energy saving trust

# at home with water 2

## technical report

Department for Environment Food & Rural Affairs

P&G

Thames Water

Consumer Council for Water

savewater savemoney

how flush do you feel?

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# Executive summary

## Objectives

In July 2013 the Energy Saving Trust's At Home with Water report explored how and where water is being used in UK homes. The report presented analysis of self-reported answers to the survey questions embedded in the online Water Energy Calculator tool. More than 86,000 responses were used, providing a robust national picture of the type and frequency of water-use behaviours of UK households.

In this study, At Home with Water 2, we seek an in-depth understanding of domestic water consumption. We investigate the key areas for action identified in the first report and we focus on insight and experience received directly from householders. In particular the aim was to:

- investigate the reliability of self-reported survey data, by comparing perceived and observed water-use behaviours;
- listen to the preferences and priorities of households to identify potential areas for water efficiency intervention, and the barriers to this; and
- understand the perceptions of householders of their water consumption, to inform effective messaging.

This study collects detailed information from a small sample in a single location, and as such results should be treated with caution. The findings presented here cannot be taken as a statistically robust representation of UK households, but they do provide qualitative insight into the types of behaviours and perceptions encountered when we engage the public in conversations about their water use.

## Methodology

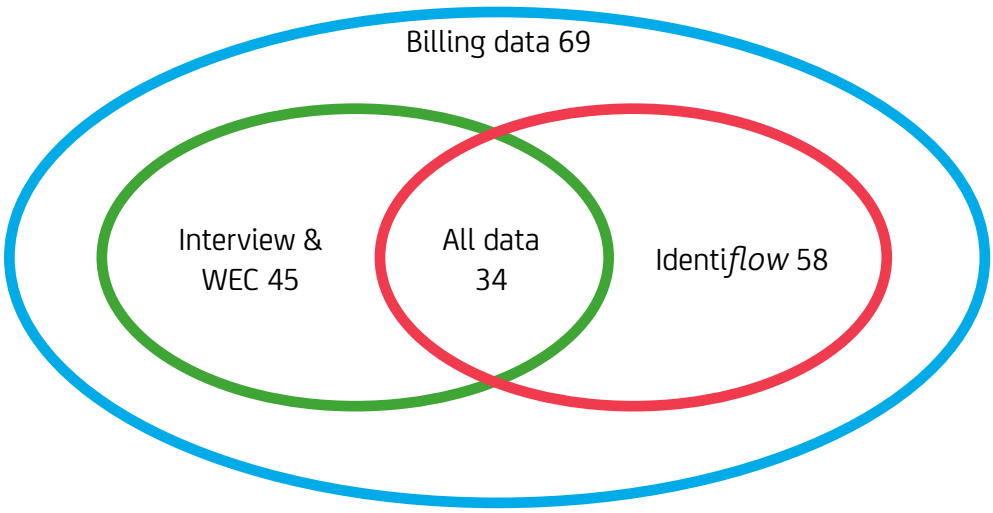
Whilst the first report was based on self-reported data and modelling, this study collects observations empirically. The research methodology was based on two main data collection exercises: (i) monitoring of water consumption and micro-component analysis[1]; and (ii) in-home interviews and behaviour survey[2]. Data was collected from a sample of 69 households, 34 of which took part in both the monitoring and interview stages (see figure below).

(i) Water monitoring was undertaken over three weeks. Two of these weeks were analysed to identify micro-components. Observations include the frequency of water-use events, their flow rates and durations. These provide a picture of how and where households use water as well as the magnitude of their total consumption.

(ii) Following the monitoring, semi-structured interviews were undertaken in-home with participants. These explored: aspects of awareness and motivations for saving water; understanding of water saving action and challenges faced in adopting these; and responses to water meters and preferences for feedback. Following the interview, and during the same visit, participants also undertook the Water Energy Calculator survey.

All data was collected between October 2013 and February 2014. Additional data was obtained from billing records for aggregate annual water-use comparisons. Updated analysis was also undertaken on the Water Energy Calculator dataset, with around 160,000 responses (to July 2014) analysed to provide a robust, national background to this research and continuity from the first report.

Summary of study sample sizes by data collected




[1] To disaggregate total household water use into individual water-use events, identifying the device used.
[2] The Water Energy Calculator survey of water-using devices, and frequency and type of water-use activity.

## Key findings

The results of our micro-component monitoring and analysis are consistent with previous empirical studies, as well as our modelling analysis in the first At Home with Water report. Personal bathing (33%), taps (31%) and toilet flushing (22%) are the highest areas of consumption.

### Do householders accurately perceive and self-report water-use behaviours?

- Real frequency, duration and volume of water-use activities, **observed** from the micro-component monitoring, was compared against householder **self-reported** assessments given during the interviews and Water Energy Calculator survey (n=34 households).
- The households significantly over-reported the number of baths and showers they took in a week: 5.4 baths and showers a week were reported, only 3.9 were observed.
- The households accurately reported their use of washing machines and dishwashers. It may be the case that communal, visible activities are easier to evaluate and report.
- Half of the households were unable to identify the highest water-using activity in their home.
- In particular, the households incorrectly assumed that washing machines are the biggest users of water. Many people were uncertain of how much water is used by white appliances. In particular the water used by toilets was underestimated, even though overall they typically use far more than washing machines.
- We observed that the average shower lasted 7 minutes 48 seconds. People's perceptions were close to reality: the average duration, as reported on the Water Energy Calculator, was 7 minutes 30 seconds (n=137,625).
- The findings of this study provide some early insight into the accuracy of self-reported assessments of water consumption. They also highlight areas where perceptions do not match reality. Further work is needed to understand how these discrepancies may influence model estimates, particularly for personal bathing.

### Are there clear motivations for an individual to save water?

Interviewees were asked whether they felt there was a "need" to save water.

- Some cited the weather as the main reason to save water; others saw the weather as a good reason not to save water. However, longer-term climate was a clear motivation.
- Perceived problems with supply infrastructure were commonly considered demotivating. Whilst both supply- and demand-side measures play a role in water saving efforts, actions at an individual level were seen as insignificant compared with actions on infrastructure (such as fixing leaks).
- Cost was not commonly identified as a motivation to save water, although this depends upon personal circumstances. Energy is regarded as a more important utility. Efforts to show the energy costs of water consumption may help. Beyond cost, additional wider values were associated with saving water, particularly its necessity and its dependencies in the environment.

### Are households aware of water saving actions, and why might adopting these be difficult?

- When asked to identify action they could take, or had taken, to reduce water use in their home, many respondents focused on basic, behavioural actions with no up-front cost; for example turning the tap off when brushing teeth or swapping showers for baths.
- Toilets retrofits (cistern displacement and dual flush) were the most commonly installed physical measures in study homes. However, a number of respondents admitted to uncertainty about how to operate a dual flush mechanism, and in particular parents felt children struggled with this.
- A number of barriers to the uptake of water saving measures were identified. Seven broad themes were identifiable – lifestyle compromise, competing priorities, imperfect solutions, information gap, physical constraints, personal circumstances, and negative perceptions.
- For many, other priorities (such as the role of water in necessary functions, for enjoyment, and for time and attention) meant that water saving was overlooked, either knowingly or subconsciously. A common position is that a household is doing all it can – although the perception of what this means varies widely across different house types.
- Hot water plays a role in the thermal comfort of some households, and some said that it helped them to cope with an inadequately heated or insulated home. This may require sensitivity when providing water-saving messages, particularly amongst elderly and infirm residents where the requirement for adequate warmth may be most essential.
- Respondents also felt that adequate solutions were often not available – because equipment wasn't of sufficient performance and quality, or because there were constraints in their personal circumstances, or because the logistics of their property posed barriers. This highlights a need to think carefully about the way in which "solutions" are presented. Moreover, experiences where equipment is provided but is unsuitable for installation, underperforms against expectations, or breaks in use, appear to demotivate individuals from pursuing similar solutions.

### What are households' experiences or perceptions of meters?

- In general, our study participants demonstrated a good understanding of how metered billing differs to rateable value bills. However, the interviews also raised a number of concerns around the impact that meters will have, beyond just the before-and-after bill comparison.
- In particular, the loss of flexibility for future changes in the household (occupancy, lifestyle), and increased vulnerability to unexpected high-use events (including leaks) and price rises, were identified by householders as unwelcome risks.
- Many felt that there was ambiguity about the impact of switching to a water meter on their bills. Whilst the cost of water was not identified as a major motivation to save water, bill payers were concerned about the uncertainty about the size of their bills, and the potential for a nasty surprise. Better supporting information, including bill estimate tools, as well as more ongoing feedback on their consumption, may help build that security.

# 1. Background

At Home with Water is the Energy Saving Trust's (EST) primary research initiative on water and energy. The first report[3], published in July 2013, presented the results of Britain's largest household water use dataset with analysis from more than 86,000 homes. The report summarised self-reported household water-use practices across the UK, modelling the resource and financial impact of these to identify key areas for action. It achieved widespread national and regional coverage, raising the profile of water and energy efficiency agendas, and winning the Waterwise award for Research and Evaluation 2014. The data underpinning this report was collected through EST's Water Energy Calculator[4] (WEC), an online tool that helps households in the UK to understand the energy associated with water-use in their home, and identify opportunities to manage their consumption and bills.

The WEC dataset – comprising around 160,000 responses by July 2014 – is an extensive resource that gives a snapshot of water-use behaviours at a national average. However, given that the data points collected are the self-reported answers to closed survey questions, this enables only a high level perspective on the diverse household water use practices in the UK. In this study we seek to add additional texture to this by taking a qualitative approach to understanding water use in the home.

## 1.1 Research objectives

In this study we uncover a deeper understanding of how water is used in the home, and the decisions and attitudes which underpin this. We explore the reliability of the WEC's results, and we build a qualitative narrative around domestic water consumption and the challenges facing water efficiency in the UK.

The particular objectives were to:

- collect accurate metered micro-component water use data, and use this dataset to compare actual and perceived water consumption, in order to understand the reliability of self-reported survey data;
- provide insight into the water efficiency interventions that have the greatest potential, by understanding the experience and preferences of householders, and the challenges to the adoption of measures; and
- develop a better understanding of how water efficiency and customer engagement messages can be delivered most effectively; particularly for future metering and demand management programmes.

Whilst the WEC survey is a cost-effective method for collecting large amounts of information through its online survey format, care must be taken when using this data to develop messaging and initiatives. Firstly, very little information is collected on the respondents: occupancy is the only demographic-type data point collected. The sheer size of the dataset gives us some confidence in its robustness, but we can reach only tentative conclusions on the representativeness of the sample. Secondly, little is known about how accurately people self-report on their personal water-use actions. This is uncertain in two particular ways. It isn't clear what sort of survey biases may be present in the anonymous online survey format, or whether there are other limitations that may hinder the ability of respondents to answer accurately. Users may not be able to recall or estimate their consumption, or there may be some idiosyncratic difference between how people perceive their water use and how they actually use water. Finally, whilst the WEC collects valuable information on the frequency and type of behaviour, it still restricts responses to a discrete set of choices. This makes it useful for analysis that summarises the UK population as an average, and subsequently for inputs to modelling exercises. However, it is likely to overlook the immense diversity of behaviours and preferences at a household level that are important for determining appropriate interventions. At Home with Water 2 aims to help fill some of these research and information gaps.

[3] Available online at http://www.energysavingtrust.org.uk/corporate/our-research-and-reports
[4] See online at http://www.energysavingtrust.org.uk/domestic/content/water-energy-calculator

# 2. Research methodology

This study uses a mixed method approach. It combines both qualitative and quantitative datasets to provide a holistic analysis. Four sources of data are utilised: monitored micro-component water consumption data; insight from in-home interviews; responses to the WEC survey; and water meter billing data. These are discussed in section 2.2, along with a discussion of the sample characteristics and limitations in section 2.3.

As well as being informed by the At Home with Water research, the project retained the same advisory group. There was expert input from Defra, Thames Water, Consumer Council for Water, Save Water Save Money, and University College London.

## 2.1 Recruitment

Initial contact was made by a co-branded letter from Energy Saving Trust and Thames Water sent in September 2013. A total of 666 households split across two London areas were invited to take part – 226 in area 1, and 440 in area 2 – and those interested were able to contact the project team at EST directly by email and phone. Participants were offered an incentive of £65 in high street shopping vouchers to be paid upon completion of the interview. Figure 1 summarises the final sample sizes recruited.

Both London areas are in the Thames Water supply and sewerage region and are part of an existing Fixed Area Network trial, one aim of which is to trial remote meter data recovery technologies. These households already had meters installed and so could be monitored straightforwardly; moreover, since not all properties were paying by meter a comparison between households of different billing types was possible. At the point of this study the Thames trial had not had any engagement with these households beyond that which would be considered normal across their supply area.

Table 1 summarises the schedule of recruitment, data collection, and household liaison activities over the study period. Field activity took place between September 2013 and February 2014. Given that the project was undertaken during autumn and winter, this should be considered in the interpretation of results. Many water-use activities are likely to be seasonal, for example watering the garden, and so the micro-component results presented here are likely to under-observe these aspects compared with an annualised study. The winter of 2013/14 was the wettest in the UK on record[5]. This is very likely to have impacted on questions relating to water supply and scarcity.

Table 1 Timeline of recruitment and data collection

| Action | Time period |
|---|---|
| Invitation letter sent | 23 Sept 2013 |
| Responses to EST via email and phone | Oct-Dec 2013 |
| Secondary door-to-door recruitment | Nov 2013 |
| Identi*flow* monitoring | Batch 1: 9-30 Oct 2013<br>Batch 2: 30 Oct-19 Nov 2013<br>Batch 3: 19 Nov-11 Dec 2013<br>Batch 4: 11 Dec-15 Jan 2013* |
| Interview with householders | Nov 2013-Jan 2014 |
| Follow-up thank you letter to householder | Feb 2014 |

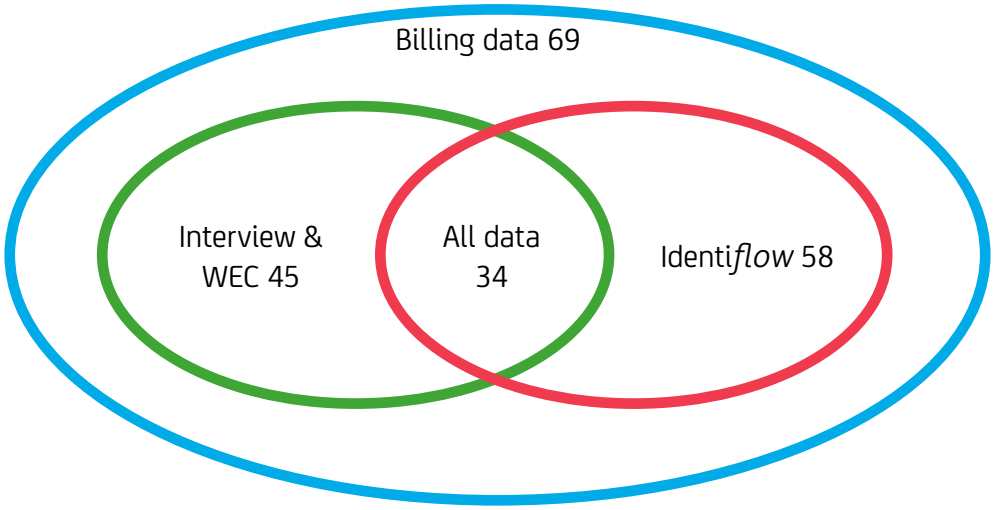
* Longer monitoring period to accommodate Christmas break

[5] Met Office assessment of Winter 2013/14 available at: http://www.metoffice.gov.uk/climate/uk/summaries/2014/winter; accessed 01/10/2014

## 2.2 Data collection

Figure 1 summarises the number of observations collected by each of the described data collection exercises. Sample sizes are given through the results section to differentiate between these where necessary. Overall data was collected for 69 households out of a targeted 70. Some properties could not have the monitoring equipment installed, for example due to insufficiently sized boundary boxes, and so a final sample of 58 properties was monitored. The 11 that could not be monitored took part in the interview exercise only. Of those that could be monitored, 34 were subsequently interviewed.

