customers would receive a lasting technology change as well as being encouraged to assess how they use water and make changes to their behavior.</p> <p>In April 2007, 4,878 customers were sent a letter and questionnaire inviting them to take part. The questionnaire aimed to gather information about the property and toilets. This enabled us to assess the suitability of the device before visiting the property, 910 customers applied; a take up rate of 18.7%. Of these, 9% were not suitable for the retrofit and so received an audit pack in the post. The remaining customers were called to arrange an appointment to install the devices.</p> <p>The project was managed by Mouchel who arranged the appointments and visited the properties to install the devices. 553 customers had devices installed between April and July 2007, with a total of 1,010 ecoBETA devices fitted as part of the project. Each customer also received their self audit pack, 187 customers completed and returned the self audit form.</p> <p><i>To calculate the savings achieved, meter readings were taken at all metered properties 3 weeks before the ecoBETAs were installed. A reading was also taken on the day the visit was made and again 3 weeks later. The water savings were calculated by looking at the water consumption before and after the devices were installed. 42 properties also had data loggers installed to gather more detailed consumptions. Combining all the data collected gave an overall saving of 31 litres/property/day.</i></p> <p>During August, each customer who had a device installed was sent a questionnaire to gather their views on the project. We also took this opportunity to thank them for taking part. 346 customers have returned the questionnaire. This has provided useful feedback to guide future projects.</p> <p><i>In November 2008, 140 customers took part in a follow-up research programme aimed at investigating how the ecoBETA devices worked a year following installation.</i> A plumber visited each participant and carried out a thorough inspection of the ecoBETA's installed within the property. These inspections were carried out in order to ascertain whether the devices were working correctly</p>


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				<p>and whether any alterations were required. Customers were also asked a series of simple questions aimed at establishing their view on the devices having used it for over a year.</p> <p>Detailed flush volume measurements were also collected during the visit. An innovative method was devised in order to collect these measurements which involved the plumber measuring the exact volume of water required for both flush settings. These visits also provided the opportunity to measure the depth of water left in the cistern after a full flush – a measurement that will provide an insight into the effectiveness of cistern displacement devices.</p> <p>The results of this project, including the customers’s views, the functionality of the devices and the flush volume measurements are currently being analysed.</p> <p>Activity 6 ecoBETA retrofitting in 2,000 properties pa. Total water saved 0.0460 MI/day saving achieved / total cost GBP 62,080. Total costs of activities GBP 243,903.47</p>																																																	
1-07	Evidence Base for Large-scale Water Efficiency Phase II Final Report April 2011 Pages 34, 51-52-64,66,102-103, 110,114,140,143,150	Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency. As the leading authority on water efficiency in the UK, their aim is to reverse the upward trend in how much water is used at home and at work by working closely with the water industry, governments and regulators, manufacturers and retailers.	This final report of Phase II of the Evidence Base Project includes new data on the effectiveness of domestic and schools projects in addition to summarising what has been learnt from the two previous reports: on domestic water efficiency retrofitting (the February 2010 report)1; and water efficiency retrofitting in schools2 (the December 2010 report).	<p>2.2.8 Estimates of water savings from devices in schools <i>These derived estimates of water savings could be used by water companies to plan for future school retrofitting projects</i> such as in future price reviews or the Water Resources Management Plan process.</p> <table><tr><th>Category</th><th>Device</th><th>Derived Water Savings</th><th>Units for savings</th></tr><tr><td rowspan="3">Toilets</td><td>Dual-flush valve conversion</td><td></td><td></td></tr><tr><td><i>ecoBETA dual flush siphon</i></td><td><i>0.174*y</i></td><td><i>litres/pupil/day</i></td></tr><tr><td>Cistern Dams</td><td></td><td></td></tr><tr><td rowspan="5">Taps</td><td>Cistern Displacement Devices</td><td>0.068*y</td><td>litres/pupil/day</td></tr><tr><td>Push Taps – Retrofit</td><td>0.105*x</td><td>litres/pupil/day</td></tr><tr><td>Push Taps- Complete tap</td><td>0.105*x</td><td>litres/pupil/day</td></tr><tr><td>In-line flow regulators</td><td>0.211*z</td><td>litres/pupil/day</td></tr><tr><td>Outlet aerators regulator</td><td>-</td><td>-</td></tr><tr><td rowspan="5">Urinals</td><td>Re-time existing tap</td><td>-</td><td>-</td></tr><tr><td>Service UCD</td><td>40</td><td>litres/day</td></tr><tr><td>Hydromate – Mains 240v</td><td>80</td><td>litres/day</td></tr><tr><td>Hydrocell – Battery 6v</td><td>80</td><td>litres/day</td></tr><tr><td>Hydrocell Ultra – Battery 6v</td><td>80</td><td>litres/day</td></tr><tr><td>Isolation valve</td><td>-</td><td>-</td></tr></table> <p>Table 6 Revised water savings assumptions for 43 schools which were part of the Severn Trent School Water Efficiency Programme</p> <p>3.3.3 United Utilities Home Audit Study</p>	Category	Device	Derived Water Savings	Units for savings	Toilets	Dual-flush valve conversion			<i>ecoBETA dual flush siphon</i>	<i>0.174*y</i>	<i>litres/pupil/day</i>	Cistern Dams			Taps	Cistern Displacement Devices	0.068*y	litres/pupil/day	Push Taps – Retrofit	0.105*x	litres/pupil/day	Push Taps- Complete tap	0.105*x	litres/pupil/day	In-line flow regulators	0.211*z	litres/pupil/day	Outlet aerators regulator	-	-	Urinals	Re-time existing tap	-	-	Service UCD	40	litres/day	Hydromate – Mains 240v	80	litres/day	Hydrocell – Battery 6v	80	litres/day	Hydrocell Ultra – Battery 6v	80	litres/day	Isolation valve	-	-
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				<p>3.3.3.1 Summary</p> <p>This trial investigated the effectiveness of domestic water efficiency devices. Specifically it was designed to:</p> <ol style="list-style-type: none">1. Determine the practicality of fitting and promoting a range of water-saving devices;2. Gain a better understanding of the likely costs of fitting these devices;3. Determine associated savings of these devices through property and District Metering Area (DMA) metering. <table><tr><th>Device Fitted</th><th>Number fitted (percentage of homes)</th></tr><tr><td>Showerheads</td><td>212 (48%)</td></tr><tr><td><i>ecoBETA dual flush retrofits</i></td><td><i>193 (34%)</i></td></tr><tr><td>Save-a-flush bags</td><td>384 (58%)</td></tr></table> <p>Table 11 Water saving devices installed during the United Utilities Home Audit Project</p> <p>All customers who had a water audit carried out were given a ‘water savers pack’ which included a basic shower timer and information on saving water. Further devices were installed where appropriate, including water-efficient showerheads (Challis aerated showerheads), dual-flush retrofit (ecoBETA dual-flush devices) and save-a-flush cistern displacement devices. Customers were given the option of requesting the removal or repair of water-efficient devices for up to 3 months after they were fitted. Devices were installed by 3 qualified plumbers, who</p> <p>4.5.3.1 The Basis of the Theoretical Water Savings</p> <p>In this section analysis is carried out to assess the appropriateness of the assumptions set out in section 4.3 surrounding water savings from retrofitting devices in schools. The assumptions presented below, in Figure 61 and Table 60, are applied to the data collected from the 43 schools which were logged as part of the Severn Trent School Water Efficiency Programme. Audits were carried out at each of the 43 schools prior to installation visits, to establish the needs of the individual schools.</p> <table><tr><th>Category</th><th>Device</th><th>Derived Water Savings</th><th>Units for savings</th></tr><tr><td rowspan="4">Toilets</td><td>Dual-flush valve conversion</td><td></td><td></td></tr><tr><td><i>ecoBETA dual flush siphon</i></td><td><i>3.3*y</i></td><td><i>litres/pupil/day</i></td></tr><tr><td>Cistern Dams</td><td></td><td></td></tr><tr><td>Cistern Displacement Devices</td><td>1.3*y</td><td>litres/pupil/day</td></tr><tr><td rowspan="5">Taps</td><td>Push Taps – Retrofit</td><td>2.0*x</td><td>litres/pupil/day</td></tr><tr><td>Push Taps- Complete tap</td><td>2.0*x</td><td>litres/pupil/day</td></tr><tr><td>In-line flow regulators</td><td>4.0*z</td><td>litres/pupil/day</td></tr><tr><td>Outlet aerators regulator</td><td>-</td><td>-</td></tr><tr><td>Re-time existing tap</td><td>-</td><td>-</td></tr><tr><td rowspan="3">Urinals</td><td>Service UCD</td><td>40</td><td>litres/day</td></tr><tr><td>Hydromate – Mains 240v</td><td>80</td><td>litres/day</td></tr><tr><td>Hydrocell – Battery 6v</td><td>80</td><td>litres/day</td></tr></table>	Device Fitted	Number fitted (percentage of homes)	Showerheads	212 (48%)	<i>ecoBETA dual flush retrofits</i>	<i>193 (34%)</i>	Save-a-flush bags	384 (58%)	Category	Device	Derived Water Savings	Units for savings	Toilets	Dual-flush valve conversion			<i>ecoBETA dual flush siphon</i>	<i>3.3*y</i>	<i>litres/pupil/day</i>	Cistern Dams			Cistern Displacement Devices	1.3*y	litres/pupil/day	Taps	Push Taps – Retrofit	2.0*x	litres/pupil/day	Push Taps- Complete tap	2.0*x	litres/pupil/day	In-line flow regulators	4.0*z	litres/pupil/day	Outlet aerators regulator	-	-	Re-time existing tap	-	-	Urinals	Service UCD	40	litres/day	Hydromate – Mains 240v	80	litres/day	Hydrocell – Battery 6v	80	litres/day
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	Cistern Displacement Devices	1.3*y	litres/pupil/day																																																				
Taps	Push Taps – Retrofit	2.0*x	litres/pupil/day																																																				
	Push Taps- Complete tap	2.0*x	litres/pupil/day																																																				
	In-line flow regulators	4.0*z	litres/pupil/day																																																				
	Outlet aerators regulator	-	-																																																				
	Re-time existing tap	-	-																																																				
Urinals	Service UCD	40	litres/day																																																				
	Hydromate – Mains 240v	80	litres/day																																																				
	Hydrocell – Battery 6v	80	litres/day																																																				

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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article																							
					Hydrocell Ultra – Battery 6v	80	litres/day																				
					Isolation valve	-	-																				
Table 60 Summary of the water savings assumptions initially applied to estimate the savings from a school retrofitting programme.																											
1-08	Annual Review of the Water Resources Management Plan January 2012 Pages 22, 26-28	Essex & Suffolk Water is part of Northumbrian Water Group providing water in eastern England.	The purpose of the annual review is to identify any material changes to the FWRMP, and to report on progress made with updating and implementing the plan. The review has been undertaken using guidelines provided by the Environment Agency.	H2eco Phase 5 H2eco is a successfully run domestic retrofit project run over the last 5 years. It provides the opportunity to customers in a selected area to book a free appointment for a fully qualified plumber to visit their property and assess how water efficient their water using appliances are. Suitable water saving products are then provided and fitted for free. The information on how much water each water saving product would save the customer was passed on straight away therefore engaging the customer. While in the home the plumbers also offered advice about where else water can be saved through the changing of bad habits into good habits such as spending one minute less in the shower. Mouchel Ltd were contracted to co-ordinate the projects running. Phase 5 was based in the Wickford area, following on from the projects previous area of Chelmsford. 15,085 customers were mailed with the offer in early October 2010 and appointments were booked up until mid March 2011. 10 free water saving products were on offer covering gardens, bathrooms and kitchen use. Overall 2266 appointments were completed with the following number of products fitted: <table><tr><td><i>ecoBETA</i></td><td>377</td></tr><tr><td>Save-a-flush</td><td>661</td></tr><tr><td>Tap Magic</td><td>293</td></tr><tr><td>Showerheads</td><td>473</td></tr><tr><td>Miracle tap Adaptor</td><td>882</td></tr><tr><td>Bath Measures</td><td>312</td></tr><tr><td>Water Saving Crystals</td><td>2217</td></tr><tr><td>Trigger hose guns</td><td>2193</td></tr><tr><td>Water butts</td><td>1770</td></tr><tr><td>Shower Timers</td><td>2209</td></tr></table> As well as these water saving products a pack to educate children on how water can be saved was provided to any household with children to increase the awareness of the whole family, not just the person attending the appointment. Water Efficiency Audits in Elderly Persons Homes Between November 2010 and March 2011, Essex & Suffolk Water embarked on a project that aimed to carryout water efficiency audits in 30 Elderly Persons Homes. The project started by sending a letter inviting the owner to have a survey which aimed to assess whether there was scope to fit water saving products. ESW’s Water Regulations team was utilised to carry out the audits during their routine site visits. 26 surveys were carried out.				<i>ecoBETA</i>	377	Save-a-flush	661	Tap Magic	293	Showerheads	473	Miracle tap Adaptor	882	Bath Measures	312	Water Saving Crystals	2217	Trigger hose guns	2193	Water butts	1770	Shower Timers	2209
<i>ecoBETA</i>	377																										
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				<p>Full audits including the fitting of water-saving products were carried out at 11 sites. Products fitted included:</p> <ul style="list-style-type: none"> • 30 <i>ecoBETA dual flush retrofit devices</i> • 2 tap aerators • 65 save-a-flush • 9 aerated showerheads • 9 trigger hose guns <p><i>The audits resulted in total water savings of 2,930.90 litres per day, which equates to each property saving on average 183.18 litres per day.</i></p> <p>H2eco Analysis Research was commissioned into the last 4 phases of H2eco to provide in depth analysis and provide conclusions to improve future phases of our large retrofit project, savings analysis, product analysis and demographic profiling.</p> <p>Some key conclusions were:</p> <ul style="list-style-type: none"> • Collecting logger data at 15 minute intervals had little benefit to the calculation of savings or identifying individual appliance usage behaviour • 1 occupancy households fulfilled their potential of water savings, low income households had the lowest water saving potential • <i>Both ecoBETA and save-a-flush were proven to have statistically significant water savings when installed in a household.</i>
1-09	Water Efficiency Evidence Base – Review and Enhancement Report – EPBLW 12032/5 Final Version, 21 June 2012 Pages 8,20,21,24,27,28,33,37,42, 51,70,77,96,116-119	Environment Agency is a UK Government Agency concerned mainly with rivers, floodings and pollution. “We protect and improve the environment and make it a better place for people and wildlife. We operate at the place where environmental change has its greatest impact on people’s	In preparation for the coming cycle of Water Resource Management Plans (WRMPs), and to give increased confidence in the evidence base for water efficiency, the Environment Agency commissioned an independent review and scrutiny of the available evidence base to date, to test its robustness and reliability.	<p>4.2 Final selection of trials for in-depth review Prioritisation was carried out to allow the statistics team to review as many trials as possible within the time constraints of the project. The trials below were selected as priority 1 and 2, and the reasons for selection are provided here.</p> <ul style="list-style-type: none"> • Essex and Suffolk Water (ESW) Chelmsford ecoBETA (2007) (Scobie, 2007) <ul style="list-style-type: none"> ○ Provided good data on a single device. No disaggregation required. Key device used frequently by companies. <p>5.2 Results and findings from the review</p>


Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article							
		<p>lives. We reduce the risks to people and properties from flood- ing; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.</p> <p>Acting to reduce climate change and helping peo- ple and wildlife adapt to its consequences are at the heart of all that we do.</p> <p>We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the com- munities we serve.”</p>	<p>The review covers principally the Waterwise Evidence Base, Phases I and II, as well as other evidence on water efficiency measures; and makes recommendations to inform the next cycle of WRMPs.</p> <p>The analysis carried out during the study confirms that most water efficiency projects reviewed lead to reductions in water consumption; and the study has identified a number of improve- ments that could be made to the existing water efficiency evidence base, which should lead to a greater confidence in its use.</p>		Waterwise Phase 2 Evidence Base			Evidence base review project findings			
				Study	Sample size	Mean reduction in consumption (l/prop/day	Quoted confidence limits	Sample size	Mean reduction in consumption (l/prop/day)	90% con- fidence limits	Comments
				STW domestic water efficiency trial	717	38.4	+149.8 to - 92.9	810	11.7	-2.92, 26.3	Using all data
								717	25.8	21.4, 30.1	Excludes data where %change >67.5%
				TW measured visit and fix trial	727	29.1	+153.9 to - 95.7	885	19.8	13.4, 26.2	Using phase 2 report screening rules
								823	16.0	11.7, 20.2	
				TW self audit rateable value trial	525	21.5 ³	+265.2 to - 221.5	635	15.6	2.63,28.5	
								489	0.32	-7.11, 7.74	
				YW water saving trial	378	27.6	+124.3 to- 69.0	3704	26.2	16.0, 36.4	Using all data
								359	34.5	-25.2, 43.7	Excludes data where % change >100%
				SWW Water efficiency trial	152	9.1	+40.9 to - 21.8	348	7.46	-7.0, 22.0	Using all data
								341	16.6	3.49, 29.7	Excludes data where %change >100%
				ESW ecoBETA study	169	31.38 (phase 1 evidence base)	-	169	40.0	34.4, 45.7	Using all data
UU Home audit study trial	211	20.6	169.4 to 128.1	260	21.8	11.4,32.1	Using all data				
		.		246	20.4	13.0, 27.9	Using Phase 2 report screening rules				

Table 5.2 Summary results from statistical review - effect of data exclusion


Table 5.2 Summary results from statistical review - effect of data exclusion

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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article																																			
				<table><tr><th>Phase</th><th>Sample size</th><th>Measured mean water saving (l/prop/day)</th><th>90% confidence limits</th><th>Predicted mean water saving (l/prop/day)</th></tr><tr><td><i>Phase 1</i></td><td><i>663</i></td><td><i>20.3</i></td><td><i>15.27</i></td><td>-</td></tr><tr><td>Phase 2</td><td>622</td><td>6.7</td><td>0.4, 13</td><td>23.7</td></tr><tr><td>Phase 3</td><td>155</td><td>4.9</td><td>-1, 11</td><td>14.4</td></tr><tr><td><i>Phase 4</i></td><td><i>416</i></td><td><i>27.8</i></td><td><i>19,36</i></td><td><i>10.9</i></td></tr></table>	Phase	Sample size	Measured mean water saving (l/prop/day)	90% confidence limits	Predicted mean water saving (l/prop/day)	<i>Phase 1</i>	<i>663</i>	<i>20.3</i>	<i>15.27</i>	-	Phase 2	622	6.7	0.4, 13	23.7	Phase 3	155	4.9	-1, 11	14.4	<i>Phase 4</i>	<i>416</i>	<i>27.8</i>	<i>19,36</i>	<i>10.9</i>	Table 5.4 Predicted savings from lear regression									
				Phase	Sample size	Measured mean water saving (l/prop/day)	90% confidence limits	Predicted mean water saving (l/prop/day)																															
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				<i>Phase 4</i>	<i>416</i>	<i>27.8</i>	<i>19,36</i>	<i>10.9</i>																															
				The table shows that the predicted savings based on a pre and post audit water consumption model from the phase 1 study are about 3 times more than the measured savings in phases 2 and 3; and just over a third of the measured savings imeet n phase 4.																																			
				This study did however manage to explain the differences between the water savings achieved in phases 1 and 4 compared with phases 2 and 3; <i>and the influencing factors are the high intensity of ecoBETA fittings in phases 1 and 4, and the low proportion of ACORN 5 (the Hard Pressed) in phases 1 and 4.</i>																																			
				5.2.5 Multiple regression <i>Whilst each device type will have its own story to tell, the dual flush device (most commonly the ecoBETA) shows the most consistent statistically significant results.</i>																																			
				The project team undertook 4 sets of multi-regression analyses, which are reported here (Table 5.5).																																			
				<table><tr><th>Study</th><th>Sample size</th><th>Saving (l/device/day)</th><th>Statistically significant</th><th>Water company</th><th>Location</th></tr><tr><td>H2Eco</td><td>1800</td><td>16.9</td><td>Highly</td><td>ESW</td><td>Chelmsford</td></tr><tr><td>TW MVF</td><td>885</td><td>17.7</td><td>Highly</td><td>Thames</td><td>Swindon/Bromley</td></tr><tr><td><i>ecoBETA</i></td><td><i>169</i></td><td><i>19.5</i></td><td><i>Highly</i></td><td><i>ESW</i></td><td><i>Chelmsford</i></td></tr><tr><td>UU Home Audit</td><td>260</td><td>15.8</td><td>Highly</td><td>UU</td><td>Warrington</td></tr></table>	Study	Sample size	Saving (l/device/day)	Statistically significant	Water company	Location	H2Eco	1800	16.9	Highly	ESW	Chelmsford	TW MVF	885	17.7	Highly	Thames	Swindon/Bromley	<i>ecoBETA</i>	<i>169</i>	<i>19.5</i>	<i>Highly</i>	<i>ESW</i>	<i>Chelmsford</i>	UU Home Audit	260	15.8	Highly	UU	Warrington	Table 5.5 Results from multiple regression analysis				
				Study	Sample size	Saving (l/device/day)	Statistically significant	Water company	Location																														
H2Eco	1800	16.9	Highly	ESW	Chelmsford																																		
TW MVF	885	17.7	Highly	Thames	Swindon/Bromley																																		
<i>ecoBETA</i>	<i>169</i>	<i>19.5</i>	<i>Highly</i>	<i>ESW</i>	<i>Chelmsford</i>																																		
UU Home Audit	260	15.8	Highly	UU	Warrington																																		
On average these 4 studies showed remarkably consistent results. <i>ecoBETAs installed as part of a multi device water efficiency audit were shown to save between 16 and 18 litres/device/day. A single device ecoBETA installation may save a little more than 19 to 20 litres/device/day.</i>																																							
<i>The other interesting inference is that an ecoBETA installed in Chelmsford in a multi-device setting saves a very similar amount of water as one installed in Swindon, Bromley or Warrington. Therefore, there may not be as much difference in regional response to water efficiency studies as some people may fear.</i>																																							

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				<p>The results suggest that application of multiple regression to other Phase II studies could provide further statistical robustness to the results obtained, and help allay concerns regarding differences in regional responses.</p> <p>6.2 WRc Collaborative Research project CP359 In 2009 a group of UK Water Companies, Defra and the Environment Agency collaborated to look at the impact of water audit activities in household properties at the micro-component level (Glennie, et al, 2010).</p> <p>The 3 key messages from the study were:</p> <ul style="list-style-type: none">The greatest savings were achieved through retrofitting toilets. <i>Toilet devices should be installed as a priority in older properties where toilet volumes are still likely to be high. Installing a combination of devices, for example „ecoBETA“ and „Save-a-Flush“ can be very effective in reducing the total volume used by toilets in a property.</i> <p>6.3 Analysis of water saving data from H2Eco studies This study has enabled the analysis of a significant volume of data collected in a consistent way from a series of water efficiencies studies.</p> <table><tr><th>Device</th><th colspan="2">Typical Values</th></tr><tr><td><i>ecoBETA</i></td><td><i>17 l/device/day</i></td><td><i>23 l/prop/day</i></td></tr><tr><td>Save-A-Flush</td><td>6 l/device/day</td><td>8 l/prop/day</td></tr><tr><td>Showerhead</td><td>12 l/device/day</td><td>14 l/prop/day</td></tr><tr><td>Tap inserts</td><td>5 l/device/day</td><td>7 l/prop/day</td></tr><tr><td>Miracle tap</td><td>5 l/device/day</td><td>5 l/prop/day</td></tr></table> <p>Table G.3 best estimates for water saving per device</p> <p><i>The detailed analysis looking at the performance of ecoBETAs revealed that the above water saving numbers are means for each device. Furthermore, the saving obtained from each device was dependent upon the installation context. Properties with saturated (or 100%) fits (e.g. the number of ecoBETAs fitted is the same as the number of toilets in the property) save more water per device than less than saturated fits. A single saturated ecoBETA saves more per device than a saturated fit comprising 3 ecoBETAs. This result is not entirely surprising.</i></p> <p><i>Correspondence analysis was also carried out on the devices, which showed that ecoBETAs and Save-A-Flushes were associated with high water savings.</i> However, showerheads and tap inserts are most closely associated with 2 types of user: those that behave as expected and save water, and those who do not save water. This may be an indication that behaviour plays a large part in the water savings realised from shower and tap devices, <i>and behaviour is much less of a factor for the WC devices.</i></p>	Device	Typical Values		<i>ecoBETA</i>	<i>17 l/device/day</i>	<i>23 l/prop/day</i>	Save-A-Flush	6 l/device/day	8 l/prop/day	Showerhead	12 l/device/day	14 l/prop/day	Tap inserts	5 l/device/day	7 l/prop/day	Miracle tap	5 l/device/day	5 l/prop/day
Device	Typical Values																					
<i>ecoBETA</i>	<i>17 l/device/day</i>	<i>23 l/prop/day</i>																				
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				<p><i>The best explanation for the differences between the water savings achieved in phases 1 and 4 compared with phases 2 and 3 are: the high intensity of ecoBETA fittings in phases 1 and 4, and the low proportion of ACORN 5 (the Hard Pressed) in phases 1 and 4.</i></p>
1-10	Water Resources Management Plan for Sutton and East Surrey Water, 4 th annual review, June 2013 Page 40	Sutton and East Surrey Water is a water-only company and supply residents in East Surrey, and parts of West Sussex, west Kent and south London	Water resources management plans set out how companies intend to meet their customers' needs for water over the next 25 years while protecting and enhancing the environment.	For WCs, we have continued to distribute the ecoBETA dual flush kit to Raven Housing Trust to install in their properties whilst completing repair work. In addition, as part of the water audits carried out at non-households, adjustments are made those toilets found to be capable of being converted to dual flush. <i>In the year, 57 ecoBETA devices were fitted, with an additional 202 toilets 'converted', in a total of 79 properties, providing savings of 0.007 MU/d.</i>
1-12	Effectiveness of Piggybacking Initiatives: A Scoping Study An Evidence Base project Final Report, May 2013 Authored by Dani Jordan, Waterwise and Charlotte McCormack, Consultant to Waterwise Pages 7, 15	Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency. As the leading authority on water efficiency in the UK, their aim is to reverse the upward trend in how much water is used at home and at work by working closely with the water industry, governments and regulators, manufacturers and retailers.	<p>This report gathers together data and experiences from across the water industry, and for the first time examines how effective such water efficiency initiatives have been. Achievements in terms of homes visited, devices installed and water saved are scrutinised.</p> <p>In order to support future activities, recommendations and emerging best practice are outlined, based upon the successes and difficulties of the projects reviewed in this report.</p>	<p>Anglian Water - Enhanced Metering Project, Ipswich Trial A total of 1000 properties received water efficiency audits and 663 of those had devices fitted. Customers were recruited by the meter installers as well as through other methods such as stands in shopping centres. The retrofits occurred separately to any actual meter fitting visits as they were carried out by a different contractor. Meter readings were taken before and after fitting any retrofit devices and actual water savings measured, the number and type of devices installed was also recorded and questionnaires were collated (both a long and short version).</p> <p><i>Overall, where retrofitting took place water savings were measured as an average of 41.5 litres of water saved per property per day (a mean reduction in water use of 14.2%). The majority of these savings relate to the ecoBETA toilet retrofit device, shower flow regulators and replacement shower heads fitted within customers' properties.</i></p> <p>Thames Water & RE:NEW Thames are now commencing Phase 2 of the project which is targeting around 25,000 homes though not all will be as actively targeted with water-saving devices. <i>Additionally, one supplier has offered to fit ecoBETA dual flush devices in properties for a small charge covering the time to do this.</i> <i>Overall Thames Water consider this partnership a very efficient use of resources, and successful in terms of the water savings made through it.</i></p> <p>Essex & Suffolk Water & RE:NEW Currently Essex & Suffolk Water is involved in a new phase of the project running in the London Borough of Havering. The project set-up is the same except that the delivery agent carrying out the home visits will <i>in this phase be fitting ecoBETA devices and Essex & Suffolk Water will cover the</i></p>


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				<i>time costs of fitting these. It is expected that a further 1500 households will get devices fitted through this phase of the project.</i>
1-15	Thames Water Annual Review 2012-2013 Environment Agency Annual Review June 2013 Page 106	Thames Water is UK's largest water and wastewater services company	Annual Review	B: Retrofit devices <i>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.</i> 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.
1-16	Sutton and East Surrey Water PLC Water Resources Management Plan 4 th annual review June 2013, Page 40	Sutton and East Surrey Water PLC is a water only company and supplies residents in East Surrey and parts of West Sussex, West Kent and West London	This report is Sutton and East Surrey Water Company's fourth annual review of its Final WRMP (March 2010), for submission to Ofwat and the Environment Agency.	Section B: Retrofit Devices For WCs, we have continued to distribute the ecoBETA dual flush kit to Raven Housing Trust to install in their properties whilst completing repair work. In addition, as part of the water audits carried out at non-households, adjustments are made those toilets found to be capable of being converted to dual flush. <i>In the year, 57 ecoBETA devices were fitted, with an additional 202 toilets 'converted', in a total of 79 properties, providing savings of 0.007 Ml/d.</i>
1-18	Waterwise Response to Energy Efficiency Partnership for Homes and DECC Call for Evidence on Green Deal – Costs and Benefits of Energy Efficiency Measures April 2011 Pages 2-3, 7-10	Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency. As the leading authority on water efficiency in the UK, their aim is to reverse the upward trend in how much water is used at home and at work by working closely with the water industry,	These figures are drawn from Waterwise's respected Evidence Base for Large-scale Water Efficiency, supported and co-funded by Defra, Ofwat, the Environment Agency and DCLG. All costs and benefits are based on hard evidence from Waterwise's Evidence Base for Large-scale	Table 1 summarises the payback times, and water and energy savings at household level, for including water efficiency measures in the Green Deal – further detail can be found on pages 7 to 10 and in Annex 2:


Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article																																				
		governments and regulators, manufacturers and retailers.	Water Efficiency in Homes and draws on actual data from retrofitted homes in water company projects.	<table><tr><th colspan="3">Table 1</th></tr><tr><th>Measure</th><th>Scenario 1 – retrofit of showers and taps</th><th>Scenario 2 – retrofit of showers, taps and toilet</th></tr><tr><td>Cost of products per household</td><td>£27.50</td><td>£37.50</td></tr><tr><td>Installation time per household</td><td>20 mins</td><td>30 mins</td></tr><tr><td>Installation cost per household</td><td>£20</td><td>£30</td></tr><tr><td>Cost per scenario per household (products and installation)</td><td>£47.50</td><td>£67.50</td></tr><tr><td>Energy savings per year</td><td>300 kWh</td><td>300 kWh</td></tr><tr><td>Water savings per year</td><td>7.4m³</td><td>15m³</td></tr><tr><td>Energy bill savings per year</td><td>£26</td><td>£26</td></tr><tr><td>Water bill savings (metered) per year</td><td>£25</td><td>£51</td></tr><tr><td>Payback on energy</td><td>Within 3rd year</td><td>Within 3rd year</td></tr><tr><td>Payback on energy and water</td><td>Within 1 year</td><td>Within 1 year</td></tr></table> <p>The spreadsheets contain two scenarios for which the payback time and net present value (NPV) over 25 years are calculated. The two scenarios are a retrofit of showers and taps to make them more water-efficient, and a retrofit of showers, taps and toilets. The calculation of energy - and water - savings and payback for each scenario is framed from the customer's perspective.</p>	Table 1			Measure	Scenario 1 – retrofit of showers and taps	Scenario 2 – retrofit of showers, taps and toilet	Cost of products per household	£27.50	£37.50	Installation time per household	20 mins	30 mins	Installation cost per household	£20	£30	Cost per scenario per household (products and installation)	£47.50	£67.50	Energy savings per year	300 kWh	300 kWh	Water savings per year	7.4m ³	15m ³	Energy bill savings per year	£26	£26	Water bill savings (metered) per year	£25	£51	Payback on energy	Within 3 rd year	Within 3 rd year	Payback on energy and water	Within 1 year	Within 1 year
Table 1																																								
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Energy bill savings per year	£26	£26																																						
Water bill savings (metered) per year	£25	£51																																						
Payback on energy	Within 3 rd year	Within 3 rd year																																						
Payback on energy and water	Within 1 year	Within 1 year																																						