Figure 1 Summary of study sample sizes by data collected




### 2.2.1 Identi*flow* monitoring

Micro-component data was collected, and analysed by WRc[6] using their Identi*flow* software. This involves installing a flow meter and logger in the household's external boundary meter box to collect flow observations at high frequency (one-second intervals). These flow profiles are then analysed using the Identi*flow* software to identify, classify and quantify water consumption events. Monitoring was undertaken in 58 properties over a three-week period, with Identi*flow* analysis provided for two of these weeks, allowing for some removal of unoccupied periods. The analysis provides the characteristics of each event, identifying the device and calculating duration, volume, average flow and maximum flow. Frequencies over the two-week period were also analysed.

Collecting data in this way does not require any visible equipment in-home. Device-level monitoring would require equipment to be installed on every device in the home, whereas in this approach equipment is installed only at the whole house boundary meter point. Minimal disruption of routines is preferable for accurate observation of 'normal' routines. In signing-up to take part, participants agreed to be re-contacted in order to set up an in-home interview, and gave consent for their water consumption to be monitored for three weeks before the interview. However, they did not know at what point during the 14 weeks of data collection this would take place.

### 2.2.2 In-home interview

In-home interviews were undertaken with 45 households. A semi-structured approach was taken to encourage diversity of responses. Key areas were prepared beforehand, giving flexibility to focus on particular issues that emerged during the engagement. Whilst this gave structure to the discussion, the intention was to create an open environment that allowed the interviewee to lead the focus towards their views and priorities as much as possible. The interviews took place following the Identi*flow* monitoring. Given the non-intrusive nature of the Identi*flow* approach to micro-component monitoring, it was felt that ordering the data collection in this way minimised potential biases.

A topic guide used to direct the conversation can be found in Appendix 4. Discussion was shaped around the following broad topics:

- Awareness & motivation: evaluate household knowledge and understanding of a "need" to conserve water, and discuss their motivations and priorities that underlie this position.
- Water-saving actions: discuss behaviours and devices they are aware of, or have adopted themselves, and their perception and acceptance of these.
- Barriers: identify perceived or experienced barriers to the adoption of water-saving or efficiency measures and discuss how these might be reduced.
- Metering & feedback: evaluate understanding and experience of water meters; consider their preferences for feedback and communication.

Data was also collected on the demographic and property characteristics of all interviewed households. This data was not available for those households which did not take part in the interview exercise.

Most interviews were undertaken with one resident, but where more than one person was present this was allowed. Each interview took around one hour; audio was digitally recorded for reference and to ensure that output content was unbiased and faithful to the householder's contribution. Recording interviews enabled us to undertake analysis of responses to identify themes. It also allowed us to extract, verbatim, the views and experiences that best exemplified key emerging findings and aspects of the research.

[6] Information available at http://www.wrcplc.co.uk/

### 2.2.3 Water Energy Calculator survey

The WEC is an online app that encourages users to self-assess and report their water-using behaviours across all the key areas of usage in the home. In addition to providing the inputs to the tool's responsive advice, these answers are also anonymously captured. They provide a powerful evidence base to better understand water-using practices in the UK. Since the publication of the first At Home with Water report, the WEC has continued to support householders to understand their water and energy bills and to collect insight. It collates the largest ever dataset on domestic water-using behaviours, with more than 160,000 records.

Following the semi-structured interview, during the same visit, the householder completed the WEC survey on a tablet device. This meant that respondents were not provided with any prompts towards particular water-use actions or savings measures that may prime or introduce bias into their interview answers. It took 5–10 minutes to complete. A full transcript of the WEC survey can be found in Appendix 5. This question set collects self-reported estimates of water-using behaviours in the home, including the types of behaviour and the frequency with which it takes place. Collecting this data also allows us to compare our study sample with the large WEC dataset collected online, thus providing a useful baseline.

### 2.2.4 Water meter billing data

Lower resolution water consumption data was also made available for all study participants (69 households) to provide an annual assessment of each household's consumption level. This data was collected by the existing volumetric meter installed at all properties in the study area. Although not all participants were paying volumetrically at the time of this study, these meter readings were collected by Thames Water as part of an ongoing longer-term exercise.

## 2.3 Sample characteristics

### 2.3.1 Representativeness

The objectives of this study were to build and further explore some of the themes reported in the first At Home with Water report, which is an analysis of a dataset with more observations but far less detail on each. In this more intensive phase we collected a wider range of both quantitative and qualitative insights but from a smaller sample. The findings presented here cannot be taken as a robust representation of the behaviours and perceptions of UK households. As such, all evidence presented here should be evaluated against, and used alongside, wider existing knowledge; where relevant, attempts are made to highlight these links.

A number of features of the study should be considered when reading the results. It should be noted that the study took place entirely in Greater London. There are likely to be aspects of domestic water consumption that differ geographically, influenced, for example, by variables such as weather, water supply company, and property characteristics such as size of garden. A study such as this, which requires participants to volunteer, may be prone to a selectivity bias from recruiting those with a pre-disposed interest in the subject matter. In this case bias may come from water efficiency or pro-environmental behaviours. We aimed to reduce this by offering a direct financial incentive to take part (a £65 voucher).

Whilst this is not a proportionally representative sample, it is nonetheless useful for illustrative purposes to consider the demographic and other characteristics of participating. Appendix 1 summarises some of the key characteristics of our sample of 45 interview participants including: the size of household (number of occupants, Table 12), economic activity of occupants (Table 13), tenure and billing type of the household (Table 14), and the household lifestage (Table 15).

### 2.3.2 Household typology

To support particular areas of discussion, verbatim quotes are used in places to provide additional narrative. These are anonymised, but are labelled to characterise some of the key attributes of the household.

These labels always include:

- usage level – high, medium, low (see section 3.1);
- age of household reference person – young (under 35), mature (35 to 54), older (55 to 64), elderly (over 65);
- occupancy type of household – single, multi;
- presence of children;
- billing type – "metered" (pays by volumetric meter) or "unmetered" (pays by fixed rateable amount).

For example:

> High use, unmetered, older family with two children

These may also include other details where relevant to the area of analysis.

# 3. Household water consumption

This section presents analysis of the observed water consumption in our study sample, both at an aggregate and a micro-component level.

## 3.1 Sample averages

Two empirical measures of total household water consumption were collected – from the Identi*flow* monitoring, and from the Thames Water billing data.

The average daily consumption by a household in litres (Per Household Consumption: PHC) was calculated for the 58 monitored properties as the arithmetic mean over the two weeks of monitoring data. As a comparator, an average household consumption was calculated using billing data for the same properties – again an arithmetic mean over the year. Table 2 summarises the average (mean), and the distribution of the data (median, upper and lower quartiles); these are also shown in Figure 2.

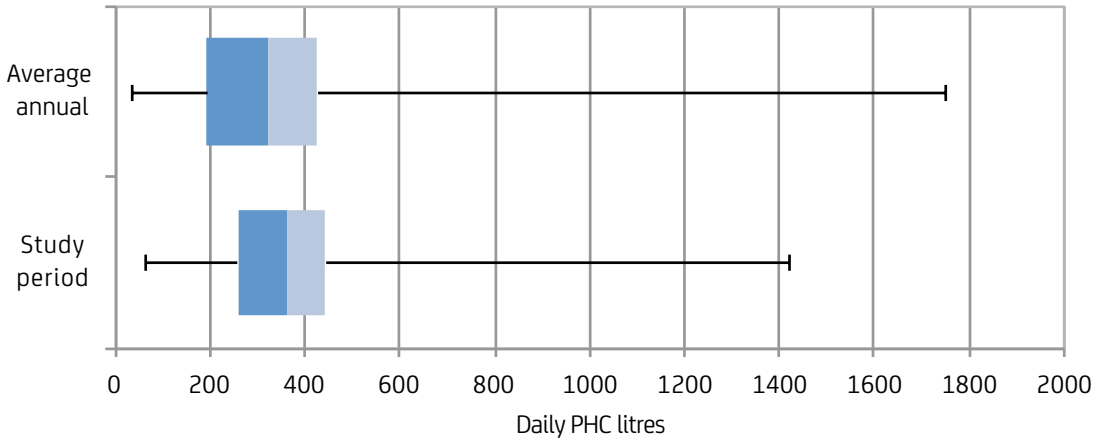
**Table 2 Average PHC (litres/household/day) in study group, study period and annual**

| Sample | Count | Mean litres/day | Lower Q litres/day | Median litres/day | Upper Q litres/day |
|---|---|---|---|---|---|
| Average Annual* | 58 | 377 | 193 | 323 | 426 |
| Study period** | 58 | 387 | 259 | 365 | 442 |

* From annual billing data ** From Identi*flow* monitored data

The average PHC over the study period is higher than that averaged over the full year. We know the participating households were occupied during the study period, whereas properties are likely to have been unoccupied for some days over the year which would lower this longer-term average. There may also be some random fluctuation in water-use that three weeks of observation is insufficient to capture; however, there was no significant difference between these two sets of observations.

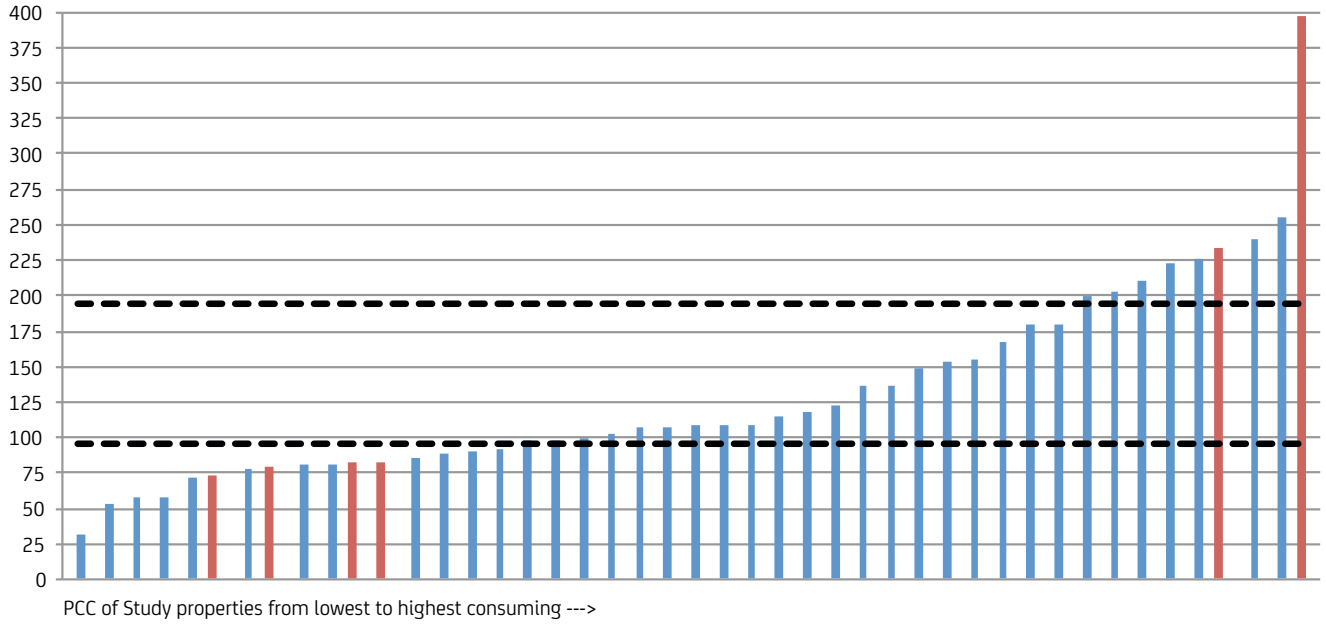
**Figure 2 Distribution of PHC (litres/household/day) in study group (n=58)**




A second analysis of aggregate consumption was undertaken for interview-participating households. The demographic data collected in the interview included the occupancy of the household, enabling us to calculate per capita consumption (PCC: litres per person per day). Using a measure of how much water each individual person uses allows comparison across homes of different size.

Figure 3 shows the distribution of average water consumption seen across the 45 interviewed households, from lowest to highest. Highlighted in red are those properties where a leak was identified during the Identi*flow* analysis. We have broadly categorised study households by their relative consumption to support the analysis of the qualitative data collected in the interviews. Based on the PCC distribution three groups are defined – low, medium and high – with thresholds set at 95 and 195 litres per person per day.

Figure 3 Average PCC (litres/person/day) of interviewed study sample (n=45)




* Red bars indicate leak identified at property during Identi*flow* analysis

Table 3 summarises the PCC of each of these broad usage groups, as well as across the entire sample of interviewed households. The average water consumption in our study sample is 132 litres per person per day, lower than that estimated for the Thames Water supply area – 165 litres for unmeasured households and 137 litres for measured households[7].

Table 3 Average water consumption of interviewed study sample, by broad usage level (n=45)

| Usage Level | Obs | Av PHC | Ac Occ | Av PCC |
|---|---|---|---|---|
| High (>195) | 9 | 552 | 2.2 | 243 |
| Medium (95-195) | 20 | 368 | 2.9 | 128 |
| Low (<95) | 16 | 215 | 2.8 | 74 |
| All | 45 | 350 | 2.7 | 132 |

[7] Thames Water Utilities Ltd Annual report and financial statements 2013/14; available at http://www.thameswater.co.uk/about-us/4229.htm; accessed 01/10/2014

## 3.2 Segmented water consumption

A sample of 58 properties was monitored and analysed providing two weeks of Identi*flow* micro-component data (see section 2.2.1). This provides us with both the total consumption segmented by activity, and the volume and characteristics of individual events, giving flow rates, durations, and frequencies.

Micro-components are grouped broadly by device: baths and showers; toilet flushing; washing machine; dishwasher; and tap use. Some flow profiles may be atypical and cannot be classified confidently – these are included but labelled "unknown". The median unallocated volume for our 58 properties was 3.7%. In many cases there was only moderate or low certainty in differentiating between shower and bath events. Consequently these have been grouped these as "personal bathing" events. Note that this definition exclusively accounts for showers and baths, and does not include personal bathing by other means e.g. bathroom basin.

Figure 4 shows the micro-component PHC estimates for the 58 monitored properties, ordered from largest to smallest aggregate consumption. We can see from this graph some of the diversity in water consumption patterns present even in our small study sample. This manifests itself both as major differences in aggregate household consumption (from 40 litres to 1,171 litres), as well as in the areas of day-to-day life in which water is used.