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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article
				<p>Toilet conversion kits</p>  <p>One third of the water used in the home is for flushing the toilet. Toilet conversion kits allow householders to convert their single-flush toilet into a dual-flush, saving around three buckets of water per day. One well-respected product in this area, which Waterwise and the water companies have used in thousands of homes, is the EcoBETA, which replaces the single-flush siphon in the toilet. In the Waterwise-led Tap into Savings partnership mentioned earlier, the EcoBETA proved very popular with residents. When the user holds the handle down it provides a full flush, but when the handle is released promptly, it provides a smaller flush, pre-set by the user. The ecoBETA insert could be adjusted to provide a single flush of 4 ½ litres which would be enough to dispose of all waste. The EcoBETA is easy to install, taking only five to ten minutes on most existing cistern water tanks. Other toilet retrofit products exist.</p> <p>A lifetime of ten years is assumed for efficient showers, tap inserts and toilet conversion kits.</p>
1-19	Planning effective water efficiency initiatives Learning from the Evidence Base, Save Water Swindon and Tap into Savings 2012	Waterwise and WWF Working together to promote water efficiency across the UK WWF is the world's leading independent conservation organisation, working in more than 100 countries to address issues from the survival of species and habitats to climate change, sustainable business and environmental education.	Drawing on lessons learnt from 2 large-scale water efficiency retrofit initiatives.	<p>This short guide identifies 8 key elements to consider when planning a home visit programme in which water saving devices are fitted.</p> <p>The ecoBETA Siphon pictured on page 10 is widely used in connection with such retrofitting projects.</p> <p>Today, some areas of England are classified by the Environment Agency as seriously water-stressed. For this reason, the government made it clear in 2011 that they want to see water companies increase water efficiency projects across the country – not only in areas currently defined as water-stressed. In this connection it is essential to draw on the practical lessons of past water efficiency projects. This practical guide provides directions for those designing a water efficiency retrofitting project: http://www.waterwise.org.uk/data/resources/51/Planning-effective-water-efficiency-initiatives_Final.pdf. The reason is, that our patented, highly efficient and cost effective single button dual flush valves have won several international prizes for their water saving potential, design, operation and quality. Evidence based research supports that an average household can expect to save up to 50% of toilet flush water or up to 47 liters per day as confirmed by OFWAT (The Water Services Regulation Authority in England and Wales) without any discomfort whatsoever for the user.</p>

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1-20	Northumbrian Water Final Water Resources Management Plan 2014	Northumbrian Water and Essex & Suffolk Water are part of Northumbrian Water Limited, which is a member of Northumbrian Water Group (NWG)	This Final Water Resource Management Plan has been prepared in accordance with the Water Resources Planning Guideline issued by the Environment Agency, Defra, and Ofwat. The plan looks across the period from2015 to 2040 starting from the baseline position from 2012/13 and includes changes from the consultation on the draft version.	<p>5.2.2 Retrofit audit projects</p> <p>NWL began to offer home water audits to our domestic customers in 2010 based on the methodology developed by ESW. These projects involve a plumber attending an appointment at a customer’s property to fit and/or deliver water-saving products that will improve the efficiency of the home. To promote behaviour change, the customer is engaged in conversation by the plumber and encouraged to spend time with them while the products are fitted. This allows the plumber to explain how the products work, but also ensures that behaviour change messages are conveyed effectively. The table below summarises the retrofit audit projects carried out in since 2010. More information about each of these projects is described in the sections that follow.</p> <table><tr><th>Project</th><th>Area</th><th>Year</th><th>No. audits</th><th>Average water saving (l/prop/d)</th></tr><tr><td>Water Saving Project</td><td>North Tyneside</td><td>2010/11</td><td>2012</td><td>29.10</td></tr><tr><td>ecoFIT trial</td><td>Durham</td><td>2011/12</td><td>386</td><td>55.0</td></tr><tr><td>ecoFIT</td><td>Houghton Le Spring, Wearside</td><td>2012/13</td><td>2003</td><td>74.9</td></tr></table> <p>Table 5.2.2: Key results of retrofit projects carried out since 2010. * Based on assumed savings</p> <p>5.2.2.2 EcoFit Trial – Are you EcoFit?</p> <p>Following success of this initiative in our southern operating area, NWL trailed, ecoFIT, a new type of home water audit. ecoFIT is a successful retrofit programme that aims to maximise water savings at minimum cost by offering customers the most water efficient devices. The project is centred on the conversion of a single flush siphon toilet into a dual flush toilet by installing an ecoBETA dual flush retrofit device. Only customers with toilet suitable for an ecoBETA to be installed qualified for a full retrofit audit. Those who did not were encouraged to request water saving devices from the NWL website. Customers that were invited to take part in the project received an invitation pack, explanatory factsheet and reply envelope. The factsheet contained information about the products on offer including the potential to save water, money and carbon. It also described the limitations of the products to help screen those customers that would not be eligible to take part. The products that were offered to customers as part of this initiative are listed in the table below.</p> <table><tr><th>Products to be fitted</th><th>Products to be delivered</th></tr><tr><td>ecoBETA dual flush device</td><td>Shower timer</td></tr><tr><td>Save-a-Flush</td><td>Water storing crystals</td></tr><tr><td>Tap inserts</td><td>Water stick</td></tr><tr><td>Eco-Flow Tap Spray</td><td>Trigger hose gun</td></tr><tr><td>Aerated shower head</td><td>Water butt</td></tr><tr><td>Re-washing dripping taps</td><td></td></tr></table> <p>Table 5.2.2-1: List of products and services fitted and/or delivered though the ecoFIT trail.</p>	Project	Area	Year	No. audits	Average water saving (l/prop/d)	Water Saving Project	North Tyneside	2010/11	2012	29.10	ecoFIT trial	Durham	2011/12	386	55.0	ecoFIT	Houghton Le Spring, Wearside	2012/13	2003	74.9	Products to be fitted	Products to be delivered	ecoBETA dual flush device	Shower timer	Save-a-Flush	Water storing crystals	Tap inserts	Water stick	Eco-Flow Tap Spray	Trigger hose gun	Aerated shower head	Water butt	Re-washing dripping taps	
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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article												
				<p>Just over 380 domestic customers in Durham agreed to take part in the trial in 2011/12. Each property saved on average 55 l/prop/day, based on Ofwat assumptions, or 21,172 litres/day in total. The table below summarises the number of products that were fitted during the project.</p> <table><tr><th>Product</th><th>Quantity Fitted</th></tr><tr><td>ecoBETA</td><td>285</td></tr><tr><td>Save-a-Flush</td><td>10</td></tr><tr><td>Aerated Shower head</td><td>129</td></tr><tr><td>Eco-Flow Tap Spray</td><td>180</td></tr><tr><td>Tap Inserts</td><td>77</td></tr></table> <p>Table 5.2.2.2 Summary of products fitted and/or delivered through the ecoFIT trial.</p> <p>5.2.2.2 EcoFIT Wearside – Are you EcoFIT? Based on the success of the trial, NWL wrote to 15,000 customers in Houghton Le Spring, Wearside in autumn 2012 offering them the opportunity to have a qualified plumber attend their property to convert their existing single flush toilet to a dual flush toilet.</p> <p>Mouchel was appointed to deliver the ecoFIT programme in Houghton Le Spring, Wearside. They were responsible for recruiting customers, delivering and installing water saving products and collecting consumption data. The flow diagram below shows the process that NWL follow throughout home audit.</p> <p>During the appointment with the customer, the plumber offered to install other water saving devices for the home and garden (listed in table 5.2.2.3.2). As in previous projects, the customer was encouraged to accompany the plumber during the audit so that the plumber could provide advice and literature on how to save water as well as fully explaining the purpose of any device and its mode of savings.</p> <p>Initially, uptake by customers was slow (less than a 1000 audits) until NWL worked in partnership with a registered social landlord. NWL and the landlord wrote a joint letter to provide further information about the project and encourage them to take part. The project was also promoted by local housing officers. This resulted in 2,003 customers participating in the project with over 15,000 products being delivered and/or installed. This represents a 13.3% project take-up by customers. Of those customers audited, 93% had at least one ecoBETA fitted.</p> <p>Despite its success, relatively few complete sets of meter reads were obtained due to bad weather and problems on ‘thunder Thursday’ hampering attempts by the plumbers to obtain meter read. The table below summarises the key results from the project:</p>	Product	Quantity Fitted	ecoBETA	285	Save-a-Flush	10	Aerated Shower head	129	Eco-Flow Tap Spray	180	Tap Inserts	77
Product	Quantity Fitted															
ecoBETA	285															
Save-a-Flush	10															
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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article																																
				<table><tr><th colspan="2">Key Results</th></tr><tr><td>Total customers invited to participate</td><td>15,134</td></tr><tr><td>Applications received</td><td>2,006</td></tr><tr><td>Audits completed</td><td>2,003</td></tr><tr><th>Product</th><th>Quantity Fitted</th></tr><tr><td>ecoBETA</td><td>2163</td></tr><tr><td>Save-a-Flush</td><td>214</td></tr><tr><td>Aerated Shower head</td><td>577</td></tr><tr><td>Shower Inline regulator</td><td>72</td></tr><tr><td>Tap Inserts</td><td>2927</td></tr><tr><td>Eco-Flow Tap Spray</td><td>870</td></tr><tr><td>Shower timer</td><td>1705</td></tr><tr><td>Hose gun</td><td>1936</td></tr><tr><td>Water storing crystals</td><td>1810</td></tr><tr><td>Water butt (190l)</td><td>1438</td></tr><tr><td>Water butt (100l)</td><td>143</td></tr></table> <p>Table 5.2.3-3: Summary results from ecoFIT retrofit project</p> <p>Working in partnership with registered social landlords proved to be a highly successful. In total the project saved over 150,000 litres/day with each property achieving an assumed saving of 75 litre per property per day. NWL plan to adopt this approach in the remainder of AMP5 and throughout AMP6 to maximise water savings, but at least cost.</p> <p>5.2.5 Non-Household Customers</p> <p><u>5.2.5.1 Schools Audit</u></p> <p>26 schools in the Gateshead, Newcastle and Sunderland Council areas were audited in February 2011 as part of a pilot schools project. These schools were chosen by their respective councils to take part in the project and all received water saving products as a result of their audits. Contractors, Aqualogic WC Ltd. carried out this work. <i>Water saving products on offer included tap inserts, Save-a-flushes, ecoBETAs, and urinal controls. Meter readings were taken 3 weeks prior to the audit, on the date of audit and 3 weeks after audit. The total reported water saving for the project is 14,464.06 l/day which equates to 556.31 l/school/day.</i></p> <p>5.3 Water Efficiency Strategy for AMP6</p> <p>Partnership working</p>	Key Results		Total customers invited to participate	15,134	Applications received	2,006	Audits completed	2,003	Product	Quantity Fitted	ecoBETA	2163	Save-a-Flush	214	Aerated Shower head	577	Shower Inline regulator	72	Tap Inserts	2927	Eco-Flow Tap Spray	870	Shower timer	1705	Hose gun	1936	Water storing crystals	1810	Water butt (190l)	1438	Water butt (100l)	143
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Ref. no.	Title of the article/document	Evaluation of the author/journal	Study / Description	Relevant information gained from the article				
				Water Saving Toolkit <i>ecoBETA</i> <i>H2eco Phase 1</i> H2eco Phase 2 H2eco Phase 3 <i>H2eco Phase 4</i> <i>H2eco Phase 5</i> <i>H2eco Phase 6</i> <i>ecoFIT trial</i> <i>H2eco Phase 7</i> <i>ecoFIT</i>	Chelmsford, Essex <i>Chelmsford, Essex</i> <i>Chelmsford, Essex</i> Chelmsford, Essex Chelmsford, Essex <i>Chelmsford, Essex</i> <i>Wickford, Essex</i> <i>Basildon, Essex</i> <i>Westcliff-on-Sea and Ilford</i> <i>Basildon, Essex</i> <i>Great Yarmouth</i>	2006/07 <i>2006/07</i> <i>2007/08</i> 2008/09 2008/09 <i>2009/10</i> <i>2006/07</i> <i>2006/07</i> <i>2006/07</i> <i>2006/07</i> <i>2006/07</i>	1,073 <i>708</i> <i>1,495</i> 1,439 194 <i>600</i> <i>2,266</i> <i>3,002</i> <i>366</i> <i>3,002</i> <i>2,552</i>	13.85 <i>31.38</i> <i>20.3</i> 6.7 4.9 <i>27.8</i> <i>34.4*</i> <i>44.4</i> ** <i>28.88</i> <i>48.2</i>
Table 5.4: Key results of retrofit projects carried out since 2006. * Based on assumed savings. ESW was unable to collect a full set of meter reads for H2eco Phase 5 due to adverse weather conditions. ** ecoFIT trial straddled Christmas 2011 and therefore low number of successful meter reads due to adverse weather.								



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Table 2: Awards, approvals and recognitions


Ref. no.	Name of award / recognition	Granted / Managed by	Description	Water saving and other relevant information
2-02	UK WRAS approval 2005	Water Regulations Advisory Scheme (WRAS)	WRAS Approval Nos. 1203063 WRAS Approval No. 1307079 WRAS Approval No. 1206029	The WRAS assesses water fittings products to ensure that they do not waste, misuse, unduly consume or contaminate the water supply in accordance with UK Government regulations
2-03	UK ecoBETA is awarded the Waterwise Marque by Waterwise UK 2007	Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency in close cooperation with the water industry, governments and regulators, manufacturers and retailers.	Until autumn 2011, The Marque was awarded annually to products which reduce water wastage or raise the awareness of water efficiency. The Marque has since been replaced by a new labelling scheme, known as the Waterwise Recommended Checkmark. Gradually the Marque will be phased out, and replaced with the Checkmark. But though the label is changing, the Marque still denotes a product that meets stringest tests of water saving. Every product with the Marque is an “Award Winning Water Saver”. Saves up 50% of water used to flush This device allows the consumers to convert their single flush toilet into a dual flush by attaching it onto a single-flush siphon. A preset half-flush is activated by depressing the flushing handle and letting go, whilst a full-flush is achieved by holding the flushing handle down. A higher level of efficiency is achieved as a conscious decision must be made to activate the large flush. This product won the Waterwise Marque in 2006 for its water efficiency.	<ul style="list-style-type: none"> • ecoBETA and ecoFLUSH awarded the Waterwise Recommended Checkmark for their water saving potential, design, operation and quality. • Saves up 50% of water used to flush • A preset half-flush is activated by depressing the flushing handle and letting go, whilst a full-flush is achieved by holding the flushing handle down. A higher level of efficiency is achieved as a conscious decision must be made to activate the large flush.

Ref. no.	Name of award / recognition	Granted / Managed by	Description	Water saving and other relevant information
2-04	UK Confirmation on ecoBETA Waterwise Awards and Recommendation issued by Jacob Tompkins, Managing Director at Waterwise UK 7 February 2012	Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency in close cooperation with the water industry, governments and regulators, manufacturers and retailers.	<p>This is a letter to confirm that ecoBETA have received 2 awards from Waterwise. The ecoBETA siphon retrofit was awarded the Waterwise Marque in 2007 and the ecoBETA eco-FLUSH was awarded the Waterwise Marque in this award covers all variants of the eco-FLUSH (i.e. handle or button operated). The Waterwise Marque has now been renamed the Waterwise Recommended Checkmark and this has been retrospectively awarded to both products. The Marque and Checkmark assess products for their water saving potential, design, operation and quality.</p> <p>In addition to these awards the ecoBETA siphon retrofit has consistently shown high levels of water saving in domestic retrofit. The Waterwise Evidence Base is an ongoing research project supported by the UK government, water regulators and water companies, it assesses and evaluates all large-scale water efficiency trials and programmes in the UK, this work shows that the ecoBETA siphon is the most effective water efficiency retrofit device in terms of overall water saving.</p> <p>As you know Waterwise has worked with ecoBETA over the past 6 years and I would strongly recommend your products. I would be happy to provide a reference regarding ecoBETA for any future clients.</p>	<ul style="list-style-type: none"> ecoBETA is acknowledged as a Waterwise Recommended Checkmark Product The Waterwise Evidence Base shows that the ecoBETA siphon is the most effective water efficiency retrofit device in terms of overall water saving.
2-05	UK E-mail from Jacob Tompkins, Managing Director at Waterwise UK February 2012		<p>We have been discussing your new ecoBETA valve at Waterwise and as I have stated several time before we think that it has 2 main benefits firstly the fact that it doesn't leak and secondly the simplicity of the design.</p> <p>There are extensive problems in the UK with <u>leaking dual flush systems</u> and this is a major concern both for the water companies and for the retailers who have had lots of complaints, this problem is intensified in the UK due to the hardness of the water which affects traditional valve systems.</p> <p>The simplicity issue is also important as there is customer confusion over the various buttons in normal dual flush models and this can lead to double flushing.</p>	<ul style="list-style-type: none"> <u>ecoBETA does not leak</u> - leaking dual flush systems are a major concern for the water companies and retailers <u>Simplicity of the design</u> - dual flush models may lead to customer confusion and therefore the risk of double flushing

Ref. no.	Name of award / recognition	Granted / Managed by	Description	Water saving and other relevant information																										
2-06	UK ecoBETA was added to the ECA Water Technology Product List 1 February 2010	UK Department for Environment Food & Rural Affairs (DEFRA) and HM Revenue & Customs (HMRC) in partnership with AEA Technology	<div>ecoBETA is listed on the ECA Water Technology Product List in the category Efficient Toilets -Retrofit WC Flushing Devices</div> <table><tr><td>Product Name:</td><td>ecoBETA Siphon</td></tr><tr><td>Ref:</td><td>3494</td></tr><tr><td>Model Number</td><td>Siphon3</td></tr><tr><td>Date Added</td><td>1st February 2010</td></tr><tr><td>Manufacturer</td><td>ecoBETA</td></tr><tr><td>Technology</td><td>Efficient toilets</td></tr><tr><td>Sub-technology</td><td>Retrofit WC Flushing Devices</td></tr><tr><td>WS(WF)R Compliant</td><td>No</td></tr><tr><td>Country</td><td>United Kingdom</td></tr><tr><td>Type of device (replacement/modification)</td><td>Modification</td></tr><tr><td>Reduced Flush Volume</td><td>50%</td></tr><tr><td>Demonstration of compliance</td><td>Self declaration of conformity</td></tr><tr><td>ISO 9001 compliant</td><td>No</td></tr></table> <div>The Enhanced Capital Allowance (ECA) scheme offers a 100% first-year allowance for investments in certain water efficient plant and machinery. It lets businesses write off 100% of the cost of qualifying plant and machinery against taxable profits in the year of purchase. This can bring significant financial savings and reduce business' impact on the environment.</div> <div>This guide is mainly aimed at businesses that want to buy water efficient products, and the manufacturers and suppliers of those products. It is also relevant to organisations that are not eligible to claim ECAs but can use the WTL as a sustainable procurement tool.</div>	Product Name:	ecoBETA Siphon	Ref:	3494	Model Number	Siphon3	Date Added	1st February 2010	Manufacturer	ecoBETA	Technology	Efficient toilets	Sub-technology	Retrofit WC Flushing Devices	WS(WF)R Compliant	No	Country	United Kingdom	Type of device (replacement/modification)	Modification	Reduced Flush Volume	50%	Demonstration of compliance	Self declaration of conformity	ISO 9001 compliant	No	<div>Free installation of ecoBETA in businesses in the UK:</div> <div>ecoBETA is listed on the water technology list (WTL) as product that encourages sustainable water use</div> <div>According to the ECA scheme, businesses can write off 100% of the cost against taxable profits in the year of the purchase.</div>
Product Name:	ecoBETA Siphon																													
Ref:	3494																													
Model Number	Siphon3																													
Date Added	1st February 2010																													
Manufacturer	ecoBETA																													
Technology	Efficient toilets																													
Sub-technology	Retrofit WC Flushing Devices																													
WS(WF)R Compliant	No																													
Country	United Kingdom																													
Type of device (replacement/modification)	Modification																													
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ISO 9001 compliant	No																													

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Ref. no.	Name of award / recognition	Granted / Managed by	Description	Water saving and other relevant information
2-07	UK ecoBETA is installed by water companies free of charge	Planning effective water efficiency initiatives - June 2012 Evaluating Water Efficiency Retrofit Projects: An Example - May 2013	<ol style="list-style-type: none"> 1. Thames Water 2012 2. Essex & Suffolk 2012 3. Anglian Water 2013 4. Northumbrian Water (1-11) 5. Portsmouth Water (1-04) <p>A process description for planning and evaluating effective, water efficiency initiatives</p>	<p>Free installation of ecoBETA in households, schools and public buildings is funded by water companies. On approval of their Water Resource Management Plans, the water companies are allocated funds by DEFRA to spend on projects covering water conservation / reduction of consumption. These plans are based on practical lessons of past water efficiency projects. Installation of ecoBETA is a part of this plan.</p> <p>Water-savings:</p> <ol style="list-style-type: none"> 1. Up to 47 litres of water every day 2. 30 litres per day
2-08	DK ecoBETA acknowledged as Climate Partner in Aarhus, the 2nd largest city in Denmark 8 February 2012	Municipality of Aarhus – the 2 nd largest municipality in Denmark	<p>The municipality of Aarhus has made climate partnership agreements with 42 Danish companies. The City Council is working closely with businesses, utility providers, universities, further education centres and other municipalities to develop new solutions to making towns and cities greener, and creating growth in the cleantech sector.</p> <p>Climate partnership agreements are business-driven and strategic agreements which hold great potential for business development and are at the same timeAs climate partner ecoBETA is to participate in development projects that can generate growth in cleantech and increase security of supply while reducing energy consumption and CO2 emissions in Aarhus.</p>	<p>ecoBETA is acknowledged as climate partner in Aarhus as test installations of their water-saving toilet flush system in several housing associations and a kindergarten in Aarhus have lead to excellent results.</p>

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Ref. no.	Name of award / recognition	Granted / Managed by	Description	Water saving and other relevant information
2-09	UK SWIG Award 2013 issued to Essex & Suffolk Water Sustainable Water Industry Group Awards (SWIG) 2013 November 2013	Sustainable Water Industry Group SWIG was conceived in 2008 by a group who came together with the idea of applying some 'whole system thinking' to sustainable water management.	<p>In November 2013 Essex & Suffolk won the SWIG Award 2013 for the H2eco project helping customers to save money and be water efficient by fitting water saving devices in their homes.</p> <p>Products such as water butts, aerated shower heads and dual flush devices for toilets, were fitted free-of-charge to customers' homes with a qualified plumber on-hand to install the items and carry out a water efficiency survey of the property.</p> <p>Undertaking H2eco Phase 7 and 8 has resulted in total water savings of 140.95 m3 per day, which equates to an average measured water saving of 23.48 litres per property per day. The water savings reported here represent "actual" water savings calculated through the analyses of meter reads taken before the audit, on the date of the audit and following the audit. In total 44,426 products have been installed across the 2 phases including 2,775 ecoBETAs fitted in 2,460 properties, 10,899 tap inserts installed across 4,761 properties and 1,934 showerheads installed in 1,774 properties.</p>	<p>Water saving of 23.48 litres per property per day</p> <p>Results of h2eco project ref. 1-08: Fitting of ecoBETA lead to the highest water savings = 48.3 l/property/day</p>



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Table 3: Case Studies

Ref. no.	Title of the article/document	Relevant information gained from the articles	Water saving and other relevant information gained from the articles
DENMARK			
3a-01	<u>The Danish Ministry of Food</u> Ministeriet for Fødevarer, 2009	Ministry of Food Replacement due to rising problems with dual flush valve with 2 buttons and thereby rising costs of repair and of continuously running water	Replacement of dual flush valve with 2 buttons with ecoBETA dual flush valve with 1 button due to continuous maintenance problems: <ul style="list-style-type: none"> • No maintenance cost • Reducing water wastage • Water savings
3a-02	<u>Town Hall</u> Frederiksberg Rådhus, 2011	Replacement of all dual flush valves with 2 buttons with ecoBETA dual flush valves with 1 button	Replacement of dual flush valve with 2 buttons with ecoBETA dual flush valve with 1 button due to continuous maintenance problems: <ul style="list-style-type: none"> • Water savings of 47% • No maintenance
3a-03	Lyngby-Taarbæk Kommune 2011		<ul style="list-style-type: none"> • Annual water savings of 25%
3a-04	<u>Concert hall</u> Musikhuset Esbjerg, 2011	Replacement of all dual flush valves with 2 buttons with ecoBETA dual flush valves with 1 button	Results after 3 years after replacement of all dual flush valves with 2 buttons with ecoBETA dual flush valves with 1 button: <ul style="list-style-type: none"> • Extraordinary water savings of 48% • No maintenance at all
3a-05	<u>Elementary school</u> Antvorskov Skole i Slagelse, 2012		<ul style="list-style-type: none"> • Water savings from 17.6 to 44.7%
3a-06	<u>Elementary school</u> Privatskolen Filipskolen Aalborg, 2012	Reduction in water consumption from 342 m3 to 170 m3	<ul style="list-style-type: none"> • Water savings of 50% • No repairs • No behavioral problems
3a-07	Institutions in Silkeborg, 2013		<ul style="list-style-type: none"> • Water savings: <ul style="list-style-type: none"> ○ Børnehuset Thorning 44% ○ Kragelund Børnehave 31% ○ Grauballe Børnegård 41%


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Ref. no.	Title of the article/document	Relevant information gained from the articles	Water saving and other relevant information gained from the articles
3a-08	<u>Police Station</u> Station City Halmtorvet, 2013	Replacement of all dual flush valves with 2 buttons in Gustavsberg toilets with ecoBETA dual flush valves with 1 button: In September, the consumption was 435.3 m3. In October, the consumption was 296.3 m3.	<ul style="list-style-type: none"> • Replacement of Gustavsberg dual flush/2 buttons with ecoBETA dual flush / 1 button • Water-savings of 32%
3a-09	<u>Elementary school</u> Marievangsskolen in Slagelse December 2013	Toilet valves ensure schools considerable water savings Easy and intuitive operation: Although the valve allows small and large flushes, it only has 1 button. Or the big flush, the user has to hold down the button for approx. 4 seconds. In this way the user has to make an extra effort to use more water. Installation of the new valves in the 90 toilets at Marievangsskolen has in total cost DKK 47,500. The school has in total approx. 960 pupils. Installation began at the end of May 2012 and already 1 year later, these installations have resulted in considerable savings on the water budget and released funds for other initiatives.	<ul style="list-style-type: none"> • Water-saving of 600.000 litres in 1 year • Simple and intuitive operation – the user must make an extra effort to use more water.
3a-10	<u>Seminarieskolen in</u> Aalborg May 2012	We were convinced that dual flush toilets with 2 buttons were the right choice. However, we had a lot of maintenance problems due to continuous running water. These problems are now solved thanks to ecoBETA as they have installed their robust dual flush with only 1 button. The valve is simple and requires no maintenance. At our school we have retrofitted all our dual flush toilets with ecoBETA and gained watersavings of 25% on the toilets alone! The reason for these savings is that 90% of all flushes only require the small flush and with only 1 button it is impossible to choose the wrong one.	<ul style="list-style-type: none"> • Replacement of dual flush/2 buttons with ecoBETA dual flush/1 button • No longer any maintenance problems • Water-savings of 25% on toilets alone • Reason: it is impossible to choose the wrong button


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INTERNATIONAL																																																															
3b-01	<p>CYPRUS</p> <p>Water Consumption Savings at Anastasia Beach Hotel</p> <p>1 November 2011</p>	<p>CLIENT: ANASTASIA BEACH HOTEL</p> <p><u>WATER SAVING DEVICES INSTALLED</u></p> <table><tr><td>TYPE: WC D/F SIPHON</td><td>AMOUNT: 224</td></tr><tr><td>TYPE: SINK SAVERS 2.5L</td><td>AMOUNT: 307</td></tr><tr><td>TYPE: SHOWER SAVER 8L</td><td>AMOUNT: 224</td></tr><tr><td>TYPE: TURBO SHOWER</td><td>AMOUNT: 224</td></tr></table> <p><u>Without water saving devices.</u></p> <table><tr><td></td><td>Period</td><td>01-31/10/2007</td></tr><tr><td>Meter reading 1</td><td>0</td><td></td></tr><tr><td>Meter reading 2</td><td>0</td><td></td></tr><tr><td>Days between readings</td><td>31</td><td></td></tr><tr><td>Persondays for the period</td><td>12837</td><td></td></tr><tr><td>Total water consumption</td><td></td><td>4383</td></tr><tr><td>Water consumption /day</td><td></td><td>141,387097</td></tr><tr><td>Water consumption /person/day</td><td></td><td>0,34143491</td></tr></table> <p><u>With water saving devices</u></p> <table><tr><td></td><td>Period</td><td>01-31/10/08</td></tr><tr><td>Meter reading 1</td><td>0</td><td></td></tr><tr><td>Meter reading 2</td><td>0</td><td></td></tr><tr><td>Days between readings</td><td>31</td><td></td></tr><tr><td>Persondays for the period</td><td>12012</td><td></td></tr><tr><td>Total water consumption</td><td></td><td>2228</td></tr><tr><td>Water consumption /day</td><td></td><td>71,8709677</td></tr><tr><td>Water consumption /person/day</td><td></td><td>0,18548119</td></tr></table> <p><u>Savings</u></p> <table><tr><td>Percentage overall saving</td><td>49,1672371</td></tr><tr><td>Percentage saving /person/day</td><td>45,6759759</td></tr></table>	TYPE: WC D/F SIPHON	AMOUNT: 224	TYPE: SINK SAVERS 2.5L	AMOUNT: 307	TYPE: SHOWER SAVER 8L	AMOUNT: 224	TYPE: TURBO SHOWER	AMOUNT: 224		Period	01-31/10/2007	Meter reading 1	0		Meter reading 2	0		Days between readings	31		Persondays for the period	12837		Total water consumption		4383	Water consumption /day		141,387097	Water consumption /person/day		0,34143491		Period	01-31/10/08	Meter reading 1	0		Meter reading 2	0		Days between readings	31		Persondays for the period	12012		Total water consumption		2228	Water consumption /day		71,8709677	Water consumption /person/day		0,18548119	Percentage overall saving	49,1672371	Percentage saving /person/day	45,6759759	<ul style="list-style-type: none">After installation of ecoBETA, sink savers, shower savers and turbo showers: Overall water saving 49%, saving person/day 45%
TYPE: WC D/F SIPHON	AMOUNT: 224																																																														
TYPE: SINK SAVERS 2.5L	AMOUNT: 307																																																														
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Ref. no.	Title of the article/document	Relevant information gained from the articles	Water saving and other relevant information gained from the articles
3b-02	<p>UK</p> <p>Waterwise Consulting June 2008</p> <p>Brian Hooper BSc (Tech) MBE Managing Director Waterwise Consulting Ltd.</p>	<p>ecoBETA came to the UK about 2 years ago with a cistern device designed to convert a single flush toilet to dual flush. Up to 2001 all toilets in the UK were symphonic and with an estimated 25 million houses and 40 million plus toilets there was a market for a cistern device that would save water. The ecoBETA is a very cleverly designed device to fulfil this role.</p> <p>Toilets in the UK prior to 1991 used 9 litres of water which was reduced to 7.5 litres between 1991 and 2001. All these toilets could benefit from the installation of an ecoBETA. The device can be installed in less than half an hour and is not visible from the exterior of the toilet. It allows the user to deliver a short flush by depressing the handle and releasing it or a full flush by holding the handle down.</p> <p>In order to prepare for the UK market 3 important routes were followed:</p> <ol style="list-style-type: none"> 1. It was submitted to WRAS (Water Regulations Advisory Scheme) for approval 2. It was entered for the prestigious Waterwise Marque award 3. A large trial was set up with Essex & Suffolk Water (one of the 23 UK water Companies) <p>It went through rigorous testing to win WRAS approval and picked up the Waterwise Marque award in 2007. However, the trial was to take longer and the results from this trial are only now available in a report entitled “Chelmsford ecoBETA trial”.</p> <p>Results on some 1,012 toilets fitted in 555 properties show savings of 31.4 litres/property/day. There were no problems with installation or consumer acceptance of this product.</p> <p>Many other UK Water Companies are already using ecoBETA’s in their large scale water efficiency trials with further results being reported throughout 2008. It is the intention of some of these Companies to apply to OFWAT (the UK water regulator) for funding to allow the fitting of ecoBETA’s to both social housing and private housing in the coming periodic review process. This process determines funding for the 5 year period 2010 to 2015.</p> <p>I believe that we will see a rapid spread of ecoBETA’s in the UK as a result of this process and I thoroughly recommend this product as an economic and effective way of saving water.</p>	<ul style="list-style-type: none"> • Installation takes less than an hour • Not visible from the exterior • Results on 1,012 toilets show water savings of 31.4 litres/property/day