Figure 4: Segmented per household water consumption (n=58)

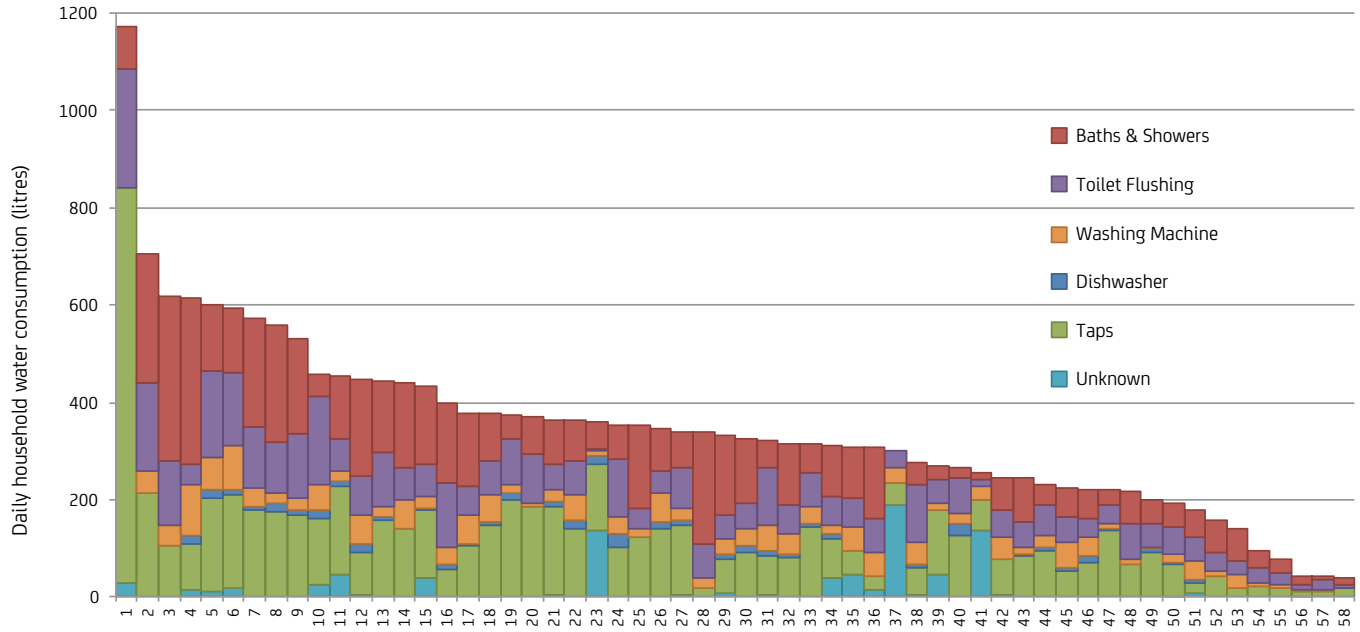


Figure 5 shows the segmented split of water consumption averaged across the sample population. Fifty-four of the monitored 58 properties were deemed sufficiently reliable for inclusion in this analysis. In some properties there was some element of "unknown" water consumption that could not be allocated by the Identi*flow* analysis. This is due to atypical devices or practices that cannot be classified by the analytical algorithms. For the majority this was negligible; however, in three cases (23, 37, 41 in Figure 4), a large portion (38%, 63%, 54%) of water consumption was "unknown". These three observations were removed from the aggregate analysis. The property with the highest water consumption, 1,171 litres per day, was also removed. This property appeared anomalous compared with the whole sample, and in particular had very high estimates for tap use (812 litres per day). During the interview with this household it was revealed that they regularly watered the garden, sometimes leaving the hose on overnight.

The micro-component split of water consumption shown in Figure 5 is within the range of estimates[8], with personal bathing (33%) and toilets (22%) the highest consuming activities ("taps" viewed as a group of activities).

Figure 5: Observed average segmented household water consumption (n=54)

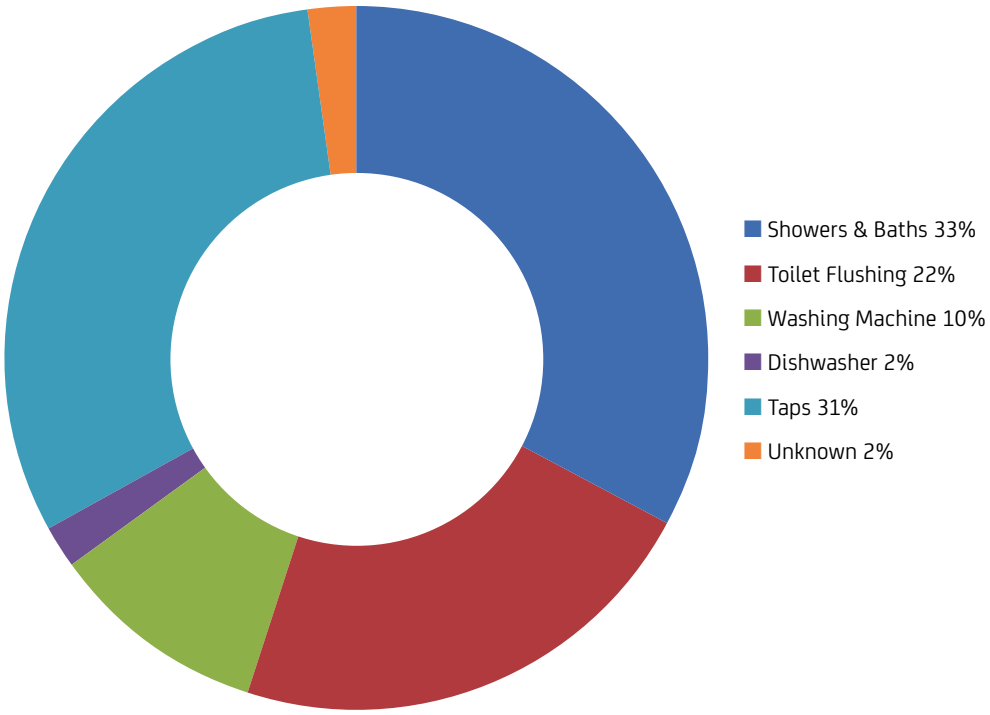
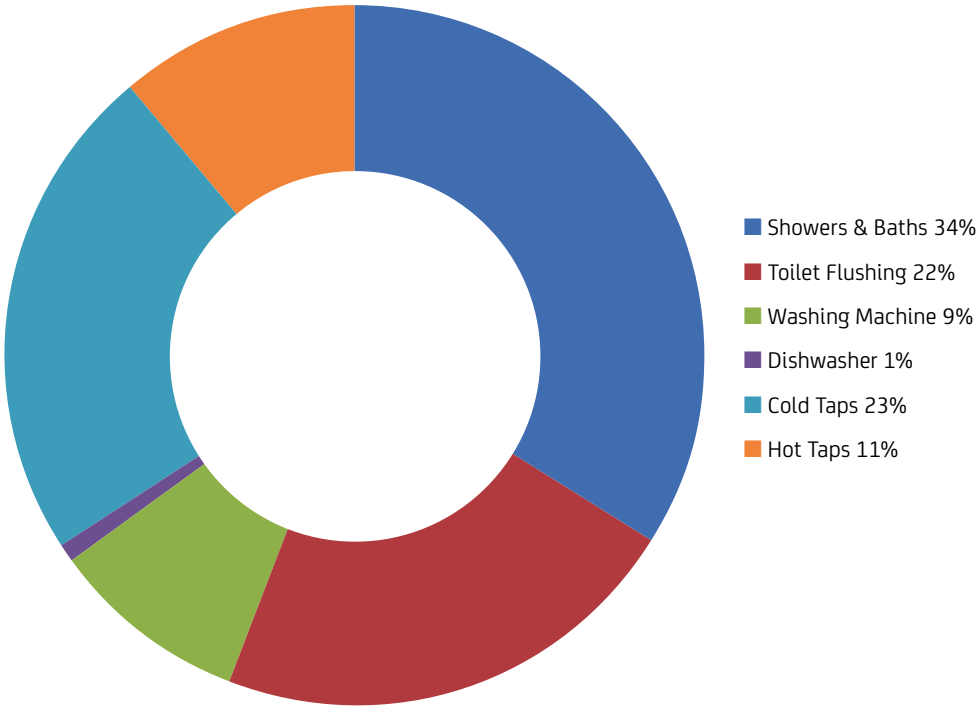



Figure 6 shows the split as modelled by the Water Energy Model based on the responses (n=159,343) to the online Water Energy Calculator between June 2010 and July 2014. The modelled percentage micro-component splits are very similar to that observed through the Indenti*flow* monitoring and analysis in this study.

Figure 6: Estimated average segmented household water consumption




[8] See for example Thames Water, Water Resources Management Plan (WRMP) 2014, Section 3.3.4; available at: http://www.thameswater.co.uk/about-us/5392.htm; accessed 01/10/2014

# 4. Testing perceptions of water-use

This section explores the similarities and differences between the perceived reported behaviours of our participants, and their actual observed behaviours (as estimated by micro-component monitoring).

For 34 properties our dataset combines both empirical measurements of water consuming behaviours, segmented at a device-level, and those same households' perceptions of their water consumption. In this study we focus on three particular comparisons between perceived and observed behaviours:

- accuracy with which householders can estimate frequency of personal bathing, washing machine and dishwasher events;
- accuracy with which householders can estimate shower length; and
- accuracy with which householders can identify the activity with the highest water consumption.

Self-reported responses to questions about behaviours may differ from reality for a number of reasons, so we need to be careful how we interpret these results. There may be survey effects whereby responses are adjusted to conform to some expected social norm – causing a gap between a respondent's real perception of their consumption and their response when asked. There may be cognitive limitations on a respondents' ability to recall information, and to assess on behalf of others. This may result in a rounding bias, where people revert to pre-sets like "daily". Finally, respondents may be unable to accurately self-assess particular aspects of their consumption, for example their shower length, resulting in some systematic mismatch between perceived and actual behaviours. Nonetheless, these results still provide an indication of the answers people provide when asked to self-report – and therefore the extent to which models and estimates based on user-reporting is likely to be accurate.

## 4.1 Frequency of behaviours

As part of the WEC survey, respondents are required to evaluate the number of times a week that the main water-using actions are undertaken in the home. In this section we compare the responses of our study sample with the observations as estimated by our monitoring and analysis.

Participants were asked:

- How many times do you use your [washing machine, dishwasher] per week?
- How many [baths, showers] does your household take per week?

The Identi*flow* and WEC datasets were cross compared for consistency, and to ensure robust samples for comparison. In this section we refer to the study householder response to the WEC as the reported frequency, and the estimate from the Identi*flow* monitoring as the observed frequency.

Table 4 summarises the average observed frequency of each action estimated by Identi*flow*, and the reported frequency. The sample sizes for each comparison are given in brackets. Device ownership, particularly dishwashers, was not universal, and not all observations were deemed reliable for inclusion in this analysis, for example due to changes in occupancy. Explanation of sample selection for each device is given in their respective sections.

Overall, households reported the number of washing machine and dishwasher cycles per week with good consistency with what was observed in their micro-component consumption. However, this was not the case for personal bathing events. The number of baths and showers taken each week was over-reported.

Table 4: Observed and perceived weekly frequency of washing machine, dishwasher and personal bathing events

| Usage Level | Washing Machine per Hh (n=30) | Dishwasher per Hh (n=19) | Personal bathing per Pers (n=30) |
|---|---|---|---|
| Observed | 4.4 | 5.6 | 3.9 |
| Perceived | 4.2 | 6.2 | 5.4 |

When we perform a Student's t-test (2 tail, paired) comparing the reported and observed frequencies, this difference is significant for personal bathing events (with greater than 99% confidence) but not for washing machine or dishwasher events (Table 5).

Table 5: Paired Student's t-test for observed and perceived frequency of activity

| | Washing Machine | Dishwasher | Personal bathing |
|---|---|---|---|
| p-value (3 d.p.) | 0.778 | 0.371 | 0.000 |

Some interpretation of these results may come from considering the types of activity we are comparing. Washing clothes and dishes are communal activities, but showers and baths are personal. An individual answering on behalf of their household may not know how often their co-habitants have a bath or a shower, but most households, in particular families, are likely to share the dishwasher and washing machine. Since most of the interviewees were older members of the household, likely to have more responsibility for housekeeping and shared tasks, they may have an overview of these activities and so be better able to estimate the frequency and to describe the decisions undertaken (e.g. wash temperature, settings).

Table 6 compares the responses to the Water Energy Calculator of our interview and Identi*flow* study sample (n=34) against those collected through the online Water Energy Calculator (n=159,343). This provides a useful comparison to illustrate the potential representativeness of our sample in terms of their reported actions.

When we compare personal bathing, the per person events per week for our sample (5.4) is identical to the average found in online responses. As can be seen in Appendix 1, our overall study sample had a higher than UK average occupancy, and this is also the case when compared with the average occupancy of online WEC users. Despite this, the reported frequency of washing machine and dishwasher events was lower than reported to the online WEC.

Table 6: Reported weekly frequency of activity of study sample against WEC baseline

| | Washing Machine | Dishwasher | Shower | Bath |
|---|---|---|---|---|
| Study sample (/34) | 4.2 (n=30) | 6.2 (n=19) | 12.8 (n=29) | 3.2 (n=29) |
| WEC sample (n=159,343) | 4.7 | 5.5 | 10.4 | 3.1 |

### 4.1.1 Personal bathing

We can have greater confidence in observations when identifying showers and baths combined as "personal bathing" events, rather than separating the two. Here we compare the frequency of these events as estimated by the householder, against the frequency observed by the monitoring and Identi*flow* analysis.

A sample of 29 out of 34 participants is included here. These were all cases where the micro-components were identified and allocated clearly and there were no other known confounding factors. Two properties had a change in occupancy during the monitoring period, which obfuscated a valid comparison with the WEC results; three properties had substantial leaks that made it difficult to identify individual personal bathing events.

Our sample over-reported the number of showers and baths taken in a week. When an average is taken the number of reported weekly bathing events is higher than the number of observed weekly bathing events (5.4 per person and 3.9 per person). In a paired t-test this difference is significant (Table 5).

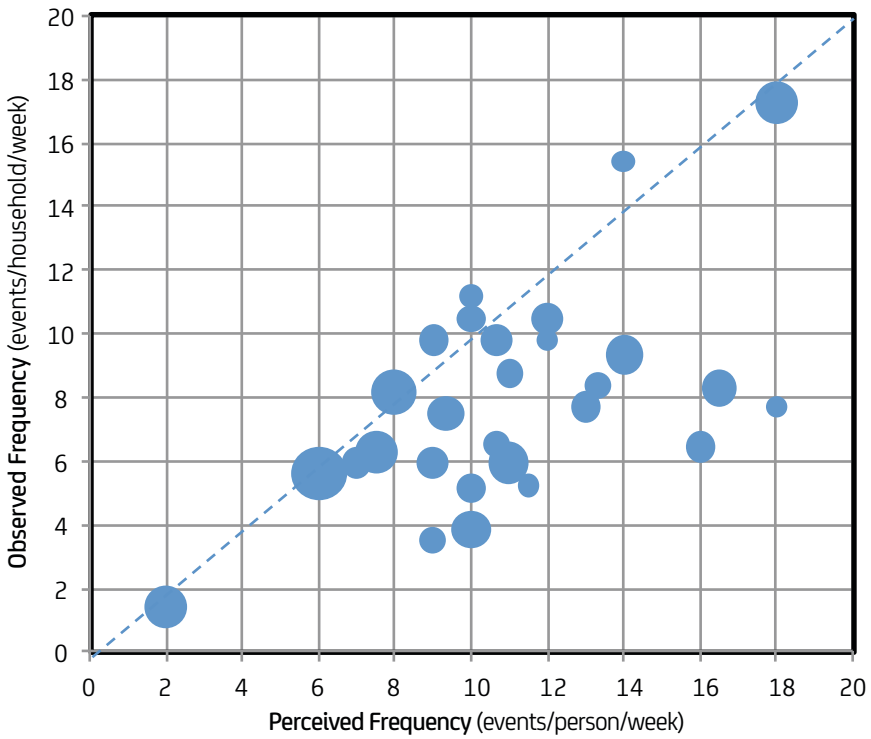
Table 7: Observed and perceived bath & shower frequency per person

| | |
|---|---|
| Count | 29 |
| Mean perceived weekly frequency | 5.4 |
| Mean observed weekly frequency | 3.9 |
| Mean difference | 1.6 |

This difference can be seen in Figure 7, in which observation and perception has been plotted for each participant. The size of each point gives an indication of the average consumption per bathing event for that household. In very few cases (five out of 29) a householder reported taking more showers and baths than was observed. Many respondents substantially over-reported the number; in some cases by as many as five per person per week.