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Ref. no.	Title of the article/document	Relevant information gained from the articles	Water saving and other relevant information gained from the articles
3b-03	DUBAI SEBASTIEN KHANDJIAN - Technical Director Middle East Environmental Technologies – MEET	For your information, we have reached the following results in water saving: Work camp 27 % School 36 % Kindergarden 38% Medical clinic 20% That is only some of the measured results from all the ecoBETA retrofit installed, and after now more than 2 years we have not received any complaints.	<ul style="list-style-type: none"> • Water savings: <ul style="list-style-type: none"> ○ Work camp 27% ○ School 36% ○ Kindergarden 38% ○ Medical clinic 20% • Hardly any complaints after more than 2 years
3b-04	EGYPT Reference letter from Mohammed Fadl I, Director of Rooms, Radisson SAS Resort El Quseir, El Quseir, Red Sea – Egypt 8 December 2010	I would like really to thank you for the very high quality products you have installed in our property, I am delighted to inform you that by installing ecoBETA water saving devices we reached about 25% saving in our monthly water consumption.	<ul style="list-style-type: none"> • Water saving 25%

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Ref. no.	Title of the article/document	Relevant information gained from the articles	Water saving and other relevant information gained from the articles
3b-05	<p>SWEDEN</p> <p>Letter from Lennart Hägglund, energyLogic in Sweden</p> <p>8 March 2011</p> <p>energyLogic are impartial energy consultants in Sweden</p>	<p>Experiences from ecoBETA installations in Swedish hotels</p> <p>During the last years we have installed ecoBETA dual flush converters for toilets in several Swedish hotels. In those hotels also equipped with EnergyGuard Automatic Meter Reading, we have been able to measure the water consumption before and after ecoBETA installation.</p> <p>The results are:</p> <ul style="list-style-type: none"> • 42% average saving on water consumption measured directly on toilets. • 15- 25% savings on total water consumption measured on main water gauge. • 20- 30% savings on total water consumption when ecoBETA is combined with water saving equipments also on showers (10 l/min) and wash basin (4 l/min). <p>During refurbishment of one hotel we have also been able to compare the difference in water saving between installing ecoBETA in existing toilets and substituting existing toilets with new toilets with double flush controlled by double buttons. The results measured directly on the toilets were that savings with ecoBETA were 42% but savings with new double flush toilets were only 18 %. This difference is due to the fact that hotel guests tend to use the large flush always on the new toilets with double buttons. But on the toilets equipped with ecoBETA most flushes were small (pull or push button and let go).</p> <p>We often hear arguments from skeptical hotel technicians that the lower water consumption from ecoBETA could cause blocked sewage pipes, but we have had no such problems reported from any of the hotels where ecoBETA have been installed.</p> <p>All hotels where we have installed ecoBETA have been able to meet requirements regarding maximum water consumption per guest night from the Nordic eco label SVANEN.</p> <p>Based on our experiences with ecoBETA we recommend all hotels to convert their old toilets with ecoBETA instead of changing to new toilets with double flush.</p>	<ul style="list-style-type: none"> • Water savings in Swedish hotels <ul style="list-style-type: none"> ○ 42% average saving measured directly on toilets ○ 15-25% measured on main water gauge ○ 20-30% when ecoBETA is combined with water saving equipment on showers and washbasin • ecoBETA compared to dual flush toilets: <ul style="list-style-type: none"> ○ 42% water savings on toilets with ecoBETA ○ 18% water savings on new installed double flush toilets <p><i>This difference is due to the fact that hotel guests tend to use the large flush always on the new toilets with double buttons. But on the toilets equipped with ecoBETA most flushes were small (pull or push button and let go).</i></p>

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Ref. no.	Title of the article/document	Relevant information gained from the articles	Water saving and other relevant information gained from the articles
3b-06	PHILIPPINES Director of eco-sense, Patrick Joseph	1. ecoBETA is simple and Idiot proof.... 2. European Design and technology 3. Guaranteed Water and Money savings....	<ul style="list-style-type: none"> • Simple and idiot proof • European design and technology • Guaranteed water and money savings
	HONG KONG Director of ecosense, Kevin K. Caldwell	1. The ecoBETA valve is very intuitive to use. It is almost impossible to make a mistake thus wasting water. 2. The valve has very few moving parts making it very reliable. Not a lot that can break. 3. The USP is “plug & play”. It can be installed by anyone, with no tools and without having to remove the toilet tank.	<ul style="list-style-type: none"> • Intuitive to use • Few moving parts makes it very reliable • Easy installation
	CALIFORNIA, USA Consultant for water conservation, Mats Dannerstedt	1. I am fascinated by the simplicity of the valve 2. The ONLY true water saving flush valve 3. The only Flush Valve where even a non-engineer can install it in less than 5 minutes 4. Nothing Betta’ than ecoBeta.....	<ul style="list-style-type: none"> • Simple design • Easy installation
	GERMANY Sven Karstensen, Dipl.-Ing. Geschäftsleitung, ecoBETA (Deutschland) UG & Co. KG	The simplicity of the ecoBETA valve is fascinating. At last a system that is ingenious, robust and intuitive. The simple operation makes watersaving enjoyable. Even the most careless users will now save water. User error is not possible. And it is not necessary to engage expensive plumbers.	<ul style="list-style-type: none"> • Simple and robust design • Simple and intuitive operation – excludes the possibility of user error • Requires nothing from the user • Easy installation
	DUBAI SEBASTIEN KHANDJIAN - Technical Director Middle East Environmental Technologies - MEET	MEET Environmental Solutions has been working with ecoBETA for over 5 years in the GCC. Our confidence in these products is marked by our 5 year warranty to all our clients. In the 5 years we have been installing the ecoBETA dual flush we have not encountered a single problem with this high efficiency water saving device. Our clients are very pleased with the ease of use and the savings they are benefitting from.	<ul style="list-style-type: none"> • 5 year warranty • Have not encountered a single problem • Clients are very pleased with the ease of use and the savings.

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Ref. no.	Title of the article/document	Relevant information gained from the articles	Water saving and other relevant information gained from the articles
3b-07	UK Greening Business and Thames Water have joined forces to bring businesses across 6 London boroughs free water-saving devices. September 2012	<p>Greening Business, part funded by the European Union, is offering businesses 12 hours of free support and advice from qualified environmental specialists to help them reduce their costs and save money by ‘going green’. The initiative will include:</p> <ul style="list-style-type: none"> • Specialist environmental advisors will visit your business • They will undertake an assessment of the site to identify areas where cost savings could be made • Produce a bespoke action plan with a focus on low or no cost changes which can be made • Help your business to implement the actions <p>Greening Business Operations Manager, Christina Parnell-Harris, says that “Excessive use of water or waste is often identified as a significant cost to businesses which is why it is fantastic that we have been able to partner with Thames Water to provide businesses with free water-saving devices.”</p> <p><i>Devices such as the Eco-Beta, which can be installed inside older toilet cisterns to retrofit them into dual flush systems, can save up to 47 litres of water every day.</i> Tap inserts mix air with the water, giving the same effect while using a lower volume of water can save up to 36 litres per day.</p> <p>Water efficiency analyst, Heather Aitken from Thames Water says “These free water-saving devices can make a real difference to businesses looking to become more sustainable and reduce their utility bills.”</p>	<ul style="list-style-type: none"> • Water savings up to 47 litres per day • These free water-saving devices can make a real difference to businesses looking to become more sustainable and reduce their utility bills
3b-08	UK Delphis Eco	<p>The only chemical supplier to supply 100% green products.</p> <p><i>Water use was also not forgotten, with Delphis Eco installing ‘ecoBETAs’ in their toilets, to save up to 50% of water through flushing.</i></p>	<ul style="list-style-type: none"> • Water savings up to 50%
3b-09	UK Cardiff Metropolitan University April 2012	<p>As part of DCWW’s (Dwr Cymru Welsh Water) water efficiency program, CMU (Cardiff Metropolitan University) was offered assistance in reducing their consumption in accommodation buildings. A number of basic water efficiency measures, aerating shower heads and dual flush toilets (ecoBETA), were carried out in order to reduce consumption.</p> <p>The cost was shared between DCWW and CMU, and evidence of savings was used to contribute towards regulatory targets and year on year 5% energy and water cost reduction targets for DCWW and CMU respectively.</p> <p>Data shows a saving of approximately 30% on consumption, which is 45 m3/week for the four buildings over two campus’ which were upgraded. (198 rooms out of 727 were upgraded)</p>	<ul style="list-style-type: none"> • Shows the impact of simple but effective water efficiency measures • Water use reduced by 30% • Savings on water alone expected to be 2200 m3/year (£5,500/year based on £2.50/m3).

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3b-10	UK The Atlanta Hotel, Eastbourne March 2007	<p>The Atlanta Hotel received a water efficiency audit through the SEEDA funded Hospitality H2O project which ran from January - March 2007. This case study details the key actions that were identified as part of the audit and the water and cost savings that were achievable.</p> <p>Toilets - By installing Ecobeta retrofit dual flush devices, along with stickers placed on cisterns to inform users how to full flush and half flush, this will cut water use by at least 30% or 52m3 and save £124 per year.</p>	<ul style="list-style-type: none"> ecoBETA retrofit dual flush devices will cut water use by at least 30% or 52 m3 and save GBP 124 per year.
3b-11	Cyprus Giorko Kindergarden July 2008	Installation of 20 ecoBETA siphon and 1 ecoBETA swing and tap flow reducers	<ul style="list-style-type: none"> Comprehensive property water saving solution Over 50% average water saving per person per day 4,500 litres annual saving
3b-12	SEWA - Sharjah Electricity and Water Authorities May 2015	<p>ecoBETA water savings project analysis</p> <p>Projects sponsors: SEWA, Sharjah Municipality, ecoBETA, MEET Environmental Solutions</p>	<ul style="list-style-type: none"> Water savings of 49.7%
3b-13	Statement from Brian Hooper, Waterwise Consulting Ltd. June 2015	<p>Brian Hooper is a consultant and member of the Waterwise Team, dedicated to reducing Water Wastage in the UK.</p> <p>History of ecoBETA in the UK. About the UK trials. About the use of ecoBETA in the UK today.</p>	<ul style="list-style-type: none"> The device works very well in private and social housing and in commercial premises The device is liked by customers – hardly any complaints The device shows consistent savings between 30-50 litres/property/day in private and social housing – saves over 47 litres/property/day Fitting takes 5-10 minutes Device is supplied free of charge from local water companies Although supplied with other water saving devices, ecoBETA contributes to the majority of savings. Thames Water, Essex & Suffolk Water now plan to concentrate on the ecoBETA as its main product in all their water conservation projects.

3b-14

Final report after phase 1 of the ecoBETA pilot project in Abidjan, Côte d'Ivoire
September 2015

Objectives of the pilot project:

- To investigate the level of water savings after implementation of ecoBETA devices in various sites.
- To understand the costs and benefits of efficient water management
- To observe behavioural changes after the raising awareness campaign

The committee in charge of the pilot project: ONEP, SODECI and AFWA

Criteria for selection of sites In total 4 sites were selected.

No.	Site	Monthly consumption	Permanent staff	Total toilets	Sources of water wastage
1	Commissariat du 7 ^e Arrondissement	32606	40	5	Showers used by employees after work Water cunts WC's
2	Inspection de l'Enseignement Primaire Cocidy II	16697	19	3	WC's
3	Direction des Renseignements Généraux	26840	30	18	N/A
4	Direction Générale des Impôts	318986	60	28	Taps Piping WC's

Total number of sites: 3
Total number of toilets: 49

Conclusions

38% savings on total water consumption corresponds to savings per year of approx. CFA 3 mill. (EURO 4570).

Lessons learned

More savings could be achieved by following these recommendations when fitting ecoBETA:

- 1) Leak repairs are made
- 2) Maintenance staff is trained
- 3) Fitting is accompanied by an awareness building programme.



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Table 4: Other relevant articles confirming the continued interest in the ecoBETA solutions

Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
4-02	<p>Design of a programme to retrofit energy and water efficiency into existing neighbourhoods of Ashford</p> <p>Funding, measures and pilot design</p> <p>November 2009</p> <p>Pages 28, 30-33, 39</p>	<p>CEN</p> <p>Create a better environment</p> <p>Since its inception in 2001, Climate Energy has provided a complete range of energy efficiency solutions to Local Authorities, housing providers, utility companies, developers and homeowners across London and South East England.</p> <p>Its services span all aspects of energy efficiency, from consultancy and project management through to delivery at a local level via a national network of accredited assessors and installers.</p>	<p>This report is the final part of the Ashford combined retrofit design project and will focus on the following topics:</p> <ul style="list-style-type: none"> Existing and emerging policies: What are the main policies that are driving the retrofit agenda and what features should the Ashford project aim to incorporate? Delivery models: How is retrofit currently being delivered and which components should the Ashford model include? Retrofitting: Which measures should the project aim to deliver directly and which should be delivered by partners? Funding: How is retrofit being funded and where are the main opportunities? Design: What are the recommended delivery options for the Ashford combined retrofit? <p>4.3.3. Water saving trials at the community scales</p> <p>In addition to these activities some water companies have been involved in more in-depth studies and field trials that have sought to tackle water efficiency at the community level. Key examples from the South East include the Preston Water Efficiency Initiative (Surrey) and the Savings on Tap retrofit project (Kent).</p> <p>4.3.3.1. Preston Water Efficiency Initiative</p> <p>This project targeted tenants living in social housing rather than ‘private’ residents. The main focus of this project was bathroom refurbishment, retrofitting water efficiency devices to existing properties and an awareness campaign.</p> <p>This initiative was delivered in partnership with a local social housing provider as part of its refurbishment programme¹¹ which aimed to refurbish bathrooms in 160 properties. The ongoing refurbishment programme was used as a vehicle for introducing water efficiency via the use of new dual flush toilets and low flow showers. A package of water efficient devices was also offered to each household and included aerated taps, leak alarms, water butts and fittings to convert toilets to dual-flush.</p> <p>The average cost per property for the main refurbishment programme was around £3,000 (cost per cubic metre £1.70). This led to a 25% saving in water consumption on average. The additional retrofit activities came in at £202 per property (£1.10 per cubic meter saved) and yielded 14% water savings. The uptake rate for the retrofit programme was 60% (n=205).</p> <p>The public awareness programme was also carried out. Leaflets were provided to householders and information disseminated via the residents' newsletter and the neighbourhood shop. Discounts on energy and water efficient washing machines were also offered to residents involved in the projects, amounting to around 25% off the list price.</p> <p>The project was funded by the Government New Growth Points scheme, which is a partnership between Central Government and local partners that aims to bring about the early delivery of housing and to provide the necessary infrastructure and services to support sustainable growth. The initiative is part of a wider programme of physical and social renewal for the Preston neighbourhood.</p> <p>In recent months Waterwise has partnered with Raven Housing Trust to roll out the Preston initiative to cover an additional 600 properties under Raven’s control. This new project was financed by a successful bid by Waterwise to Defra’s Greener Living Fund¹² which was set up to assist delivery of ‘greener living’ by third sector delivery partners. The new activity in Preston will form part of a wider set of activities across 3 regions.</p>