The average incidence of personal bathing was the same in our study sample as found through the online responses (full WEC sample, n=159,343) – 5.4 per person per week.

Figure 7: Comparison of observed and perceived frequency of personal bathing events




There may be a number of dynamics influencing this difference. Interviews were typically undertaken with one householder, so for multi-occupant homes where not all residents could attend, the interviewee was required to respond on behalf of others.

Another reason could be that there is a response bias linked to expected social norms that exerts an influence over self-reporting. Respondents may feel obliged to report up to a perceived socially acceptable level, and this may be stronger when dealing with private behaviours and when responding face-to-face.

An additional confounding factor may be that not all showers are taken at home. A number of respondents reported taking showers at work or at the gym (six out of the 45 interviewed). Whilst these might be counted by the householder, they would not be observed by this monitoring approach.

### 4.1.2 Washing machine

All participants in the study owned a washing machine at home. Four were removed, due to a change in occupancy and a major leak which reduced the ability to identify micro-components confidently, providing us with a sample of 30 for analysis.

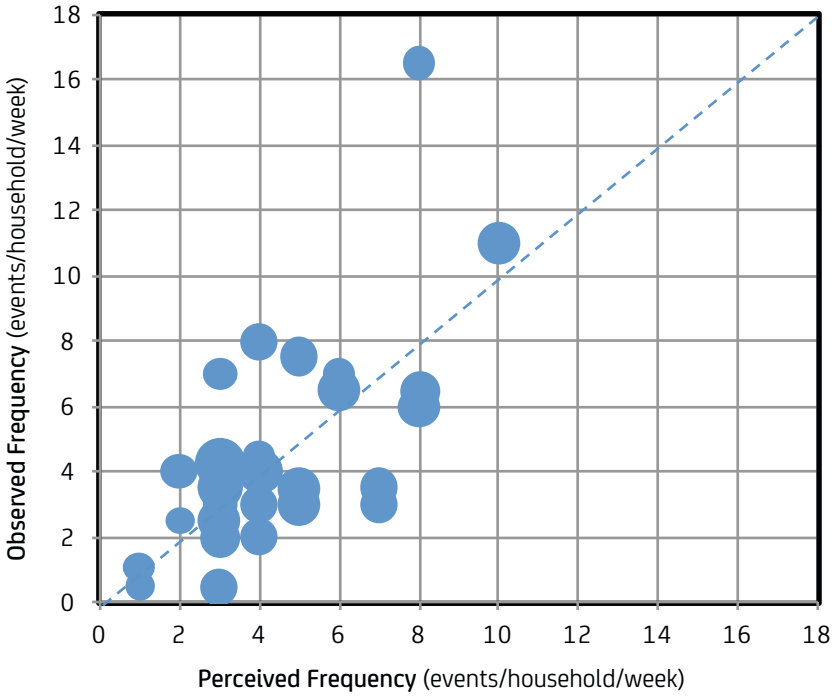
Table 8 summarises the mean reported and observed frequencies. Whilst at an average these are similar, and the difference between the two measures of frequency is insignificant (Table 5), the average difference between reported and observed frequency was 1.6 cycles per week. This indicates that although self-reported frequencies may give average values close to reality when aggregated, for individual households there is still some uncertainty.

Table 8: Observed and perceived washing machine frequency per household

| | |
|---|---|
| Count | 30 |
| Mean perceived weekly frequency | 4.2 |
| Mean observed weekly frequency | 4.4 |
| Mean difference | 1.6 |

Figure 8 plots the reported frequency and observation for each participating household. Again, the size of each point gives an indication of the average consumption per event for that household. As we would expect, these are far more even in size compared with the personal bathing events in Figure 7.

Figure 8: Comparison of observed and perceived frequency of washing machine events




### 4.1.3 Dishwasher

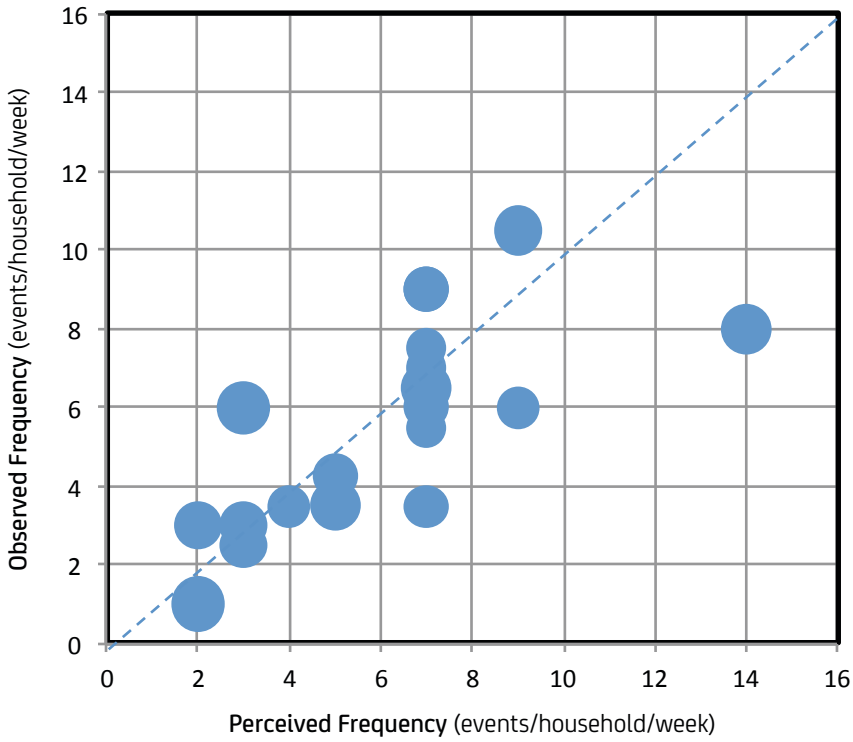
Fewer households in our study sample owned a dishwasher, and a sample of only 19 was available for analysis. Table 9 summarises the mean reported and observed frequencies. Overall, our sample reported using the dishwasher more often than it was observed in the micro-component analysis.

Table 9: Observed and perceived dishwasher frequency per household

| | |
|---|---|
| Count | 19 |
| Mean perceived weekly frequency | 6.2 |
| Mean observed weekly frequency | 5.6 |
| Mean difference | 1.8 |

One of the reasons for this difference may be a rounding bias by which householders report using the dishwasher seven days a week – perhaps because they intend to use it this much or because this seems a reasonable number – but in reality use it less. We can see in Figure 9 that there is vertical clustering around the reporting of seven as a frequency on the horizontal axis. Eight households gave this answer, whilst no-one at all reported using the dishwasher six or eight times a week.

Figure 9: Comparison of observed and perceived frequency of dishwasher events




### 4.1.4 Summary

Our study participants did not accurately self-report the number of baths and showers taken by their household per week. These were significantly overestimated ($p<0.001$), on average by 1.6 personal bathing events per person per week. There was no significant difference between the self-reported frequencies of washing machine events or dishwasher events.

Reasons for the discrepancy between self-reported and observed frequencies of personal bathing may be found by comparing the characteristics of this practice with other activities. Whilst dishwashers and washing machines are both communal water-use activities that will typically be shared by a number of occupants, personal bathing is a private activity and so it may be difficult for an individual to assess on behalf of others. There may be a strong social desirability bias, whereby interviewees report up to a level they feel is "normal"; for example one every day.

The extent to which personal bathing is over-reported has implications for modelling estimates that are based on self-reported data, including the WEC. Even for an individual home, aggregate estimates of consumption will be heavily influenced by the reliability of responses around personal bathing.

## 4.2 Shower duration

Personal bathing is one of the highest areas of household water consumption – on average 33% of total consumption in our study group. There are three determinants of water consumption from showers – the frequency of showers, the flow rate of the shower, and the duration of a shower.

The accuracy with which self-reported data can be used to predict consumption for a household will depend on assessment of these factors. Whilst the flow rate of a shower might be more plausibly estimated by categorizing showers using broad descriptors (e.g. power, mixer, electric), it is less clear whether individuals can accurately self-assess the time they spend in the shower.

As part of the WEC survey, participants were asked:

- How many minutes, on average, does one shower last?

A sample of 21 observations was suitable for analysis. Due to the nature of the measurement required, a number of exclusion criteria were applied. Those omitted were:

- indirect feed showers where duration could not easily be identified due to a tail on the device; and
- those where showers could not be confidently differentiated from other micro-component events, for example taps/baths, potentially due to a high leak.

The average shower duration observed across our monitored sample was 7.7 minutes (n=35, with sample inclusion criteria as above; see Appendix 2). This is within the range of existing estimates for average shower length, with previous studies finding a median of around five minutes[9]. More recent evidence finds longer durations, as much as eight minutes[10]. Studies of shower duration based on survey data have also yielded estimates similar to those found in this study[11], including the responses to the online WEC survey (see Figure 10).

Table 10 summarises the average observed shower lengths against those perceived by householders. When we take an average the reported and observed shower length are very similar – between seven-and-a-half to eight minutes. When a Student's t-test (2 tail, paired) is applied, no significant difference between reported and observed shower times is found (p=0.769). Whilst the findings of previous studies have suggested that individuals overestimate shower length when responding to surveys, in our study group these two measures average to give very similar durations.

At an aggregated average the difference in perceived and observed duration was only 12 seconds apart. However, the average absolute difference between what an individual reported for their household and what was measured was around two minutes.

Table 10: Summary of observed and perceived shower length (minutes), by household type

| Usage Level | Obs | Perceived | Observed | Diff | Av Abs. Diff |
|---|---|---|---|---|---|
| No Children | 10 | 7.5 | 6.9 | 0.6 | 2.3 |
| Children | 10 | 8.1 | 8.4 | -0.3 | 1.4 |
| Unmetered | 11 | 8.2 | 7.3 | 0.9 | 1.8 |
| Metered | 9 | 7.3 | 8.1 | -0.7 | 1.9 |
| All respondents | 20 | 7.8 | 7.6 | 0.2 | 1.9 |

Table 10 also makes this comparison for two subsets in our data: (i) households with children and households without; and (ii) households paying by meter and households paying by rateable amount. On average, our study households without children took shorter showers than those with by around a minute and a half. The difference in observed shower time between these two groups was significant with 10% confidence (p=0.056). Consistent with this, some parents when interviewed felt that their children spent a long time in the shower. One interviewee suggested that since the children weren't responsible for the bills they weren't interested in keeping showers short.

**"The kids aren't worried. My son has very long showers; he'd spend half an hour in the shower if we let him."** Medium use, unmetered, older couple with two children

No significant difference in shower length was observed between those paying by meter and by rateable amount.

Of the nearly 160,000 responses to the online WEC, 86% reported using a shower at least once a week. Table 11 summarises the self-reported shower lengths of this sample (n=137,625). Comparing this against our study sample, we can see that the shower length reported (7.8 minutes) has good agreement with the nationwide self-reported average of 7.5 minutes. In the national sample, 32% report that their typical showers take ten minutes or longer.

[9] See summary in Environment Agency/Energy Saving Trust (2009) Quantifying the energy and carbon effects of water saving, full technical report

[10] For example the Unilever Sustainable Shower study estimated average shower lengths to be closer to eight minutes, press release (05/12/2011); available at http://www.unilever.co.uk/media-centre/pressreleases/2011/sustainableshowerstudy.aspx

[11] For example average shower length reported to WaterWise Ipsos MORI poll 2007/08 was 7.2 minutes; report available at http://www.waterwise.org.uk/newsletter_archive/images/site/Documents/mori%20survey%20results%20final%2017-04-08.pdf

Table 11: Summary of reported shower length to online Water Energy Calculator survey

| Typical Household Shower Length* | Count | % (n=137,625) |
|---|---|---|
| 0-5 minutes | 25,005 | 18% |
| 5-10 minutes | 69,004 | 50% |
| 10-15 minutes | 32,032 | 23% |
| 15-20 minutes | 8,223 | 6% |
| 20-30 minutes | 2,632 | 2% |
| 30+ minutes | 729 | 1% |
| Mean stated shower length | 7.5 | mins |

* Cohorts are for presentation purposes, respondents were asked on a continuous sliding minute-interval scale from 1 to 30, see Appendix 5

Figure 10 shows box-and-whisker plots of the distribution of shower times for our study sample (observed and perceived), and the online WEC sample. Whilst we saw in Table 10 that they have a very similar mean, our Identi*flow* observations have a lower range (9) and inter quartile range (2) than the self-reported perceptions of shower time. In the online WEC sample we have data that stretches to the full extent of the choice limits (one minute to 30 minutes); however, none of our study sample reported typical shower times at the extremes of this range.

Figure 10: Distribution of observed and perceived shower length

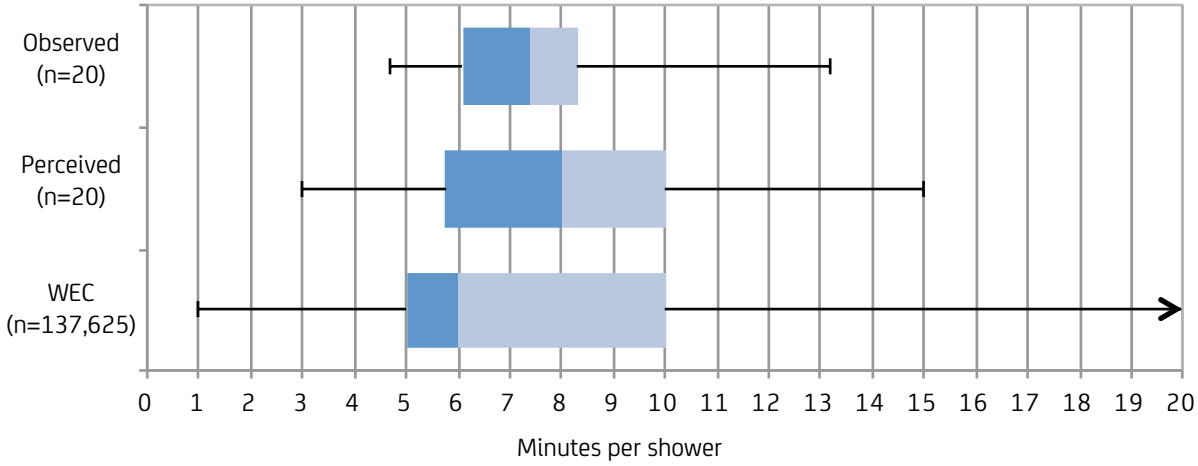


Figure 11 plots observed shower length against perceived shower length for our sample (n=20). There are few outliers, with the majority broadly clustered between five and 10 minutes on both axes.

Figure 11: Comparison of observed and perceived shower durations

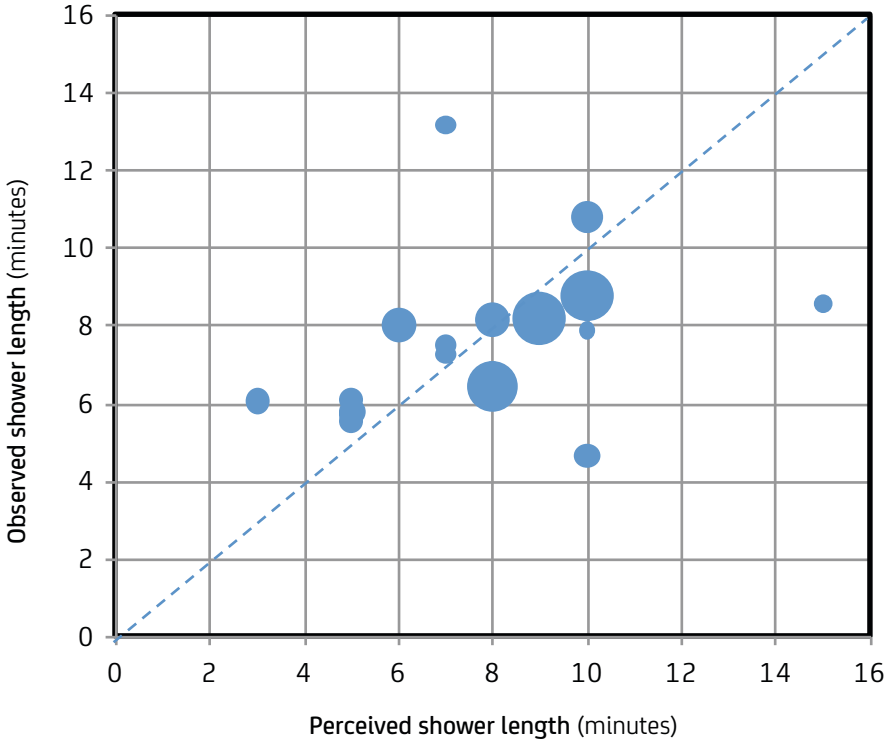
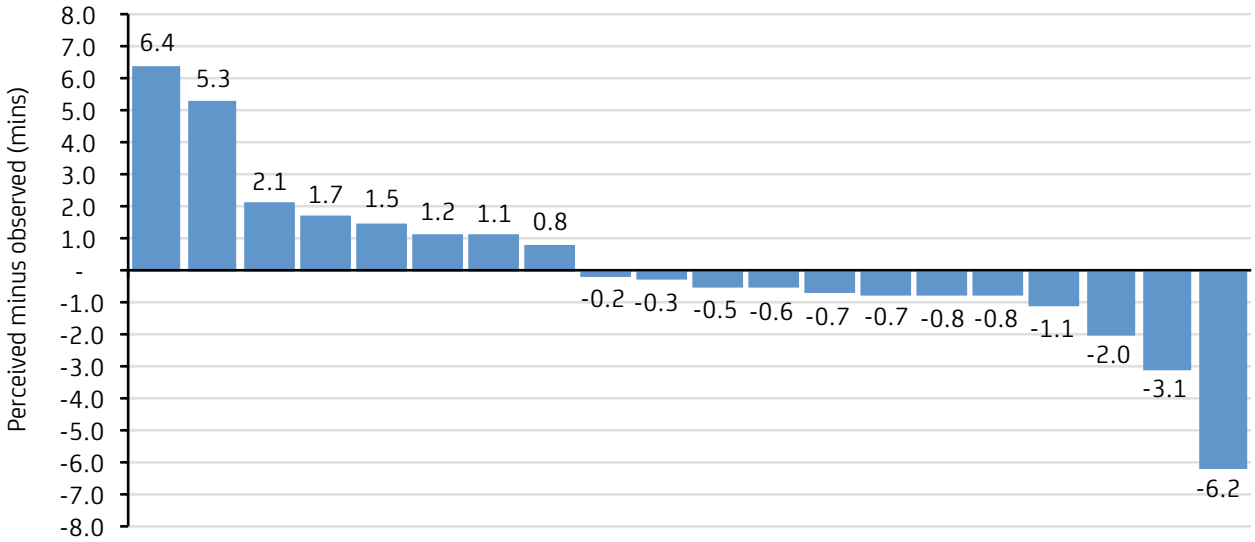



Figure 12 shows the distribution of the differences. Those on the left hand side most overestimated their typical shower length, and those on the right most underestimated it. This distribution shows how many of our study group were fairly accurately able to assess their shower duration in minutes – nine out of 20 estimated typical shower length to within one minute. Four respondents estimated their shower length more than three minutes different to that which was observed.

Figure 12: Difference between observed and perceived shower length



### 4.2.1 Summary

Building on the estimates of shower lengths collected through the self-reported WEC survey we have presented a comparison with empirically measured data.

When averaged, self-reported and observed shower durations were very similar – 7.8 and 7.6 minutes respectively – and were close to the average reported to the online WEC survey (7.5 minutes). There was no significant difference between the reported and observed shower durations.

Householder estimates showed a greater range (between three and 15 minutes) than those observed in monitoring. This is further apparent when the online WEC survey results are considered, as this includes responses from one minute up to 30 minutes (the maximum that could be selected). However, the majority of households reported shower lengths within two minutes of those observed.

These findings suggest that self-reported shower durations may be closer to reality than previously expected. This is the case both for the majority of individual households, and when we compare at an average across the sample.

Our Identi*flow* monitoring provides empirical evidence that for many households reducing the length of showers has strong potential as a free measure to reduce both water and energy consumption. Whilst our sample is small, we can get some idea of the full potential by considering the larger self-reported dataset. That the perceived and observed lengths in our sample are largely similar supports this.

## 4.3 Highest using activity

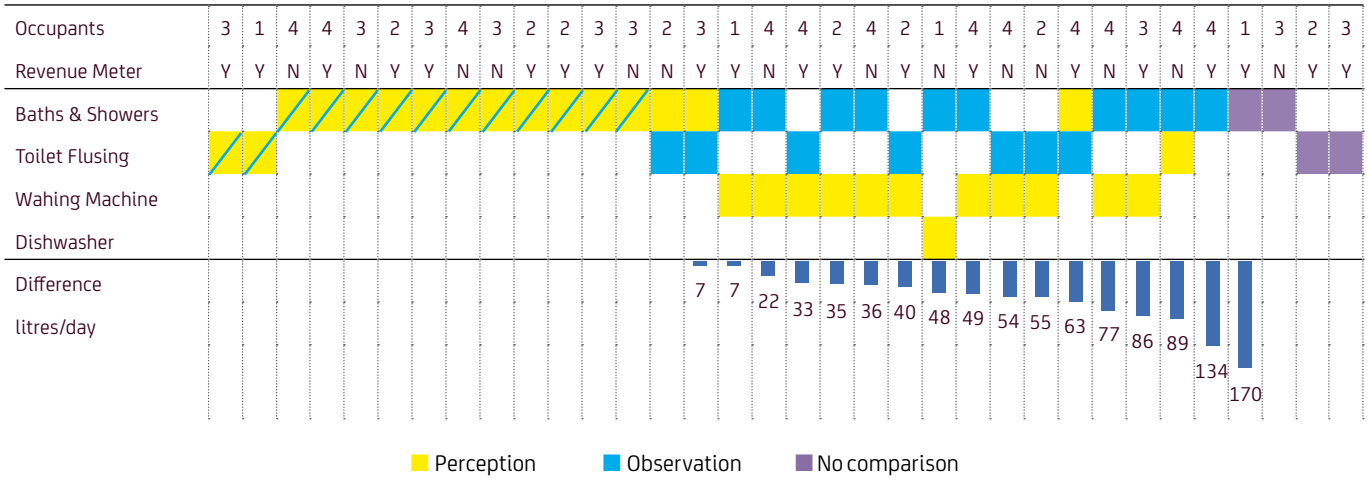
Those activities which use the most water are likely to have the greatest opportunities for savings. It is not clear whether households are able to self-assess and identify these areas of their own consumption. Participants were asked:

- In your normal day-to-day routine, which activity or device do you think uses the highest amount of water?

Responses were compared against the highest water-using activity for each household as observed. The majority of participants identified one of four behaviours as the highest using – showers & baths, washing machine, dishwasher, and toilet flushing. Four identified a practice associated with taps: general sink use; water for cooking; washing up dishes by hand; and water for drinking. Whilst we do know that "tap" usage, split across kitchen and bathroom sinks and outdoor taps, may often be the highest area of consumption, Identi*flow* analysis is unable to differentiate accurately between different tap activities as these are unlikely to possess sufficiently distinctive or consistent flow profiles. These participants were omitted from this analysis.

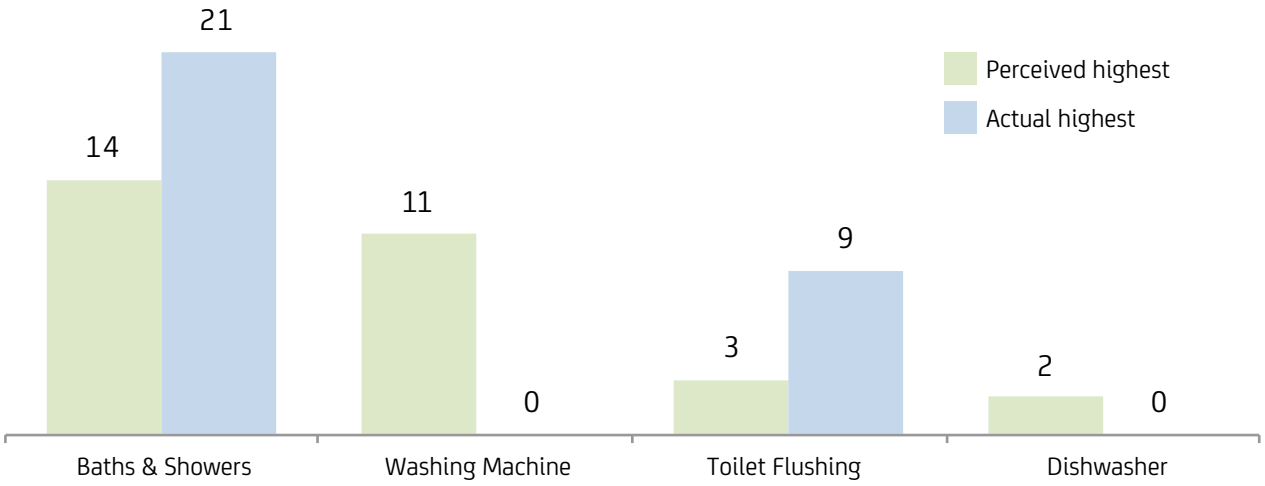
Figure 13 summarises the responses of each participant when asked to identify the activity with the highest water consumption in their home (n=34). This is compared with their highest using activity as estimated by the micro-components analysis, as well as the absolute difference in litres per day (per household). Many respondents incorrectly identified washing machines or dishwashers as the highest using device, potentially indicating a lack of clear (or any) information on the consumption of these appliances. Volumetrically, the difference in consumption between washing machines and the actual highest for these households was between 22 and 89 litres per day (51 litres on average). This highlights the potentially substantial difference between the water consumed by a washing machine and that used for other activities (see section 3.2 for micro-component split).

**Figure 13 Highest water-using activities, observations and perceptions**



Of the thirty households considered in this analysis, thirteen accurately identified the activity that consumed the highest amount of water in their home (Figure 14). Whilst thirteen participants estimated that washing machines or dishwashers were the highest, neither of these was actually the highest in any study household. In the average micro-component consumption, Figure 4, usage for these activities was much lower (10% and 2% respectively) than personal bathing (33%) or toilets (25%). Only three felt that flushing the toilet consumed the most, despite this being the highest for many households (11 in total).

Figure 14: Comparison of perceived and observed highest using activities




A number of households described uncertainty about the level of water consumption by washing machines and dishwashers. The water used for these activities is less visible than for taps or personal bathing where the use involves direct contact, and householders may benefit from clearer guidance to help them understand the footprint of these actions.

**"I don't know about the washing machine and the dishwasher, but they're quite modern and I would hope they are made in a way to reduce water."** Low use, unmetered, mature couple, perceived highest: taps

**"The washing machine probably does use a large quantity of water without you being able to see it."** Medium use, metered, mature couple with one child, perceived highest: washing machine

### 4.3.1 Summary

The ability of householders to identify the highest areas of water consumption tells us how well they understand water-using devices and activities in the home, and also may indicate the extent to which they can usefully interpret water saving opportunities in the context of their own use.

Many participants in the study were unable to identify the activity in their home where they used the most water – only thirteen identified this correctly. When we consider this volumetrically these differences may be substantial. Toilet flushing is typically one of the highest areas of water use in the home, but was rarely identified as such (two out of nine where this was the case).

In order for households to identify and apply water saving actions, an improved ability to evaluate areas of higher use may be beneficial. Whilst the split of water-use by activity in the home may be well established through trials such as this, it may not be well understood by householders.

In many cases, washing machines were perceived to be the highest user of water. For most homes washing machine events occur less frequently than toilet flushing or personal bathing, and there is clear uncertainty about the volume of water consumed during each cycle. Because they are self-contained units, the water used by washing machines and dishwashers is less visible and may therefore be harder to evaluate.

Some participants felt that clearer information on the consumption of these "white" devices would be beneficial, and clearly there may be opportunities through device labelling schemes to improve this knowledge. It is unclear whether the availability of this information would make a difference on consumption habits. Given that the consumption of washing machines is currently overestimated compared with other activities, additional information to dispel this might perversely increase frequency of usage. Therefore, in terms of water-saving, it may be better to raise awareness that personal bathing (showers, baths) and toilets are typically the highest areas of consumption.

# 5. Perception of need

In this section we present discussion of study participants' perception of the need to save water, and the motivations that they attach to this. During the interview, participants were asked whether they felt there was a need to save water. This was to explore potential motivating factors behind their actions and practices. It also gives us insight into the ways in which these factors are, or are not, motivating – with potential consequences for the framing of information and messaging.

Initially, participants were asked:

- Do you think there is a need to conserve water in your home, in your area, in the UK?
- Can you describe why you think there [is/is not] a need?
- Do you ever worry about the amount of water you use?

## 5.1 Motivating and demotivating factors

Responses to the questions around the need to conserve water were analysed and coded to identify recurring themes. These were categorised as motivating factors (those that enforce a sense of need) and demotivating factors (those that dissipate a sense of need).

There were five commonly recurring themes: the UK weather and rainfall; the environmental or resource values of water; the effect of water supply infrastructure; a comparison between the UK and other countries; and the household cost of water.

### 5.1.1 Weather

One common theme was the UK's weather, and the perception that participants have on the relationship between climate and the availability of water. This was identified by some as a reason to save water, but many thought that a lot of rain meant that there was no need to save water. This polarisation is interesting given that these householders experience the same weather and receive the same supply. The interviews took place during the winter of 2013/14 which was the wettest on record (see Section 2.1). Our analysis suggests this had an impact on responses.

Water supply in the UK is linked to climate; however, the significance of this link may be not be consistently communicated, or understood. Whilst some participants did describe the importance of longer term climate patterns, the majority focused specifically on rainfall events and short-term conditions. The extent to which weather events translate to action or inaction is unclear from this analysis. However, if short-term events do have a strong influence on householder propensity to take action this has challenging implications for achieving more lasting behaviour change.

**"We've got plenty of it – it's wet, we're on the coast of the Atlantic, we're an island. Only very short periods of time when we don't have it."**
Medium use, unmetered, elderly couple, no need

**"Climate's unpredictable – rainfall patterns are getting more erratic."**
Low use, metered, mature couple, need

**"Ironic when it rains so much – where does the water go?"**
Medium use, unmetered, mature couple with one child, possible need

### 5.1.2 Environmental resource

A further theme was the properties and values associated with water as a resource – including finiteness, necessity, and environmental impact. In particular, they understood the need to sustainably manage water as a resource, with reference to its impact on wider human and natural systems. These values were often described in terms of sustainability and planning for the future. As will be seen in the next section (5.2), particular values were assigned to water that were not given to energy.

**"You have to think about the next generation. Most people think water is the most important thing in life – it gets people in appeals, it's emotive."**
Low use, metered, older couple, need

**What would worry me most is not what's going to happen to me, but what's going to happen to them [children]. But it's more likely to happen over energy resources."**
Medium use, metered, mature family, no need

**"There's a disconnect from the resource in London."**
Low use, metered, mature 3-person family, possible need

**"We need to be careful of our carbon footprint on the planet. Most people are aware of what's happening, and obviously energy is used to clean and supply the water."**
Low use, unmetered, mature couple, need

### 5.1.3 Infrastructure

Some participants identified infrastructure as a factor influencing the need to save water. The two key aspects that householders raised were leakages, and collection/storage of water.