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			<p>The core activities are as follows:</p> <ul style="list-style-type: none">• <i>Water efficiency retrofits: Water wasting fixtures and fittings in homes will be replaced or refitted with Waterwise alternatives.</i>• Community Action Teams: Teams of residents will be supported to help households reduce their impact on the environment and to save money.• Creating a supportive environment: The retrofits and Teams will combine to create a community in which being water wise is the norm. The projects will also be working with local groups, such as wildlife groups, social housing providers and local media. <p>4.3.3.2. Savings on Tap</p> <p>The ‘Savings on Tap’ trial in Ashford (Kent) is already well known to the Client Group. This project consisted of 2 trials:</p> <ul style="list-style-type: none">• Retrofit and tariff testing in new homes in Singleton (see Box 1).• Retrofit into existing homes in Washford Farm. <p>The Washford project is more relevant to the pilot design as it set out to deliver water efficiency savings (via simple devices) to existing households. The trial used a plumber to carry out basic surveys and carry out relevant installations and repairs (see Table 7).</p> <table><tr><th>Output (advice and installations)</th><th>Qty / summary</th><th>Uptake</th></tr><tr><td>Total properties in target area</td><td>539</td><td>n/a</td></tr><tr><td>No. properties surveyed</td><td>273</td><td>44%</td></tr><tr><td>No. properties – outdoor devices provided</td><td>239</td><td>40%</td></tr><tr><td>ecoBETA cistern device</td><td>115</td><td>21%</td></tr><tr><td>New cistern</td><td>4</td><td>1%</td></tr><tr><td>Tap insert</td><td>98</td><td>18%</td></tr><tr><td>Hose gun</td><td>171</td><td>32%</td></tr><tr><td>Hippo</td><td>58</td><td>11%</td></tr><tr><td>Other work (e.g. ball valve repairs, re-washing, re-seating, leak fix, new taps)</td><td>41</td><td>8%</td></tr><tr><td>Garden information</td><td>281</td><td>52%</td></tr><tr><td>Meter pack</td><td>26</td><td>5%</td></tr><tr><td>Average installation time</td><td>1 hour</td><td>n/a</td></tr></table> <p>Table 7: Summary of Washford Farm water retrofit trial / Source: Kent County Council.</p> <p>The project achieved around 51% uptake in the target area which compared favourably against the 60% target. The plumber achieved up to 10 visits per day, a key factor in keeping the cost per house to around £60. In later stages of the project costs increased to around £72 per house due to more complex problems being encountered. The trial was therefore stopped at this point to avoid overspending.</p> <table><tr><th>Company</th><th>Year</th><th>Approach</th><th>Uptake</th><th>Measures/activities</th></tr><tr><td>Essex and Suffolk Water: Chelmsford</td><td>2006</td><td>Water audits</td><td>20%</td><td>Aerated showerhead, Water butts, ecoBETA, Tap inserts, Tap washers</td></tr></table>	Output (advice and installations)	Qty / summary	Uptake	Total properties in target area	539	n/a	No. properties surveyed	273	44%	No. properties – outdoor devices provided	239	40%	ecoBETA cistern device	115	21%	New cistern	4	1%	Tap insert	98	18%	Hose gun	171	32%	Hippo	58	11%	Other work (e.g. ball valve repairs, re-washing, re-seating, leak fix, new taps)	41	8%	Garden information	281	52%	Meter pack	26	5%	Average installation time	1 hour	n/a	Company	Year	Approach	Uptake	Measures/activities	Essex and Suffolk Water: Chelmsford	2006	Water audits	20%	Aerated showerhead, Water butts, ecoBETA, Tap inserts, Tap washers
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			Essex and Suffolk Water: Chelmsford	2007	Dual flush study	19%	ecoBETA																															
			Sutton and East Surrey Water: Preston	2007	Water efficiency initiative	58%	ecoBETA, Water butts, Shower timer, efficient washing machine, Dual flush																															
			United Utilities: Warrington	?	Home audits	77%	ecoBETA, Save-a-Flush, Showerhead																															
			Yorkshire Water	2007	Water saving trial	9%	Duoflush, ecoBETA, Save-a-Flush, Showerhead, Shower timer, Tap sprayer, Tap aerator, Hose gun																															
			Severn Trent Water: Nottingham	2007	Water efficiency trial	8%	Save-a-Flush, Duoflush, ecoBETA, Showerhead, Tap aerators																															
			Anglian Water: Ipswich	2007	Water audit trial	N=56	ecoBETA, Shower timer, Save-a-Flush, Tap Magic, Shower flow restrictor																															
			Savings on Tap retrofit: Existing homes (Ashford)	2008/9	Water efficiency tariff trial	N=250	ecoBETA, low flush cistern, tap insert, hose gun, Hippo, literature, other work (e.g. ball valve repairs, re-washing)																															
			Table 8: Summary of large scale water saving trials, audits and retrofit EXTRACT																																			
What is interesting is that the devices that save the most water, such as cistern devices and shower heads, are usually only offered to consumers via a third party (e.g. www.savewatersavemoney.co.uk/ ; http://www.watergrouppromotions.co.uk/) and whilst some measures are sometimes discounted (e.g. water butts) most devices are charged for. It is not clear to what extent measures are being subsidised by the water companies (if at all).																																						
<table><tr><th>Water Efficiency Measure</th><th>Average saving litres per property per day</th></tr><tr><td>Hose gun</td><td>1</td></tr><tr><td>Water butts</td><td>3</td></tr><tr><td>Shower timer</td><td>4</td></tr><tr><td>Shower flow restrictor</td><td>6</td></tr><tr><td>Tap washers</td><td>8</td></tr><tr><td>Tap inserts and restrictors</td><td>10</td></tr><tr><td>Cistern displacement devices</td><td>11</td></tr><tr><td>Fixed external leaks</td><td>12</td></tr><tr><td>Showerheads</td><td>12</td></tr><tr><td>DuoFlush</td><td>16</td></tr><tr><td>Ecoflush</td><td>20</td></tr><tr><td>ecoBETA</td><td>21</td></tr><tr><td>Variflush</td><td>23</td></tr><tr><td>Efficient washing machine</td><td>27</td></tr><tr><td>Float valve repair</td><td>34</td></tr><tr><td>Dual flush toilet</td><td>103</td></tr></table>		Water Efficiency Measure	Average saving litres per property per day	Hose gun	1	Water butts	3	Shower timer	4	Shower flow restrictor	6	Tap washers	8	Tap inserts and restrictors	10	Cistern displacement devices	11	Fixed external leaks	12	Showerheads	12	DuoFlush	16	Ecoflush	20	ecoBETA	21	Variflush	23	Efficient washing machine	27	Float valve repair	34	Dual flush toilet	103			
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Table 9: Summary water savings from commonly used measures in Ofwat evidence base / Source: Waterwise (2008); CEN calculations.																																						

Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles																																				
			<p>Ofwat has specified the measures that can be included under BSWE – Base Service Water Efficiency (see 4.3.5). Each measure has been allocated a water saving amount (litres per day) as well as a minimum installation target (i.e. the water company needs to achieve and confirm a minimum install rate for each measure for it to count towards their target).</p> <p>Table 10: Allowable measures under BSWE</p> <table><tr><th>Device</th><th>Saving (litres/day/property)</th></tr><tr><td>Save-a-Flush</td><td>1</td></tr><tr><td>Hippo</td><td>2.5</td></tr><tr><td>Water butt</td><td>6 fills/year</td></tr><tr><td>Variflush</td><td>23</td></tr><tr><td>Ecoflush</td><td>23</td></tr><tr><td>EcoBETA</td><td>23</td></tr><tr><td>Dudley turbo</td><td>23</td></tr><tr><td>Interflush</td><td>23</td></tr><tr><td>Tap inserts</td><td>16</td></tr><tr><td>Tap re-washing</td><td>12</td></tr><tr><td>Miracle tap</td><td>14</td></tr><tr><td>Retrofit push tap</td><td>30</td></tr><tr><td>Challis aerated head</td><td>29</td></tr><tr><td>Shower timers</td><td>5</td></tr><tr><td>Water saving crystals/gel</td><td>0.1</td></tr><tr><td>Hose trigger/spray gun</td><td>2</td></tr><tr><td>Self audits/welcome packs</td><td>10</td></tr></table> <p>Source: Ofwat: (2008).</p> <p>The required savings could be achieved with fewer devices, but presumably this would require South East to partner with a manufacturer to create a deal that would achieve volume uptake (e.g. 70,000 showerheads, 36,552 cistern devices). Obviously many homes have more than one bathroom/toilet/shower and as such these crude calculations are ‘worst case scenario’.</p>	Device	Saving (litres/day/property)	Save-a-Flush	1	Hippo	2.5	Water butt	6 fills/year	Variflush	23	Ecoflush	23	EcoBETA	23	Dudley turbo	23	Interflush	23	Tap inserts	16	Tap re-washing	12	Miracle tap	14	Retrofit push tap	30	Challis aerated head	29	Shower timers	5	Water saving crystals/gel	0.1	Hose trigger/spray gun	2	Self audits/welcome packs	10
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Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles																																																			
			<div><div><p>Table 12: Single WEM scenario for South East Water: Qty devices required to meet target</p><table><tr><th>Water Efficiency Measure</th><th>Average saving litres per property per day</th><th>No. measures required to meet BSWE target</th></tr><tr><td>Save-a-Flush</td><td>1</td><td>840,000</td></tr><tr><td>Hippo</td><td>2.5</td><td>336,000</td></tr><tr><td>Variflush</td><td>23</td><td>36,522</td></tr><tr><td>Ecoflush</td><td>23</td><td>36,522</td></tr><tr><td>EcoBETA</td><td>23</td><td>36,522</td></tr><tr><td>Dudley turbo</td><td>23</td><td>36,522</td></tr><tr><td>Interflush</td><td>23</td><td>36,522</td></tr><tr><td>Tap inserts</td><td>16</td><td>52,500</td></tr><tr><td>Tap re-washing</td><td>12</td><td>70,000</td></tr><tr><td>Miracle tap</td><td>14</td><td>60,000</td></tr><tr><td>Retrofit push tap</td><td>30</td><td>28,000</td></tr><tr><td>Challis aerated head</td><td>29</td><td>28,966</td></tr><tr><td>Shower timers</td><td>5</td><td>168,000</td></tr><tr><td>Water saving crystals/gel</td><td>0.1</td><td>8,400,000</td></tr><tr><td>Hose trigger/spray gun</td><td>2</td><td>420,000</td></tr><tr><td>Self audits/welcome packs</td><td>10</td><td>84,000</td></tr></table></div><div><p>Source: Ofwat (2008); CEN calculations. Notes: * This assumes one measure approach – a mix of measures would normally be used.</p></div><div><p>NB!</p></div></div>	Water Efficiency Measure	Average saving litres per property per day	No. measures required to meet BSWE target	Save-a-Flush	1	840,000	Hippo	2.5	336,000	Variflush	23	36,522	Ecoflush	23	36,522	EcoBETA	23	36,522	Dudley turbo	23	36,522	Interflush	23	36,522	Tap inserts	16	52,500	Tap re-washing	12	70,000	Miracle tap	14	60,000	Retrofit push tap	30	28,000	Challis aerated head	29	28,966	Shower timers	5	168,000	Water saving crystals/gel	0.1	8,400,000	Hose trigger/spray gun	2	420,000	Self audits/welcome packs	10	84,000
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4-03	Veolia Water Central Water Resources Management Plan Main Report March 2010 Page 232	<p>Veolia Water Central (formerly Three Valleys Water) was a privately owned company supplying water to Hertfordshire and parts of Surrey, North London and Bedfordshire, in England. It was owned by Veolia Environnement, a French company with international interests in the water, waste management, energy and transportation sectors.</p> <p>Veolia Water Central was sold along with its sister companies Veolia Water Southeast and Veolia Water East to Morgan Stanley and M&G Investments in 2012. The 3 companies were</p>	<p>Our Water Resources Management Plan identifies the actions that we need to take to ensure that we can supply our customers with the water they need over the next 25 years. We consider a wide range of factors such as climate change, changes in lifestyle, the condition of our rivers and groundwater, pressures of housing and population changes, and our customers’ expectations of us in terms of the standard of the services we provide. Our Plan is prepared in accordance with the relevant Regulations¹ and guidance from the Environment Agency².</p> <p>10.7 Water Efficiency Uncertainties</p> <p>The table below outlines the risks and uncertainties associated with water efficiency options considered for the least cost plan. We will continue to improve the reliability, sustainability and repeatability of demand management options in line with the developments in the evidence base for our next plan.</p> <table><tr><td>Scheme title:</td><td>Water saving devices – Customer subsidy for purchasing water saving devices</td></tr><tr><td>Description of scheme:</td><td>Offer discounts or money off vouchers to customers of VWC towards the purchase of water efficient devices, such as taps, Ecobeta dual toilet flush, aerated shower heads etc.</td></tr><tr><td>Description of benefits:</td><td>Customers can replace inefficient devices at a discounted price, making water saving around the home more attractive and more cost effective for home owners. Actual Water savings will depend on the number of devices installed</td></tr><tr><td>Benefits at average:</td><td>Unknown</td></tr><tr><td>Benefits at peak:</td><td>Unknown</td></tr></table>	Scheme title:	Water saving devices – Customer subsidy for purchasing water saving devices	Description of scheme:	Offer discounts or money off vouchers to customers of VWC towards the purchase of water efficient devices, such as taps, Ecobeta dual toilet flush, aerated shower heads etc.	Description of benefits:	Customers can replace inefficient devices at a discounted price, making water saving around the home more attractive and more cost effective for home owners. Actual Water savings will depend on the number of devices installed	Benefits at average:	Unknown	Benefits at peak:	Unknown																																									
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		merged to form Affinity Water on 1 October 2012.	Confidence in benefits: High Description of risks and uncertainties: Risk of not undertaking - may fail to fulfil statutory duty. Uncertainty of working with a manufacturer or supplier to support discounted products.
4-04	Waterwise Press Release Waterwise report shows potential water savings of 25% to help meet the challenges of climate change March 2010	Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency in close cooperation with the water industry, governments and regulators, manufacturers and retailers	<p>EXTRACT</p> <p><i>The report highlights that water savings of, on average, 42 litres per property per day (around 15%) are possible by installing a range of water-efficient products in homes and through encouraging customers to make behaviour changes.</i> This is good news for <i>householders on a water meter who could potentially reduce their water bills by £44 a year</i> through making their existing water-using home devices such as toilets, showers and taps more water efficient. It will also help all of us <i>meet the challenges of climate change</i> – we know that in coming years there will be less water and more people in the UK, and some areas of England are already classified as seriously water-stressed, so less water will need to go further.</p> <p>These results come from Waterwise’s analysis of 9 water efficiency projects carried out by Anglian Water, Severn Trent Water, South West Water, Sutton and East Surrey Water, Thames Water, United Utilities, Wessex Water and Yorkshire Water. The projects involved fitting a range of water-saving devices in thousands of customers’ homes and monitoring the savings. The devices tested ranged from aerated showerheads to <i>kits to convert toilets to a lower-flush, or a more water-efficient dual-flush</i>, and from water butts to encourage rainwater use in the garden to shower timers to help people behave in a more water-efficient way.</p> <p><i>The savings highlighted in the report indicate that reducing water demand through water-efficiency measures is a cost-effective tool in water resource management and can offer benefits for everyone.</i> Water companies in England and Wales have targets to reduce water consumption; energy and water companies have targets to reduce carbon emissions; local authorities want to reduce their overall environmental impact; and individuals want to lead a more sustainable lifestyle. In addition, there are government plans for every home in Britain to receive an energy-efficiency visit in the next twenty years, and it makes sense to include water efficiency in that.</p>
4-05	The Plan Water Supply Project – Dublin Region Appendix A October 2010 Page 78	Veolia Water Ireland was established in 2004 reinforcing our position as a leader in water and wastewater solutions to local authorities and industry in Ireland. We currently employ 180 people at offices in Kilkenny, Dublin and on over 30 operations sites countrywide.	<p>1.1 WATER SUPPLY NEEDS – SHORT TO MEDIUM TERM</p> <p>During the past 10–15 years, the major socio-economic development in the Dublin Region has significantly increased demand for water. This demand has largely been met by a major programme of leakage management and water conservation, which has reduced distribution system losses from the order of 45% in the late 1990’s to under 30% today. Demand has been met within an ongoing knife edge ‘supply – demand balance’ operational regime as there is no spare capacity (headroom) in the supply system. Whilst operating with little or no headroom, future short to medium term demand growth can continue to be met by sustained leakage management and water conservation initiatives (e.g. domestic metering), in combination with the expansion of Ballymore Eustace and Leixlip water treatment plants to their sustainable limits. The scale of increased water availability from these initiatives, however, will at best maintain the status quo (up to approx. 2020) taking account of the increasing short term water demand growth in the Region.</p> <p>1.2 WATER SUPPLY NEEDS – MEDIUM TO LONG TERM</p>