All respondents who mentioned infrastructure felt that there were deficiencies or difficulties in supply that might be improved; however, some concluded from this that there was subsequently not a need for water saving at a household level. Despite identifying a link between infrastructure and overall water saving, these interviewees felt that infrastructure should be the focus. Evaluated against the perceived potential for improvements in supply efficiency, individual households may view their own influence as insignificant or futile. Negative views about the extent to which water companies or governing agents are taking action appears to have an influence on personal motivation.

**"All you hear is water shortage … wrong type of rain … hasn't filled the reservoirs … pipes leaking. I know they're old, Victorian times etcetera and it's a big project. But putting the onus on the consumer to turn off their hosepipes, rather than fixing pipes that leak and gush out is not good enough. It's a long time ago by now and the project needs to be speeded up – a hosepipe ban is lack of sustainable planning."**
Medium use, unmetered, mature couple with two children, no need

**"The alternatives involve massive infrastructure projects"**
High use, metered, elderly couple, need

**"We have to save, the water companies are always hiking up bills to cover the costs of infrastructure."**
Medium use, unmetered, older couple, possible need

### 5.1.4 Overseas comparison

Some participants drew comparison with experiences in other countries as a driver for the need to save water. This included observation of differences in supply side factors such as climate and infrastructure, which were particularly clear when compared with severely water-stressed areas. Living and travelling abroad may also provide a perspective on differing public attitudes towards water use. A number of participants felt that water is less appreciated in the UK than in many other countries.

**"Yes it is a bit extravagant watering the garden when there are those in the world that can't drink. But I pay to have it in my home and don't honestly think that standing in the shower for two seconds less is going to help somebody somewhere else have a drink of water – I don't think there's that parallel."**
Medium use, unmetered, mature family, no need

**"I stopped leaving taps running after living in Europe – they treat water completely differently."**
Low use, unmetered, older couple, possible need

**"We lived in Israel, so for us it's virtually a sin to waste water."**
Medium use, metered, mature couple with two children, need

**"This country's just not good at water saving."**
High use, metered, elderly single occupant, need

### 5.1.5 Cost

Finally, some interviewees identified cost as a motivator to save water. Water is still relatively cheap compared with energy, although there are a number of reasons why there is likely to be upwards pressure on these costs in future, including population growth, the need to modernise and replace infrastructure, and the effects of climate change.

**"I'm not on a meter so there's no incentive for me."**
Medium use, unmetered, mature mixed rental, possible need

**"Driver wouldn't be environmental, would be money – bills going up and up – but actually if we could save water, we could save money."**
High use, metered, young family with one child, need

**"Would like to use more, but mindful that can't afford it."**
High use, metered, elderly single occupant, need

## 5.2 Relative importance of utilities

Households have many competing priorities for their budget, including a number of utility bills. Energy is used to heat water and to power electrical water-using appliances such as washing machines and dishwashers, which means that water-use activities have an impact on energy bills.

To understand similarities or differences between how water and energy are perceived by householders, and the reasons behind this, participants were asked:

Do you think it is important to conserve energy?

Would you say this is more or less important than water?

The majority of respondents described saving energy as more important to them than saving water. In particular, cost was the reason behind this view. This stems from two positions. The first is that whilst energy is paid on a per unit basis some households pay a fixed rateable water amount, and therefore financial incentives for water saving may not exist in the same way. The second is that energy bills are higher – the average GB household's energy bill in 2014 was around £654 for gas and £596 for electricity[12] whilst the average combined water bill for a Thames Water customer was £354[13].

**"With electricity I know that light's on – I'm paying for it. If you weren't paying for heating, you'd leave it on all the time."**
High use, unmetered, older family with two children, energy more important

**You see active programs related to energy saving. It's more visible. Water saving action is a little spotty - unaware of a broad campaign."**
High use, metered, elderly couple, energy more important

**More energy conscious than water. Water is less of a concern, it's not as expensive, in some ways it's a more necessary commodity – gotta drink, gotta clean, gotta wash up – not like the heating you can just switch off and be a bit cold."**
Low use, metered, mature family with two children, energy more important

Many participants also felt they were more aware of energy, that there were more ongoing and visible signs that energy was being expended. Energy use had more regular points of use within their routines, and energy saving campaigns and messages were more visible. The importance of water was discussed more in context of its natural attributes and relative necessity, aside from its presence as a utility bill.

**"Would rank energy above water, for cost probably. Depends if looking at it from a money point of view or a more emotional wasting a resource point of view."**
Medium use, metered, mature couple, energy more important

**"For cost: energy ... for ethical living: water."**
Medium use, metered, mature couple, equally important

**"Water is more important – water is energy anyway."**
Medium use, metered, elderly couple, water more important

**With water, sod it, you just pay the bill – better things to do. There's less room for manoeuver in savings than energy as bills much lower."**
High use, metered, elderly couple, energy more important

[12] Energy Saving Trust, 2013/14

[13] Ofwat, Average household bills information: 2013/14

## 5.3 Summary

Identifying thematically the way in which householders frame their water consumption is likely to suggest opportunities to structure messages.

Weather was the most prominent factor linked to the need to save water, although there were conflicting views on its implications. Many households did not feel that the UK's weather was linked to water scarcity, with a particular recurrence of the image of the UK as a "wet, grey" country. The evidence suggests that where a householder could identify a stronger link between climate and longer-term rainfall patterns, then weather was identified as a reason why water needed to be managed more carefully. This may point to a need to improve people's understanding of the water cycle, and the processes that link natural events and their consumption.

Some participants felt that inefficiencies in supply infrastructure outweighed the need for households to save water. Whilst these are re-enforcing activities that operate in the same direction, there may be an opportunity through more linking of micro and macro water saving initiatives. Furthermore, where infrastructure action is being taken, householders should be informed of this so that they can better identify where their own behaviours fit alongside this.

The greater cost of energy bills places energy use above water use in terms of importance to householders. This supports efforts to link the two by focusing on the dual-benefits of managing hot water use more efficiently.

Beyond cost, there are other valued attributes to water that may not exist in the same way for energy. This includes the perception of water as more of a "necessity", but also wider environmental values and dependencies. Efforts to engage householders in water saving practices may be aided by looking beyond "savings" and "return on investment" and instead exploiting these wider values.

# 6. Water use interventions

In this section we present analysis of the householder interviews, focused on three aspects of domestic water efficiency: the ability of householders to identify and understand potential water saving actions available to them; the barriers that they have encountered to adopting these; and their feelings towards meters as a billing mechanism and potential driver of water saving.

## 6.1 Water saving behaviours

Participants were asked to identify water saving actions, both those that they had undertaken, and those that they were aware of.

- Do you, or anyone in your household, do anything in particular to manage the amount of water you use?
- Have you ever installed a device, or chosen a product or device, to try to reduce the amount of water you use?
- Have you ever changed a behaviour or routine to try to reduce the amount of water you use?

The actions identified may not fully represent what is currently being done in the homes of our study sample, but they give a picture of which devices and behaviours households most obviously associate with water saving. Some actions may have been identified but are not undertaken, and others undertaken but not identified when unprompted. Comparison with responses to the WEC survey highlights this. This unprompted question approach is also a mechanism for collecting information on any less common, or more peripheral, water saving actions not included in the standard WEC survey.

The most commonly raised measures were all linked to behavioural choices rather than the installation of a device or equipment. More permanent measures such as installing a water efficient showerhead or a toilet displacement device were less commonly described.

### 6.1.1 Personal bathing

A number of actions relating to personal bathing were discussed – including taking fewer baths and showers, not filling the bath to the top, and getting kids to share bathwater. Whilst installing an eco-showerhead or taking shorter showers will guarantee reduced water use, many also reported choosing to take showers over baths as a water saving action. Hygiene and personal preference were also described as reasons for this. Whilst the perception may be that showers always use substantially less than baths, this will not always be the case. Ensuring that they use less water would require a comparison of the length, flow rate and frequency of shower, against the volume and frequency of bath – a level of information that householders are very unlikely to have access to.

**"Having a shower is far better than the bath – both water saving and hygienic."**
High use, metered, elderly single occupant

**"Don't have baths, prefer showers – every day for both of us. I know that we use much less than if we used a bath every day. I've always thought that the shower was better than a bath so you could stay in as long as possible."**
Low use, unmetered, mature couple

**"People make the mistake of thinking a shower potentially uses less water than a bath – but I think it depends how long you're in the shower."**
Low use, metered, mature couple with two children

Taking shorter showers was also reported. Some households described this action in terms of awareness of their shower length and a general intention to take shorter showers, in some cases prompted by a shower timer. Others were more absolute and tried to keep water running for as short a time as possible, particularly those who had lived in environments where water was very scarce.

**"Got a free shower timer. I'm currently using it to cook eggs, but it did make me think about how long I'm using the shower."**
High use, metered, young couple with one child

**"Always conscious that I shower for too long. You're supposed to just sing a pop song and get out – I know all that."**
Low use, metered, mature family

**"I only take one minute in the shower – 30 seconds to get wet, step out to soap, 30 seconds to rinse off."**
Medium use, metered, mature couple with one child

### 6.1.2 Toilets

Many households identified having either a dual flush mechanism or a cistern displacement device. Whilst reducing flush volume with a displacement device requires no ongoing action from the householder, householders still need to use the dual flush correctly – something which was not clear to a number of those in our study group (see section 6.2.4).

**"We have a big button little button, but the little button doesn't always work. I always press the same button anyway and doubt the kids use it properly. Back in the day we had a brick in the cistern – it was more straightforward."**
High use, unmetered, older family with two children

**"Hippo flush a good idea – old fashioned systems use a staggering amount of water."**
High use, metered, elderly couple

**Kids never flush the toilet – but maybe that's not a conscious decision!"**
Low use, metered, mature family with two children

### 6.1.3 Appliances

The behaviours associated with water-using electrical appliances (washing machine, dishwasher, kettle) were in purchasing decisions (choosing an efficient device), frequency of use (waiting to fill before use), and choices during use (settings, temperatures).

**"Wait to load washing machine – but not unlimited wardrobe so have to eventually."**
High use, metered, elderly single occupant

**"Our water consumption has fallen since the new dishwasher and washing machine were installed – kitchen modernised, devices downsized. We've been pleasantly surprised by how much less water the dishwasher uses."**
High use, metered, elderly couple

**Use economy when I can, fill the machine. Sometimes a very quick 15 minute wash – but chefs whites don't get white in a 15 min wash."**
Medium use, unmetered, mature family

**"Two and a half hours [in the washing machine] is a complete waste of water and energy so I tend to use an hour long cycle. I don't fully load as don't want to break it, to overload it."**
Low use, unmetered, mature couple with two children

### 6.1.4 Outdoors

There was interest in using water butts from a number of respondents; however, relatively few had one set up correctly and used it regularly in the garden. Barriers to installation included: the upfront cost; being in a rental property and required landlord permissions; and that the down pipe was inaccessible or that installation was too complicated for DIY.

**"Tried one [a water butt] once; had two in the garden but they don't work. I think we need to connect them properly to guttering."**
Medium use, unmetered, mature couple with two children

**"We stopped using the hose as much to lower bills. Have petitioned the landlord to get a water butt. You can hear rainwater just flowing away when it rains. Have a hose trigger but admit we just put the catch on and leave it on."**
High use, metered, young family with one child

**"I'm conscious particularly in summer when watering garden. We water just the roots rather than whole area; don't water the grass now – haven't for many years. I think other people should use less in garden, more selectively, and wash the car less - not every day or week."** Medium use, metered, elderly couple

### 6.1.5 Taps

Turning the taps off when they brush their teeth was mentioned by many households, and often one that they recall learning when growing up and are proud to have remembered. In particular households with children described this as something that their children had encouraged them to do.

**"Cleaning teeth, wouldn't leave the tap on the whole time – brought up with that."**
Medium use, metered, mature couple with one child

**"We don't leave water running when brush teeth. My son goes around telling us to stop it when brushing our teeth – in two minutes it's a lot of water."**
Low use, unmetered, mature couple, one child

**"We don't wash [dishes] up in the sink, would probably use more water or energy than the dishwasher, but in a different way."**
Low use, unmetered, mature couple

### 6.1.6 Summary

Many households reported "quick tip" recommendations. Some messages, for example "turn the tap off when brushing your teeth" or "take a shower over a bath", were readily identified by a number of interviewees and described as engrained in their habits.

Whilst toilet retrofits were a commonly identified physical measure, a number of participants were not sure how their dual flush system works. Whilst they should be designed to be straightforward, they require an ongoing action from the user. If not used correctly they will not achieve their maximum water saving potential and this may be a missed opportunity.

Whilst householders were not always quite sure how to access or install devices, there was interest in water efficiency measures. For example, a number of residents had explored the use of water butts but were unable to either purchase one or to take the action necessary to install them properly.

## 6.2 Identifying barriers to water saving

Particular focus was given to the motivations and barriers behind the water-use decisions and practices undertaken by householders. Framing this discussion, participants were asked directly to think about and identify barriers to actions that had been discussed:

- Can you think of anything that has, or might, prevent you from adopting this change?

Insight was also included from other areas of the interview where barriers were identified. Responses were analysed and coded for common themes to identify the most prevalent ideas. Individually these highlight a number of challenges that the householders we spoke to have personally faced.

There were seven types of barrier consistently mentioned by householders. Each is discussed in more detail on the following pages; however, in short these were: unwillingness to make lifestyle compromises; competing priorities for time and money; imperfect products and solutions; a lack of supporting information; physical characteristics of property; personal situation of household; and negative perceptions of water efficiency actions and devices.

### 6.2.1 Lifestyle compromise

Many expressed some concern that actions to conserve water or improve water efficiency would have some detrimental impact on their choices, or comfort. This potential compromise to lifestyle was the most commonly identified barrier and encompassed a number of aspects. The main concerns centred on two valued aspects of water – its necessity for everyday functions, and its luxury value. A number of respondents felt that cutting back their water use would require some "sacrifice" in either of these areas.

Firstly, water use in day-to-day life was linked to the idea of necessity. There were both activities that could not be cut back, and minimum thresholds of water usage that are required for a comfortable life; perceptions of necessity varied across different households. A common view of many interviewees was that there was nothing more they could do reduce their usage.

**"Bills do [annoy me] in principle, but it's really a matter of comfort."**
High use, metered, elderly couple

**"Unfortunately, although it's not very environmentally sound, the washing still needs to be done, the flowers still need to be watered."**
High use, metered, young family with one child

**"Would like to use more than using already – but I'd have to sacrifice something."**
High use, metered, elderly single occupant

As well as being a necessity, water use was also associated with luxury practices in the home. Motivations behind this were even more varied between households. Differences were also highlighted within households, with varying personal preferences at an individual level.

Water use for recreation, particularly gardening, is a good example of where water is used for its luxury value beyond necessity. For example, those who had invested time and money in their gardens described resistance to any changes which might threaten this investment. Personal bathing practices also held some clear value to interviewees beyond hygiene. Many interviewees felt that taking shorter showers or smaller baths would inhibit their enjoyment and was not something they were willing to change.

**"I'm going to enjoy this bath a bit more if it's deeper – the luxury of using a lot of water [...] Having said how conscious my husband is, he loves gardening and so in the summer that's quite a chunk – that's his luxury definitely."**
Medium use, metered, mature couple with one child

**"There's no point in spending money on plants if you're not going to water them in the dry season. If we had a dry spell, the fact that it would cost me money would not stop me from coming home at night and watering the garden with a hose."**
Medium use, metered, elderly couple

## 6.2.2 Competing priorities

Time, money, awareness and interest were all identified as requirements for action that may be instead allocated elsewhere. For many households, the amount of water being used was not something that concerned them during their daily routines. Water-use practices may be built around habit and routine, and so actions which require active engagement are likely to be more difficult to encourage. This makes it even more important to think carefully about the way in which water saving messages are designed and delivered.

**"It takes time and energy to be ecological – my husband works late, no time for it. We probably do waste water, but it's not really on our consciousness."**
Medium use, unmetered, mature couple with one child

**"Life's more busy these days, far more complications, distractions, stresses. With so many competing things it's hard to grab people's attention."**
Low use, metered, mature couple

**"It's partial inertia – if someone hands you something you're more likely to use it. If I go to the shop, water devices aren't a priority."**
Low use, metered, elderly single occupant

Upfront cost was also a key aspect of this competing priorities view, with many feeling that their household budget was required elsewhere. This was particularly linked to the potential impact that these changes could have on their bills. Participants tended to see expenditure on water supply as a secondary concern when compared with energy, typically because of the comparative cost, and so the attractiveness purely in terms of returns on investment may be missing. However, many water efficient actions are effectively free, and even showerheads and toilet retrofits are often provided free of charge. When people spend money on refurbishing bathrooms or kitchens – key trigger points to promote water efficient fittings and appliances – the efficiency of devices may still not be a primary concern. Aesthetics and functionality are the priorities.

**"Water's not really up there on my list of things to worry about. Turning lights off and heating down will make a significant difference to my bills, whereas turning the tap off won't."**
Low use, unmetered, mature couple with two children

**"As a landlord working to the bottom line it's hard to find the cash for water or energy saving – especially as I'm not always paying the bills. If there's not added cost implication, or negligible – 10%, otherwise it's not really considered."**
Medium use, unmetered, mature mixed rental

**"It's what it looks like that's the big thing. I was slightly aware when re-fitting my house but it's very much the design, working efficiency, reliability, cost factor, that are more important. But as a secondary thing, saving resource is absolutely a good thing – just needs to come as part of a whole package."**
Medium use, unmetered, mature family

Whilst there is a strong case for the co-ordination of water and energy saving initiatives, it tends to focus on the resource-saving benefits from reductions in hot water. There may be other ways in which energy efficiency outcomes, such as affordable warmth, cross-over with water saving efforts. Some of our interviewees described the "warmth" that they felt when taking a shower or bath relative to the general warmth of their house, and this may be an under-recognised necessity or priority for households.

**"The house is so cold that my shower is the best bit of the day because I'm warm. I'm probably in there for 10 minutes, maybe longer, because I actually feel so relaxed."**
Low use, metered, mature family

Hot water plays a role in the thermal comfort of some households. It helps them to cope with an inadequately heated or insulated home. There is strong evidence linking living at cold temperatures to risk of poor health[14], particularly amongst the elderly, young children and those with existing health conditions. Schemes that target reductions in hot water use need to be sensitive to this, particularly in households where space heating may be inadequate. Where these coping mechanisms are important, it may be that the potential to reduce hot water consumption can be unlocked only when other causes of deficiencies in thermal comfort have been addressed.

[14] See for example Marmot Review Team, The Health Impacts of Cold Homes and Fuel Poverty (2011)

### 6.2.3 Imperfect solutions

Many participants cited problems with unsuitable water efficient technology as a barrier, either because of incompatibility with their homes and requirements, or because of poor durability and working efficiency. A number of interviewees described faulty equipment that they had bought or received for free including showerheads and timers, water butts, trigger hoses, and a cistern displacement device. In many cases, for example the trigger hose, the issue seemed to be a misunderstanding or a misrepresentation of the device; this householder had left the tap on at the wall and was using the trigger as the primary shut-off mechanism. The majority of those that had problems with installed equipment, whether free or otherwise, had not sought to replace it. This indicates that whilst households may be willing to try something new, they might not remain engaged following an unsatisfactory experience.

**"The shower's funny – it leaks everywhere due to curtain so we just take baths."**
Low use, metered, older single mother with adult son

**"We had an eco-showerhead but it didn't work properly – too many issues with the flow rate."**
Medium use, unmetered, older couple

**"Used to have a [toilet displacement] bag in the toilet but it broke so we took it out and haven't replaced it."**
Medium use, unmetered, older single person

**"Want a proper water butt kit that works, the current kit is feeble."**
High use, metered, elderly couple

Many had also tried equipment, or searched for it, that could not be installed within the specifications of their home. For example, one household with an original 1930s' bathroom was unable to identify water-saving solutions that would allow them to keep their original bath tub. Aside from sentimental attachment, the monetary value of potential water efficiency savings is unlikely to be sufficient motivation for a household to take on the considerable up-front costs of fully retrofitting a bathroom. This household felt that this left them with no options.

**"We can't fit a dual flush to our old style toilet, and we can't find a modern toilet that fits our bathroom."**
High use, metered, elderly couple

**"We have a small dishwasher – but everything might not fit, it overheats, and if items aren't separated they come out dirty and have to be re-washed, wasting more water."**
Medium use, unmetered, mature couple with one child

Some interviewees also expressed concerns about eco-settings on dishwashers or quick cycles on washing machines, in particular that eco-dishwashers did not achieve the desired cleanliness so that some tap rinsing was also required. Householders, particularly in rental properties, may have very little control over the size and performance of their white devices. This is likely to influence their water-using behaviours – for example, washing by hand more often, or rinsing dishes before loading the dishwasher.

### 6.2.4 Information gap

Some participants felt that a lack of supporting information and guidance was a barrier to their ability to identify and adopt water-saving actions. This included issues with identifying appropriate actions, differentiating between options, and understanding how to use devices effectively. The ability of householders to identify water saving action relevant to their own circumstances varied substantially across our study sample. This points to an ongoing requirement for information and advice campaigns to reinforce these messages.

**"It's hard to see where we could make changes. I'm not aware enough of it and don't see that type of information at all. For someone like me who's not that interested it's difficult, needs to hit me directly."**
Medium use, metered, three-person family, young child

A misunderstanding of how to use or install a device was particularly raised with respect to dual flush toilets and water butts. A number of participants admitted that they did not understand how to use the dual flush buttons on their toilet, and in particular some parents felt these were difficult for children to use. In many cases whilst households had, or had inherited a water butt from the previous owner, they didn't know how to install it and so it remained unused.

**"I had no idea about the two buttons on the loo – I just push them both down."**
Medium use, metered, elderly couple

A further area where information provision was deemed unsupportive was in the way in which it helps householders to understand and evaluate their consumption. For many, billing was identified as overly complicated and was not felt to provide useful comparisons or metrics by which households could assess their level of usage; litres were not seen as easy to interpret.

**"I've got no idea how much my devices use. Bills are too complicated and not written in plain English – you'd need to be Stephen Hawking to understand them."**
Medium use, metered, mature couple

**"It's not clear on efficiency labels whether it's energy or water or both?"**
High use, metered, young family with one child

### 6.2.5 Physical constraints

Constraints imposed by physical features of their property and tenancy arrangement also posed a barrier for many households we spoke to. Participants in rental properties in particular identified a lack of control over options and an unwillingness to invest.

**"If it was our own place we'd have more efficient things but we aren't in control of that so just live with what's here. We haven't investigated it much due to tenancy and house type."**
Low use, metered, mature family with two kids

Particular idiosyncrasies with properties and their fittings can also restrict options. For example, installation of a water butt requires access to a suitable down-pipe from the roof, as well as the ability to undertake the necessary installation actions. Whilst many of our study households had water butts in their gardens, they were often not plumbed correctly. Many collected water not from the largest surface area (the roof), but instead from places where they were easier to install such as the garden shed.

**"No access to the down pipe on our property so couldn't install a water butt."**
High use, unmetered, mature couple with two children

Older properties with original plumbing systems, fittings or appliances may be difficult to retrofit with generic devices designed to conform to modern specifications. An area commonly identified as water wasting by householders was running the tap whilst waiting for hot water, or the "dead leg". Knowing how to deal with this was an issue for householders.

**"Aware of running the cold water for it to become hot – longer than I'm quite comfortable with. The house used to have a back boiler, so pipes go on a circuitous route around the house."**
Medium use, metered, mature couple

### 6.2.6 Personal circumstances

Participants identified a range of personal circumstances, including age, health, culture, religion, and occupancy, as barriers to reducing their water consumption. Whilst our sample of 45 interviewees captures only a snapshot of the diversity that exists in UK households, a range of different aspects were encountered. Certain water-using activities are necessitated by personal circumstances and cannot be reduced or substituted – for example, warm baths for health treatments or washing as part of cultural or religious practice – and it is important that water saving messages and opportunities recognise these. Smaller households, particularly single occupancies, described difficulty in filling the washing machine or dishwasher because they do not get through as many clothes or dishes, so these may run less efficiently than where there are more occupants.

**"My health issues mean showering and washing clothes is important, but it's just me so it would take time to fill the washing machine."**
High use, metered, elderly single occupant

**"When I'm ill I feel the cold much more and need hot baths."**
Medium use, unmetered, older single occupant

**"As Muslims we have to pray five times per day which requires ablution – so our usage is probably higher than normal."**
Medium use, metered, elderly couple

Inertia in making more permanent decisions can be caused by personal factors. For example, if a household envisages moving home in the near future it may not be seen as worthwhile for them to make permanent decisions such as switching the property to a meter, or installing a modern efficient bathroom. This was particularly identified by elderly households as a reason why they would not consider undertaking major actions.

**"I can't see anything really in our lifetime that we would invest in. Lots of things you'd like to do but it's not really worth your while. Even if you do, then immediately when new people come in they don't want it your way – you're old fashioned, they want something modern."**
Low use, metered, elderly couple

### 6.2.7 Negative perceptions

Few participants held negative views towards water efficient devices or actions that they felt were a barrier to them taking. These respondents questioned whether water saving actions would make a discernible difference – either in living up to claims to save on their own utility bills, or in furthering wider resource conservation efforts. As discussed in Section 5.1.3, individuals may perceive that their own personal actions can have little environmental or social impact when compared with water losses in supply systems. This may also be built on aspects of section 6.2.3 for those who have had disappointing experiences with water efficient equipment.

**"My husband is pessimistic that efficient devices would make a difference – need to see proof that they will save money."**
Medium use, unmetered, mature couple with one child

**"I've always been a bit cynical about save water campaigns as so much of it gets lost through the pipes anyway."**
Medium use, unmetered, mature couple with two kids

### 6.2.8 Summary of barriers

Every householder we spoke to could identify aspects of their home and lifestyle that might present challenges to water saving actions. Whether these were factors outside of their control, or within the sphere of their personal decision making, an understanding of these provides a useful foundation for designing successful domestic water efficiency interventions.

A commonly identified barrier was that water saving actions would involve some lifestyle compromise – either in terms of its necessity for daily activities, or in impacting more luxury practices. As a utility and a resource, cost was not the primary concern to participants and so any perceived impact on practices may outweigh financial merits.

It is difficult to provide water efficient devices for every type of bathroom fitting and so imperfect solutions are likely to remain an issue for some households. However, a number of participants reported problems with water efficiency equipment that had not performed as expected. This appeared to be demotivating for many. An unsatisfactory experience is a likely disincentive to try an alternative. There are implications of this for low-cost, high-volume water efficiency interventions that seek to distribute cheap and easy water saving devices en masse.

However, in support of easily accessible and cheap water efficiency devices, a number of participants identified that there were too many competing priorities for their time, money, and interest for them to be meaningfully proactive in saving water. Measures such as a cistern displacement device, or a low-flow showerhead, that can be installed and then forgotten about, may be a good way of counteracting this inertia.

A lack of access to sufficient supporting information was also raised. This is important for providing and reinforcing knowledge of water consumption, and supporting an ability to identify and undertake suitable actions. One particular issue was the number of households that described confusion around dual flush toilets. This is both an issue of education at the point of installation and use, as well as around the design: there are many different varieties. For a dual flush to realise its potential the householder must use it correctly, and so this may be an area for further attention.

Finally, a range of more permanent barriers were identified – either in the construction and set-up of the house, or in resident circumstances and characteristics. To achieve long-term shifts in water-use practices it is important that appropriate opportunities to participate and make changes are identified across different cultural and demographic groups, as well as technical solutions developed for different house types.

## 6.3 Responses to meters

There are many established motivations behind the drive to install water meters in domestic properties, as well as a number of known ways in which a switch in billing will impact a household. This includes distributional impacts, for example the financial risk to low-income households in low rateable properties with high usage. However, the response of an individual to voluntarily or compulsorily switching their billing type may also include wider considerations beyond the up-front cost comparison.

In this section we present the views of our study sample on meters, gauging their basic level of understanding and identifying challenges. These may be things that they have experienced when switching to a meter, or reservations and perceptions that they have if they have not previously been billed in this way.

Participants were asked:

- What are your thoughts about water meters as the way to monitor and pay for water use?
- Do you think that it is better for households to pay a fixed rate for water, or for what they use?

For the discussion provided here, "meter" refers to a meter where the household pays for a measured amount by a volumetric tariff and not a fixed rateable amount, and not to any other type of water meter or monitor. Whilst all households in our study sample did have a volumetric meter installed, at the time of the study not all of them were being, or had been, charged on this basis (see section 2.1).

Interviewee responses were analysed and coded thematically. The following sections expand on each of these in turn, focusing on why these were important to participants.

### 6.3.1 Cost

A common theme raised with respect to water meters was cost. In general the ambiguity about comparative costs and the lack of guarantee about costs once a household switches were viewed as barriers to uptake. Some interviewees viewed meters as a more expensive way to be billed for water – regardless of considerations about potential usage or household size. A number of households were interested in seeing an estimate of how much their bill might be if paying for a meter, but did not know how to access this information[15].

**"Does it really save you money? – households already struggle with bills so it's an extra problem."**
Medium use, unmetered, mature couple with one child

**"I don't think it would save very much compared to the worry. Seems very hard to give more accurate information, but if I'm going to be paying more then I want more information on my usage broken down - more than just 6 months 'here's your bill'."**
Low use, unmetered, mature couple with two children

**"I pay what I pay and water isn't a high priority; it's peripheral. Although having said that I would be interested in seeing a metered bill."**
Medium use, unmetered, mature couple with two children

**"It's something we'd never do. I think the majority don't like meters as it will cost them far more."**
Medium use, unmetered, older couple

[15] This is despite the existence of freely available water meter bill estimators such as that provided by the Consumer Council for Water, available at http://www.ccwater.org.uk/watermetercalculator/

For those households that had switched to a meter, cost also provided some interesting discussion. Some households that had achieved substantial reductions to their water bills described how cheap they felt their bills were, without their adopting any additional measures to manage their bills, to the extent that they worried far less about their water consumption. There may be the potential for some rebound effect in consumption whereby the householders expand their consumption to fill the space in their household budget allocated to water utility bills; or increase consumption elsewhere in their household budget. Whilst this study is unable to empirically explore this, the possibility that below-average users increase their consumption when switching from fixed to volumetric charging should certainly be of interest.

**"Changed to a meter and bills went down a lot – from £240 to £60 for half a year. A neighbour round the corner told me to do it, said I'd be silly not to."**
Low use, metered, elderly single occupant

**"We weren't metered at old house but are now, if we'd known in advance how much cheaper it would be. Initially the bills were similar, but then we found a leak and it's now a fraction; still in credit as was TW responsibility."**
Low use, metered, mature three person family

### 6.3.2 Awareness

A number of interviewees felt that water meters would raise awareness of personal water consumption. The majority of householders were able to explain that without a water meter there were limited incentives for a householder to save water – specifically because these actions couldn't reduce their bills. There was a strong level of appreciation that whilst a meter might not have a private benefit for all households, there was a link between paying for what you use and taking responsibility for your consumption.