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			<p>The National and Local Authorities in the Dublin Region recognise that developing a new major water source for the region is a key long-term project which could take up to 10 years to realise. Because of this long timescale, it is imperative that the region’s future water-supply needs are quantified and the strategies to meet them determined now.</p> <p>Appendices</p> <p>As the great majority of existing houses have flush volumes higher than the 6 litre model <i>there are 3 ways in which existing models may have their flush volumes reduced depending on the model and existing flush capacity. These are:</i></p> <p><i>a. Fit a retrofit device (Figure 2.12) to convert the existing cistern to dual flush or controlled interrupted flush e.g. “Mecon Water Saver (Irish Device)” or “ecoBETA”. The variable flush retrofit involves fitting a small device to an existing, single flush toilet that allows it to flush with different amounts of water. Evidence from large-scale studies suggests that implementing this can bring noticeable savings.</i></p> <p>1) Fit a complete replacement cistern/toilet to convert to dual or low single flush; or,</p> <p>2) Fit a cistern displacement device (refer Figure 2.11) which reduces the flush volume.</p> <p>Generally, options 1) or 2) are felt to be more permanent and satisfactory than option 3) assuming all are fitted correctly which is essential.</p> <p>For valve operated cisterns, a check should be made for leaks using either a dye or dry paper test</p>																																									
4-06	Securing London’s Water Future The Mayor’s Water Strategy 2011 Page 53	Mayor of London	<table><tr><td></td><td>Change to m³ year</td><td>Change to water cost</td><td>Change to energy cost</td><td>Change to total cost</td><td>Change to kg CO₂ year</td><td>Notes</td></tr><tr><td>Baseline: Standard London house with high flow mixer shower</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>Weekly: 5 showers and 2 baths per person. 10 litre toilet.</td></tr><tr><td>Scenario 1 <i>Retrofit: Showerheads, taps, cistern insert</i></td><td><i>18% less</i></td><td><i>18% less</i></td><td><i>24% less</i></td><td><i>21% less</i></td><td><i>24% less</i></td><td><i>Showerhead 11 litres per minute for 7 minutes, tap aerators and ecoBETA toilet insert</i></td></tr><tr><td>Scenario 2 Behaviour changes: Replace bath/long shower with short shower</td><td>22% less</td><td>22% less</td><td>8% less</td><td>25% less</td><td>28% less</td><td>5 minute shower instead of daily bath or long shower</td></tr><tr><td>Scenario 3 Retrofit and behaviour changes combining Scenarios 1 and 2</td><td>44% less</td><td>44% less</td><td>47% less</td><td>55% less</td><td>47% less</td><td>Shower, toilet and tap retrofits. 5 minute showers</td></tr></table>								Change to m³ year	Change to water cost	Change to energy cost	Change to total cost	Change to kg CO₂ year	Notes	Baseline: Standard London house with high flow mixer shower	0	0	0	0	0	Weekly: 5 showers and 2 baths per person. 10 litre toilet.	Scenario 1 <i>Retrofit: Showerheads, taps, cistern insert</i>	<i>18% less</i>	<i>18% less</i>	<i>24% less</i>	<i>21% less</i>	<i>24% less</i>	<i>Showerhead 11 litres per minute for 7 minutes, tap aerators and ecoBETA toilet insert</i>	Scenario 2 Behaviour changes: Replace bath/long shower with short shower	22% less	22% less	8% less	25% less	28% less	5 minute shower instead of daily bath or long shower	Scenario 3 Retrofit and behaviour changes combining Scenarios 1 and 2	44% less	44% less	47% less	55% less	47% less	Shower, toilet and tap retrofits. 5 minute showers
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Scenario 3 Retrofit and behaviour changes combining Scenarios 1 and 2	44% less	44% less	47% less	55% less	47% less	Shower, toilet and tap retrofits. 5 minute showers																																						
Table 3.1 Reduced household water use, cost and carbon emissions through retrofits and behaviour changes																																												
* Based on the average Thames Water bill for water and sewerage services in 2008/09. Calculation based on Energy Saving Trust data																																												

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Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
			<p>Table 3.1 shows the potential savings in water usage, water and energy costs and carbon emissions that can be achieved through the introduction of various water saving devices and changes in behaviour.</p>
4-07	<p>Energy Saving Trust Green Deal Guidance for the Water Sector November 2012 Page 17</p>	<p>The Energy Saving Trust gives impartial, accurate and independent advice to communities and households on how to reduce carbon emissions, how to use water more sustainably and how to save money on energy bills.</p> <p>Waterwise is an independent, not-for-profit NGO focused on decreasing water consumption in the UK and building the evidence base for large-scale water efficiency in close cooperation with the water industry, governments and regulators, manufacturers and retailers.</p>	<p>This guidance has been developed to help increase and simplify the delivery of joint energy and water efficiency programmes, through partnership working between water companies and energy efficiency programme providers. This includes Green Deal, ECO and other local authority energy efficiency/fuel poverty-led in-home schemes.</p> <p>Toilet conversion kits <i>The devices: Toilet conversion kits usually involve the installation of a simple device converting the cistern to a dual-flush mechanism. These can reduce the original full flush volumes by up to 50% per flush, while retaining the existing siphon, and in some cases handle. Half-flush volumes can be adjusted.</i> Several well-tested dual-flush conversion products are currently available. Their installation takes up to ten minutes on most existing cistern water tanks. Existing programmes have highlighted the importance of installer training on toilet conversion devices.</p> <p><i>Positives: Dual-flush conversion kits have the potential to save the most water. Some studies report high customer satisfaction with the commonly-used products (such as ecoBETA).</i></p> <p>Incompatibility: Dual-flush conversion will only suit older single-flush toilets with 7.5 litre or more cisterns. There is a risk of householders practicing double flushing due to either insufficient water to clear the pan, or users simply not being accustomed to the lower flush volume. Provision of advice on correct usage at time of installation is important.</p>
4-08	<p>Water Performance of Buildings European Commission, DG Environment, November 2011 Water UK response Date of submission: 8 February 2012, Page 7</p>	<p>Water UK is the industry association that represents UK statutory water supply and wastewater companies at national and European level.</p>	<p>This paper presents some good ideas on incentives, educational campaigns, mandatory labelling and targets, and many of which water companies across England and Wales are already working on. We have annual water efficiency targets set by Ofwat (the economic regulator for England and Wales) for each company, which are currently achieved using some of the methods presented in the paper.</p> <p>Question 16 We think that there is potential for water saving in buildings from water using products. <i>There are simple retrofit measures to existing products</i> (for example, save a flush, and Ecobeta for WCs, tap inserts, water efficient showerheads) which will reduce consumption. Most of these measures can be installed at the same time so there is no need to prioritise these measures. <i>We think these are only effective when combined with behaviour changes and awareness raising.</i></p>

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Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
4-09	Southern Water Revised Draft Water Resources Management Plan – Appendices to OVERALL STRATEGY FOR 2010-2015 PERIOD AND BEYOND	Southern Water is responsible for water and wastewater services for Kent, Sussex, Hampshire and the Isle of Wight	<p>During AMP5, Southern Water has run an extensive programme to promote water efficiency through the provision of free advice on saving water at home, distributing free save-a-flush bags and offering discounts on a range of water-saving products such as water butts, low-flow showerheads, tap aerators, shower regulators, shower timers, and water saving crystals for gardens. All these activities are expected to continue as part of ‘baseline water efficiency’ through the planning period.</p> <p>In addition, a set of ‘enhanced’ water efficiency options involving water audits and retrofits was developed, to be implemented should they be selected as cost effective options in preference to resource development options in investment modelling. Savings associated with retrofit devices are based on the figures that were available.</p> <p>Home audits with retrofits</p> <p>Southern Water currently offers home audits to vulnerable customers, i.e. customers who may face affordability issues in paying their bills once they are switched to a metered basis. This option is a variation of the existing scheme and is not limited to vulnerable customers only. It involves not only offering audits but actually retro-fitting devices including 1 ecoBETA flush system, 2 tap inserts and 1 low flow showerhead. The programme will require screening of households to ensure that these devices can be fitted and a target of 1,000 properties per year has been set. This option is estimated to save over 100 litres/property/day based on the following assumptions:</p> <ul style="list-style-type: none"> • each household will have an occupancy of 2.4 (the average Southern Water household occupancy); • <i>each ecoBETA will deliver a saving of 3 litres/flush</i> • the average flush frequency is set at 5 flushes/person/day • each tap insert will save 18 litres/property/day • each low flow shower will save 30 litres/property/day <p>School water audits</p> <p>This option proposes to offer water audits to 50 schools per year to <i>include retrofitting at least 5 ecoBETA systems, 10</i> tap aerators and 10 urinals. The occupancy of each school is assumed to be 400. Savings associated with the ecoBETA system and tap aerators per use are the same as in the case of home audits; however daily flushing frequency per person is assumed to be 2. Retrofitted urinals are assumed to save 120 litres/day. In total, the option is estimated to reduce daily consumption by over 13,000 litres per school.</p> <p>Water audits for Small and Medium Enterprises (SMEs)</p> <p>This option will offer water audits and retrofits to SMEs. In order to calculate savings, it is assumed that on average <i>5 ecoBETA systems</i> and 10 tap aerators can be installed per SME and the average occupancy will be 50. This option is estimated to save over 3,000 litres/property/day.</p> <p>Water audits for large businesses</p>

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			<p>This option will target large businesses with an average occupancy of 500 and will involve retrofitting at least 100 devices <i>including 25 ecoBETA systems</i>, 40 tap aerators, 25 urinals and 10 low-flow showerheads. The saving per device is the same as above but a daily flushing frequency of 2 per person and 10 showers per day are assumed. For each business, this option is estimated to save about 79,000 litres per day. The target is set at 5 businesses per year.</p>
4-10	Anglian Water Presentation by Water Efficiency Manager 2013	Anglian Water is a water company operating in the East of England	<p><i>Free devices installed include ecoBETA flushing device.</i> Why is Anglian Water doing this for free?</p> <ul style="list-style-type: none"> • Leakage rates are good • Looking for other ways to save water • To help us manage demand and maintain the balance of water used for homes, businesses and for the environment in our region • Underpinning growth for up to one million new homes by 2035 • Tackling climate change • Government target to reduce average daily water use from 150 litres to 130 litres

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4-11	Strategic Environmental Assessment of Draft Water Resources Management Plan Environmental Report April 2013 Pages 204 and 208	AMEC Environment & Infrastructure UK Limited Dŵr Cymru Welsh Water (Welsh Water) provides water services to customers in much of Wales and parts of Herefordshire in England. Along with all water companies in England and Wales, there is a statutory requirement for Welsh Water to prepare, maintain and publish a Water Resources Management Plan (WRMP).	<p>The WRMP sets out how the balance between water supply and demand, and security of supply will be maintained over the coming 25 years in a way that is economically, socially and environmentally sustainable. The WRMPs are reviewed on a rolling 5 year basis.</p> <p>Assessment of the Water Efficiency Feasible Options across all WRZs 20 water efficiency and 3 metering options were considered as feasible options across for all resource zones. A brief description of each of the feasible water efficiency options is shown in Table 4.16.</p> <p>Table 4.16 Descriptions of Feasible Water Efficiency and Metering options Considered Across All WRZs</p> <table><tr><th>Ref</th><th>Option</th><th>Description</th><th>Saving per Household in Year 1 from Unmeasured Households Ml/d</th><th>Saving per Household in Year 1 from Measured Households Ml/d</th><th>Average Annual Saving per Household from Unmeasured Households Ml/d</th><th>Average Annual Saving per Household from Measured Households Ml/d</th></tr><tr><td>WE002</td><td>Low Flow Shower Retrofit</td><td>DCWW would supply replacement showerheads for customers to fit themselves.</td><td>0.040</td><td>0.061</td><td>0.036</td><td>0.046</td></tr><tr><td>WE223</td><td>Household Tap Flow Regulation</td><td>Aerators, flow restrictors and in-line regulators would be posted to householders to fit themselves.</td><td>0.029</td><td>0.071</td><td>0.026</td><td>0.067</td></tr><tr><td>WE007</td><td>Household Toilet Variable Flush Retrofit</td><td>DCWW fitters would supply and fit Ecobeta variable flush systems into existing cisterns.</td><td>0.040</td><td>0.061</td><td>0.036</td><td>0.060</td></tr><tr><td>WE008</td><td>Household Toilet Cistern Displacement Device</td><td>Hippo or other cistern displacement device to reduce volume of water in a cistern, distributed by post for householders to fit.</td><td>0.046</td><td>0.055</td><td>0.040</td><td>0.050</td></tr><tr><td>WE019</td><td>Household Audits and Fit</td><td>This option would comprise a mail short to inform customers, and for those who want to take up the offer, a visit from DCWW staff to assess water consumption and to fit a series of water saving devices including low flow shower heads, tap flow regulators, variable flush systems for toilets and trigger heads for hosepipes.</td><td>0.043</td><td>0.058</td><td>0.039</td><td>0.059</td></tr><tr><td>WE019A</td><td>Household Audits and Fit (Collaboration)</td><td>This option would comprise a mail short to inform customers, and for those who want to take up the offer, a visit from staff from DCWW and its partners (gas companies, housing companies and so on) to assess water consumption and to fit a series of water saving devices including low flow shower heads, tap flow regulators, variable flush systems for toilets and trigger heads for hosepipes.</td><td>0.000</td><td>0.100</td><td>0.000</td><td>0.100</td></tr><tr><td>WE020</td><td>Household Education</td><td>Provision of leaflet on the efficient use of water.</td><td>0.003</td><td>0.008</td><td>0.002</td><td>0.002</td></tr><tr><td>WE025</td><td>Household Water Butts</td><td>DCWW provision of water butts for customers to collect from depot and to fit themselves.</td><td>0.062</td><td>0.038</td><td>0.021</td><td>0.012</td></tr></table>	Ref	Option	Description	Saving per Household in Year 1 from Unmeasured Households Ml/d	Saving per Household in Year 1 from Measured Households Ml/d	Average Annual Saving per Household from Unmeasured Households Ml/d	Average Annual Saving per Household from Measured Households Ml/d	WE002	Low Flow Shower Retrofit	DCWW would supply replacement showerheads for customers to fit themselves.	0.040	0.061	0.036	0.046	WE223	Household Tap Flow Regulation	Aerators, flow restrictors and in-line regulators would be posted to householders to fit themselves.	0.029	0.071	0.026	0.067	WE007	Household Toilet Variable Flush Retrofit	DCWW fitters would supply and fit Ecobeta variable flush systems into existing cisterns.	0.040	0.061	0.036	0.060	WE008	Household Toilet Cistern Displacement Device	Hippo or other cistern displacement device to reduce volume of water in a cistern, distributed by post for householders to fit.	0.046	0.055	0.040	0.050	WE019	Household Audits and Fit	This option would comprise a mail short to inform customers, and for those who want to take up the offer, a visit from DCWW staff to assess water consumption and to fit a series of water saving devices including low flow shower heads, tap flow regulators, variable flush systems for toilets and trigger heads for hosepipes.	0.043	0.058	0.039	0.059	WE019A	Household Audits and Fit (Collaboration)	This option would comprise a mail short to inform customers, and for those who want to take up the offer, a visit from staff from DCWW and its partners (gas companies, housing companies and so on) to assess water consumption and to fit a series of water saving devices including low flow shower heads, tap flow regulators, variable flush systems for toilets and trigger heads for hosepipes.	0.000	0.100	0.000	0.100	WE020	Household Education	Provision of leaflet on the efficient use of water.	0.003	0.008	0.002	0.002	WE025	Household Water Butts	DCWW provision of water butts for customers to collect from depot and to fit themselves.	0.062	0.038	0.021	0.012
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NB!!!

Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles					
			Table 4.18 Carbon Amounts Released as a Result of Implementing and Operating Water Efficiency Measures					

NB!


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Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
4-12	Demand management bulletin, Series 2, Issue 6, April 2013 Pages 5	Environment Agency is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs	<p>Essex and Suffolk Water ecoFIT – saving customer’s litres is Essex & Suffolk Water’s latest water saving initiative. It has been delivered to over 2,500 customers in the Great Yarmouth area of Norfolk.</p> <p>The underpinning aim of ecoFIT is to maximise savings at minimum cost by offering customers <i>the most water efficient devices such as the ecoBETA dual flush retrofit siphon.</i></p> <p>ecoFIT adopted the H₂eco process, which has been developed and improved by Essex & Suffolk Water over many years. <i>Customers that had a toilet suitable for an ecoBETA to be installed qualified for a full retrofit audit</i>, while those who did not were encouraged to request water saving devices from the company website.</p> <p>In addition to the ecoBETA, products such as aerated showerheads, tap inserts, Eco-Flow-Tap Sprays, water butts and trigger hose guns were offered and installed (where suitable) for free during the audit by a qualified plumber. Over 12,400 products have been fitted and/or delivered to date.</p> <p>The ecoFIT project has proved to be Essex and Suffolk Water’s most successful by far in demonstrating genuine water savings and best practise. Key results are as follows:</p> <ul style="list-style-type: none"> • <i>average OFWAT assumed saving of 96.7 l/prop/day</i> • <i>measured saving of 43.72 l/prop/day (calculated using meter reads)</i> • <i>ecoBETA’s fitted in 81% of properties.</i> <p><i>Essex and Suffolk Water report that customer satisfaction has been outstanding with over 99% of customers saying they were happy with the overall level of service and with the products they received.</i></p>


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Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
4-13	Demand management bulletin, Series 2, Issue 9, January 2014 Pages 5-6	Environment Agency is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs	<p>Essex and Suffolk Water has carried out stage 3 of their Database Integration and Statistical Analysis of H2eco and Ecobeta Studies.</p> <p>In a continued effort to improve their understanding of the effects of their endeavours this project was initiated to further integrate the first 7 phases of study data and look at some new areas of analysis.</p> <p>In autumn 2013 Callidus/Artesia completed the analysis of the latest phases of the H2echo project.</p> <p>The main objective of this study was to integrate the results of all 7 of the H2eco project phases carried out to date; and to assess the long term sustainability of water savings from retrofit projects. In addition, the analyses of water savings from ecoBETA's and tap inserts were examined in detail and compared with multi-device water savings.</p> <p>Essex and Suffolk <i>Further detailed statistical analysis of individual devices shows that ecoBETA installations consistently return the largest savings per device at 17 litres/device/day. The project also concluded that the most successful ecoBETA installations are those in older detached properties.</i></p> <p>Northumbrian Water – EcoFIT trials Northumbrian Water has offered up to 500 families living in Gresham, Middlesbrough, the chance to trial a new water cycle audit. ecoFIT Helping Gresham go Green offers customers a free integrated service that will:</p> <ul style="list-style-type: none"> • assess their water use and survey the drainage areas in their garden or yard. It will also identify and record any drainage misconnections • <i>install a range of water saving products (including an ecoBETA to convert their siphon toilet to a dual flush) and surface water management devices (e.g. water butt and/or planter)</i> • help the customer make simple changes to help them save water and reduce the risk of flooding • gather feedback from the customer throughout different stages of the project on the value of the services <p>The project is a Northumbrian Water led initiative that is being delivered in collaboration with the One Planet Middlesbrough (OPM) - Creating Sustainable Communities Project. OPM aims to improve the quality of life for Middlesbrough residents by promoting sustainable living and providing advice on simple changes that can make a difference.</p> <p>Customer uptake of water efficiency retrofit projects is around 20%. The aim of the initiative is to understand if an integrated service for water can increase customer uptake of water efficiency.</p> <p>This collaborative approach has led to many benefits including support from Gresham residents to 'community proof' literature and support from OPM Eco champions to help promote the project to local groups and the wider community.</p>

Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
4-14	Demand management bulletin, Series 2, Issue 13 January 2015 Pages 4	Environment Agency is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs	<p>Essex & Suffolk Water sets out all the latest developments in the company's water efficiency programme. Their <i>Every Drop Counts Campaign</i> has a 'whole town approach'. It involves helping customers in Billericay in Essex and Wooler in Northumberland save water by fitting water saving products in their home and business premises.</p> <p>Thames Water has developed TAP (<i>Talk and Products</i>), its interactive water efficiency in-home engagement software – based on the Energy Saving Trust's <i>Water Energy Calculator</i>. Customers will get, amongst other things, a water saving report through this. 'Smarter home' visits have been trialled in Bexley and Greenwich. The visits include fitting single flush toilets with dual flush Ecobeta units.</p>
4-15	United Utilities Water Efficiency Contract Win	<p>Crowder Consulting – Innovative Solutions</p> <p>Crowder Consulting was founded in 1985 and became a limited company in 1994. The company has continued to grow and develop and now employs around 70 professional staff and associates, split into three main areas:</p> <ul style="list-style-type: none"> ○ 55% Consultancy and Fieldwork ○ 15% Data and Information ○ 30% Software Development 	<p>http://www.crowderconsult.com/united-utilities-contract-win/</p> <p>United Utilities have extended their water efficiency initiative to a further 800 homes in the area of West Cumbria and awarded Crowder Consulting the contract to carry out the work.</p> <p>Crowder Consulting will be delivering the project including the acquisition of appointments, carrying out water audits and water saving device installations. This is the third water efficiency initiative that Crowder Consulting has undertaken for United Utilities, with the previous two having been a great success. The previous water efficiency initiative in West Cumbria saw average water savings of 40 litres per household per day, with nearly 900 visits carried out, meaning a total savings of 14 Ml/year.</p> <p>This project is set to be even more successful than the last. Our fully qualified plumbing team are now equipped with more advanced water saving devices, including the EcoBETA. The EcoBETA is a device that can turn a single flush toilet into a dual flush toilet with no alteration to the system required. An EcoBETA can save up to 30 litres of water per day for each household.</p>

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Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
4-16	<p>Case Study H2ECO 4 June 2014</p> <p>H2eco is Essex & Suffolk Water's (ESW) leading large scale retrofit project which since its inception has delivered 14,999 water audits to metered and un-metered customers. Starting in 2007, the project is the culmination of developments, feedback and lessons learnt ...</p>	<p>The Water Cluster: a collaboration between the Global Sustainability Institute at Anglia Ruskin University and Opportunity Peterborough. We've created this network to identify opportunities for collaboration and improve the coordination of Research, Development and Innovation in water efficiency and urban water management, firstly within the East of England and then nationally and internationally.</p>	<p>H2ECO HTTP://WWW.THEWATERCLUSTER.CO.UK/H2ECO/</p> <p>H2eco is Essex & Suffolk Water's (ESW) leading large scale retrofit project which since its inception has delivered 14,999 water audits to metered and un-metered customers. Starting in 2007, the project is the culmination of developments, feedback and lessons learnt – the project has been an interesting journey!</p> <p>What is H2eco's key objective and how do you go about delivering it? H2eco's key objective is to leave the property of each participant as water efficient as possible. A plumber is provided, free of charge, to fit and deliver of a wide range of retrofit water saving products. The project aims to effectively engage with each customer, by explaining each product as it is fitted while moving around the home and garden. This approach has delivered proven long term and sustainable behaviour change.</p> <p>How do you look to ensure maximum water savings? Any feedback from plumbers or customers is constantly reviewed to ensure the products continue to maximise water savings without detracting from the customer's water using experience. The water saving products fitted have been tested in ESW trials and previous projects. The opportunity is also taken to trial new water saving products.</p> <p>All additional opportunities are considered to maximise the number of water saving products which can be fitted, which in turn delivers sustainable water savings. For example, H2eco uses four different types of tap inserts and three water-saving showerheads to increase the chance of one fitting. Additional information focusing on the bathroom, kitchen and garden is also left with the customer enhance sustained behavioural change.</p> <p>How many customers are participating? 87,062 customers have been invited to participate in the H2eco project covering the entire towns of Chelmsford, Wickford, Basildon and South Benfleet in Essex. 14,999 full retrofit audits have been successfully completed since the first audit in December 2007, representing a 17.2% uptake rate. Undertaking H2eco has resulted in measured water savings totalling 329,978 litres per day, which equates to an average measured saving of 22 litres per day for each participating property. ESW's H2eco project goes beyond the basics by focusing on real water savings proven by measurements.</p> <p>And what does this mean in terms of savings? The water savings achieved by each property would lead to an average financial saving of £16.70 per year which means this project has saved our customers £250,483.30 a year. The net carbon saving for the project over one year is 1,489 tonnes of CO2 equivalent a year.</p> <p>How many units have been fitted so far? A total of 105,985 products have been fitted or provided over the course of the project to date. This includes fitting 18,610 tap inserts, 7,158 ecoBETA dual flush retrofit devices, 4,184 aerated shower heads and providing 11,529 water butts. The Average Incremental Social Cost (AISC) is £1.33 per cubic meter.</p>

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Ref. no.	Title of the article/document	Author	Water saving and other relevant information gained from the articles
			<p>Any early indications on how effective the product has been?</p> <p>Full statistical analysis of the vast amount of data collected during the 14,999 audits has shown that H2eco is effective in delivering sustained water savings. This has been accomplished by achieving a successful blend of fitting products whilst delivering valuable behaviour change.</p>

Evaluation


Relevant literature listed in Table 1 is edited by Waterwise UK, Environment Agency, Essex & Suffolk Water, Sutton and East Surrey Water, Northumbrian Water, Thames Water – all specialists within the areas of investigation.

The awards and recognitions listed in Table 2 are granted/managed by recognized authorities.

Case studies in Table 3 are written by customers and distributors as well as recognized authorities.

Other relevant articles listed in Table 4 are edited by specialists at the Oxford Institute for Sustainable Development, CEN, Veolia Water Central, Waterwise, Veolia Water Ireland, Mayor of London, the Energy Saving Trust, Water UK Southern Water and Anglian Water - all specialists within the areas of investigation.

Therefore, the studies/documents are altogether regarded as having a high grade of evidence.

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Conclusion

The found studies/documents are altogether regarded as having a high grade of evidence.

Much of the world is faced with a situation of physical water scarcity. For this reason there has been an increase in water efficient products coming onto the market to help save water whilst carrying out daily activities. The typical family uses about 70% of their water in the bathroom, with toilet flushing accounting for 30% of the household water use (2-03).

One of the main reasons for targeting toilets to reduce demand management is that they will always be used daily, and the yield is more accurate than other devices as it is an engineered defined solution and does not have a behavioural component. There is not a time component of this water use - one flush is one flush and this hopefully will not change over time (1-03).

Old style single flush toilets typically use 10-14 litres per flush (2-03). By converting existing single flush toilets to dual flush and thereby minimizing the toilet flush volumes, good value for money savings can be obtained (1-01). Especially in older properties, where the toilet volumes are still likely to be high, toilet devices should be installed as a priority in older properties (1-04,1-09).

Dual-flush toilets are often considered to be more efficient than single-flush systems. They allow a main flush (long flush) of between 4-6 litres, with a smaller flush (short flush) button that uses around 2-4 litres. There is however now growing evidence that many dual-flush mechanisms can fail which can result in leakage. As well as risk of the mechanism jamming and the valves leaking (which go undetected due to the internal overflow) there is also evidence that the user does not know how to operate the dual-flush system properly. Often only the higher flush is used, or sometimes when the smaller flush is used at the wrong time this necessitates a double flush which wastes water. Current devices on the market are not always intuitive and are not usually clearly labelled (1-03,2-03,2-05,3a-01,3a-02,3a-04,3a-08,3a-09,3b-05,3b-06).

Based on the articles/studies in this overview, the ecoBETA® single button dual flush solution is regarded as state of the art providing statistically significant water-savings (1-01,1-02,1-08,1-09,2-04,3b-02,3b-13) by preventing overflushing of toilets and minimizing the risk of leakage.

In recognition of the water saving potential, design, operation and quality of the ecoBETA® single button dual flush solutions, all variants of the product have been awarded the Waterwise Recommended Checkmark (2-04).

The Evidence Base for Large-Scale Water Efficiency is an ongoing research project funded by Defra, the Environment Agency and Ofwat and steered by a range of water company representatives, assessing and evaluating all large-scale water efficiency trials and programmes in the UK. This work shows that the ecoBETA® siphon is the most effective water efficiency retrofit device in terms of overall water saving (Table 1,2-04). With reference to 4 independent studies, ecoBETA®s installed as part of a multi device water efficiency audit were shown to save between 16 and 18 litres/device/day. A single ecoBETA® installation may save a little more at 19 to 20 litres/device/day (1-09). For this reason, future programmes to promote water efficiency in the UK will also include ecoBETA® retrofittings (3b-13,4-03,4-04,4-05,4-06,4-07,4-08,4-09).


Free installations in businesses in the UK: ecoBETA® is listed on the Water Technology List (WTL) managed by DEFRA (Department for Environment, Food & Rural Affairs) in the UK. The WTL is central to the Enhanced Capital Allowance (ECA) Scheme enabling businesses to claim 100% first year capital allowances on investments in technologies and products that encourage sustainable water use (2-06).

Free project-related installations in households, schools and public buildings in the UK: As part of Water Resource Management Plans, water companies in the UK are allocated funds by DEFRA to spend on projects covering water conservation / reduction of consumption. These projects are based on practical lessons of past water efficiency projects and often include free installations of ecoBETA® dual flush valves and retrofits (2-07).

Customer satisfaction has been outstanding; however, it must be fitted correctly (1-01,1-04,1-05,4-12).

The ecoBETA® dual flush device shows the most consistent statistically significant results (1-01,1-02,1-08,1-09,2-04,3b-13) and provided the best value for money water savings (1-01).The water savings listed in this overview range from 14% to over 50%.

The ecoBETA® dual flush solutions hardly require any maintenance compared to the 2-button flushing mechanisms in dual flush toilets (1-03,2-05,3a-01,3a-02,3a-04,3a-06,3a-08,3b-03,3b-06,4-07).

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Raising awareness on the importance of water conservation alongside fitting water efficient devices is required as the way water is used also contributes to further reducing water consumption (1-04,1-08,3b-14,2-03,4-02,4-08).

Installation of the *ecoBETA*® dual flush solutions could perhaps have been more wide-spread if there was more emphasis on fitting eco-technology, such as the *ecoBETA*®, for the labour force, compared to other priorities (1-04).