**"I think it's pretty ridiculous, a waste of time, to urge you to save water if you're not being charged for what you use."**
Medium use, metered, elderly couple

**"Can't disagree with universal metering – would be good and encourage people to save water; since going on a meter I think of it more."**
Low use, metered, elderly single occupant

**"Need to educate people because some households might get a real shock. The cost will be what it is, but if it's too much then people need to know how they can play with this."**
Low use, unmetered, mature couple

### 6.3.3 Risk

Some interviewees felt that paying by meter involved some risk. Switching to a meter removes the capping effect of rateable bills and places the responsibility for the size of the bill on household actions. Those with experiences of where leaks, or taps left on when the house is unoccupied, have generated high one-off bills were particularly aware of this risk. Without adequate feedback and information it may be difficult to identify where a leak, or particular areas of high consumption, may be affecting bills.

**"When we moved in we had a leak from a punctured pipe but didn't realise – water bills were higher and we couldn't claim it back."**
Low use, metered, older couple

**"We've previously left the hose on all night and the bill was very high. There just isn't enough time to remember all this stuff and it's easy to forget."**
High use, metered, young family with one son

**"A friend of mine was away for a couple of weeks and left the tap running. They came back to a huge bill."**
Low use, metered, elderly couple

A further area where householders expressed worry was in terms of potential prices changes. Particular comparison was made to energy bills for which householders are more accustomed to variable tariffs, and which are often negatively associated with price rises. This was further compounded for some households by a concern that households with a meter were less attractive to prospective buyers. One elderly couple, who would benefit financially by switching to a meter, were worried that locking in to this would affect the value of their property when they came to sell it to a larger family.

**"I've never been attracted to it. When we all have a meter they can put bills up much more easily like with energy."**
Medium use, unmetered, older couple

**"Big negative is the risk of people's bills going up. My fear is that they're locking you into something – once you've got one, you've always got one."**
Medium use, unmetered, older single occupant

**"At some point the house will need to be sold and it's the next person who comes in who'll be lumbered with it."**
Low use, unmetered, elderly couple

### 6.3.4 Unknown

A number of interviewees discussed the unknown aspect of water meters, and a lack of supporting information. Whilst links were made by some householders to other bills that are paid on a variable amount – such as energy, car fuel, or pay-as-you-go mobile phone contracts – feedback on water consumption has traditionally been less frequent. It was identified that communications and updates on water consumption should be frequent enough to allow households to plan their budgets, which for many was monthly. One household used the example of a car fuel meter, by which they can very clearly see the remaining fuel available for consumption and so take a more active role in budgeting within this.

**"In a car you have a petrol meter so you know how much you've used and can estimate whether this fits your budget. But I'm in the dark for 6 months of the year so can't make that comparison."**
High use, metered, elderly single occupant

**"The meter's outside though and it would worry me not to see how much I'm using – I'm not going to bend down on the pavement and pick it up all the time."**
Medium use, unmetered, mature couple with two children

**"Have never really investigated it, being a layman I'm not sure what it's telling me – just a random string of numbers."**
Low use, metered, mature couple with two children

Many felt detached from their water meter and unable to access it to check their consumption. The physical location of the meter, and potential access difficulties, mean that householders get feedback on their consumption only when the water company provides it – typically when billing. This is unlike other areas of variable payment where instant updates are more readily available, such as a car fuel gauge, mobile phone online account, or in-home energy display. This may make meters seem a riskier option even if people are well acquainted with the payment system.

### 6.3.5 Occupancy

Occupancy, and in particular its relationship with the size of the house, is key to determining whether a household is likely to see bills increase or decrease following a switch. This raised two concerns amongst two subgroups of our study sample – those with medium to large occupancies and those where occupancy is likely to vary.

Some interviewees assume that small families living in larger homes, particularly with spare rooms, are best placed to see a reduction in their bills with volumetric billing. However, the situation was felt to be less clear for those with larger families and no spare rooms, whose volumetric bills are likely to be far closer to or larger than the rateable amounts.

**"For a big family, even if they're water conscious, they may use quite a lot more than average – need a sliding scale to demonstrate value to them."**
High use, metered, elderly couple

**"We seem to be on the cusp – indicated to us that as a family of four it might save you money but it might not."**
Low use, unmetered, mature couple with two children

A second aspect of occupancy highlighted by our study sample is that it is not static. Households that are likely to see an increase in occupancy, or may want to in future, tended to be unmetered as they were reserving the option to consume more, or consume differently, in future without worrying about how these choices would affect their bill. This also highlights issues around advice that is generated based on consumption at one point in time – for example, two households were removed from our analysis in section 4 because of dramatic changes in occupancy during the study period.

**"I might be getting a tenant for the spare room, and then the usage would go up. What if the new tenant had a very different lifestyle?"**
Medium use, unmetered, older single person

**"It's a mixed rental with lots of changing tenants so I like the freedom of not having to worry about how much they're using."**
Medium use, unmetered, mature mixed rental

### 6.3.6 Fairness

Water meters are often promoted as a "fairer" way to pay. A number of households we spoke to expressed this sentiment, unprompted, with a split across those currently using meters and those not.

**"It's the fairest way, not different to anything else. Not having meters is like saying – 'you don't have to bother paying for petrol, just fill up whatever you want'."**
High use, unmetered, older family with two children

**"We've just moved into the home and are sticking with the meter on a moral point – if you use water excessively then you should be the one paying for it, it's only fair to take responsibility."**
High use, metered, young family with one child

**"Fair in one sense as you're paying for what you use – but possible unfair on poorer, larger families in smaller houses who might lose out."**
Low use, metered, elderly single occupant

### 6.3.7 Lifestyle

Whilst lifestyle compromise was the most commonly identified barrier to water efficiency, it was not as frequently discussed in relation to water meters. Linking with the observation that volumetric charging meant the cost repercussion rests with the user, a few households felt that this would introduce additional "worry" into areas of consumption where they previously had none, potentially reducing the enjoyment of certain practices.

**"Because we water the garden we want that extra leverage instead of being afraid to actually water the garden."**
High use, unmetered, mature couple

**"Don't think it will save very much compared to the extra worry. We already have to worry about everything else, like heating, but we've never had to worry about water. People my age aren't ready yet to pay for it differently to how it's always been."**
Low use, unmetered, mature couple with two children

**"Totally against it, it affects your quality of life if you can't do something because of the cost – we'd worry that we couldn't use the hose or take a bath."**
Medium use, unmetered, older couple

### 6.3.8 Summary

We encountered a range of views on meters in our study group. Of particular interest are the experiences or perceptions that may act as barriers to installing a meter, or that may be an unintended negative consequence of installing a meter.

Many households worried about the potential cost of their bills should they switch to metered billing, and are concerned about the permanence of switching. It was identified that switching to paying volumetrically opens the risk of a very large, and uncapped, bill if consumption is unusually high.

One commonly cited disincentive to pro-actively switching is the permanence of the switch. Whilst a meter might be cost-effective for a particular household at one point in time, this may change if more, or different, people move in. This may be particularly the case where occupancy is likely to change, for example rental properties or for those looking to move. However, many water companies will install a water meter when occupancy changes, and so this is an unnecessary consideration.

More regular feedback on consumption may help to overcome some of the "unknown" aspects of a pay-as-you-go type approach. For example, this would help those whose budget is on a monthly basis to plan payment of their water bill. Householders may also benefit from tools that can help them to evaluate their consumption, but awareness was low about where to access these.

# 7. Closing summary

In this paper we present a snapshot of water use behaviours and practices in the UK: we uncover some early insight into how accurately households may be able to self-report on their water consumption, and we analyse qualitative householder experiences with water use and efficiency.

At an average the Water Energy Calculator modelled results do closely correspond with those observed in micro-component monitoring exercises, including this study. However, individual households may not be able to accurately self-assess and report on their water-use behaviours. In particular, individuals were often not able to accurately estimate the number of showers and baths taken by their households, and toilets were not commonly identified as a high water user. Tools to help householders self-assess their consumption may need to provide additional guidance to help them do so, particular in these key high-use areas.

A number of barriers to adopting water saving measures have been identified amongst our study sample, including a perceived negative impact upon the lifestyle and choices of a household; and water efficiency is often not a high priority for time or money. Cost saving was not strongly identified as a driver for action, particularly when water is compared with other more expensive bills such as energy.

Households have instead described to us other ways in which they value water, and these might be exploited in messaging to engage households. There are also aspects of water supply and availability, in particular the impact of weather and infrastructure, which cause uncertainty among householders. Educating households about these may enable them to understand the context of their own use. It may also allow us to communicate reasons other than cost to help to save water.

# Appendices

## A1 Study sample characteristics

Table 12 Number of occupants in participating interview households

| Occupancy | Sample Count | % Sample | % UK |
|---|---|---|---|
| 1 person | 6 | 13% | 29% |
| 2 person | 12 | 27% | 35% |
| 3 person | 13 | 29% | 16% |
| 4 person | 12 | 27% | 14% |
| 5 person | 1 | 2% | 4% |
| 6 person | 1 | 2% | 2% |
| Dependent children | 17 | 38% | 29% |
| Average | 45 | 2.84 | 2.37 |

Table 13 Economic activity of participating interview households

| Economic Activity | Sample Count | % Sample | % UK |
|---|---|---|---|
| FT | 26 | 58% | 43% |
| PT | 2 | 4% | 9% |
| Unemployed | 2 | 4% | 3% |
| Inactive | 15 | 33% | 33% |
| Student | 0 | 0% | 1% |
| Retired | 14 | 31% | 25% |
| Long term sick | 1 | 2% | 4% |

Table 14 Tenure and billing characteristics of participating interview households

| Property Character | Sample count | % Sample | % UK |
|---|---|---|---|
| Owner-occupier | 38 | 84% | 64% |
| Private rental | 4 | 9% | 18% |
| Social rental | 3 | 7% | 18% |
| Metered bills | 27 | 60% | 42% |
| Rateable bills | 18 | 40% | 58% |

Table 15 Lifestage of participating interview households

| HRP Lifestage | Size | Children | No Children | Total |
|---|---|---|---|---|
| Young (under 35) | Single | - | 0 | 1 |
| | Multi | 1 | 0 | |
| Mature (35 to 54) | Single | - | 0 | 22 |
| | Multi | 15 | | |
| Older (55 to 64) | Single | - | 0 | 8 |
| | Multi | 1 | | |
| Elderly (65 and over) | Single | - | 7 | 14 |
| | Multi | 0 | | |
| | Total | 17 | 28 | 45 |

# A2 Overview of Identi*flow* results

These are the results from the 58 properties monitored and analysed by Identi*flow* micro-component analysis. Note: values may not match those in main body of report where sub-samples have been used for analysis.

| | |
|---|---|
| Number of properties monitored: | 58 |
| Location: | London, UK |
| Dates of monitoring: | 10/10/2013 to 12/01/2014 |

**Table 16 Aggregate consumption details of monitored properties**

| | Obs | 10% | Median | Mean | 90% |
|---|---|---|---|---|---|
| Average PHC litres | 58 | 165 | 365 | 387 | 617 |
| Percentage unallocated* | 58 | 0% | 4% | 11% | 34% |
| Number of flow events (per hh per day) | 58 | 28 | 84 | 111 | 139 |

*the proportion of observed volume that could not be confidently attributed to a particular water-using device

**Table 17 Summary of monitored micro-component volumes**

| | | Average daily volume (litres per household) | | | |
|---|---|---|---|---|---|
| Device | Obs | 10% | Median | Mean | 90% |
| Bath | 28 | 9 | 32 | 51 | 102 |
| Shower | 53 | 17 | 57 | 86 | 185 |
| Toilet | 58 | 28 | 62 | 74 | 132 |
| Taps | 58 | 21 | 92 | 113 | 183 |
| Dishwasher | 40 | 4 | 10 | 10 | 18 |
| Washing Machine | 56 | 9 | 29 | 33 | 58 |

**Table 18 Summary of monitored frequency of use**

| | | Average daily frequency (events per household) | | | |
|---|---|---|---|---|---|
| Device | Obs | 10% | Median | Mean | 90% |
| Bath | 28 | 0.10 | 0.48 | 0.68 | 1.36 |
| Shower | 53 | 0.72 | 1.40 | 1.75 | 2.90 |
| Toilet | 58 | 3.35 | 10.40 | 11.16 | 17.85 |
| Taps | 58 | 19.24 | 67.85 | 75.30 | 110.31 |
| Dishwasher | 40 | 0.21 | 0.79 | 0.70 | 1.29 |
| Washing Machine | 56 | 0.22 | 0.57 | 0.65 | 1.11 |

**Table 19 Summary of monitored device statistics**

| Device statistic | Obs | 10% | Median | Mean | 90% |
|---|---|---|---|---|---|
| Bath volume (litres/event) | 28 | 58.0 | 78.7 | 83.3 | 105.8 |
| Shower flow rate (litres/minute) | 35* | 4.8 | 6.8 | 6.9 | 9.7 |
| Shower duration (minutes/event) | 35* | 5.6 | 7.5 | 7.7 | 10.8 |
| Shower volume (litres/event) | 53 | 26.3 | 44.4 | 50.5 | 87.0 |
| Tap flow rate (litres/min) | 58 | 2.1 | 3.2 | 3.1 | 3.9 |
| Toilet volume (litres/flush) | 58 | 4.1 | 6.6 | 6.8 | 9.4 |
| Dishwasher volume (litres/cycle) | 40 | 10.2 | 13.4 | 14.5 | 20.2 |
| Washing machine volume (litres/cycle) | 56 | 32.8 | 51.9 | 50.4 | 66.9 |

* Indirect feed showers removed from this analysis

# A3 Overview of Water Energy Calculator results

As of July 2014, 159,343 useful responses had been collected through the online Water Energy Calculator. Refreshing the results of the first At Home with Water report, a summary of analysis of these, relevant to this second report, are presented here.

**Table 20 Household size of respondents to online Water Energy Calculator (n=159,343)**

| Household Size | Count | % |
|---|---|---|
| 1 person households | 29,985 | 19% |
| 2 person households | 70,279 | 44% |
| 3 person households | 26,060 | 16% |
| 4 person households | 22,337 | 14% |
| 5 person households | 7,109 | 4% |
| >6 person households | 3,573 | 2% |
| Average household size | 2.49 | people |

**Table 21 Billing method of respondents to online Water Energy Calculator (n=159,343)**

| Billing method | Count | % |
|---|---|---|
| Metered bills | 69,945 | 44% |
| Rateable bills | 89,398 | 56% |

**Table 22 Frequency of actions reported to online Water Energy Calculator (n=159,343)**

| Action | Count | |
|---|---|---|
| Take showers | 137,625 | 86% |
| Average frequency* | 4.64 | per person per week |
| Average duration | 7.50 | minutes per shower |
| Take baths | 93,451 | 59% |
| Average frequency* | 4.64 | per person per week |
| Use washing machine | 148,490 | 93% |
| Average frequency* | 4.7 | per household per week |
| Use dishwasher | 75,082 | 47% |
| Average frequency* | 5.5 | per household per week |

* Frequency is for only those who report using the device at least once per week (taken as a reasonable proxy for ownership

## A4 In-home interview script

Table 23 Interview skeleton script used for in-home interviews

| | |
|---|---|
| 1 | The Household |
| 1a | Along with yourself, who lives here at the moment? |
| | [Note age, gender, occupation, ethnic background of respondent and of household; note relations; note any recent changes in occupancy; focus on permanent residents] |
| | How many people live here on a permanent basis? |
| | Gender of residents |
| | Ages of residents [use broad cohorts below] |
| | 0-15; 15-24; 25-44; 45-64; 65+ |
| | What does each person do? [generally] |
| | Ethnic background [broad groups below] |
| | White British; Other White; Mixed background; Indian; Pakistani; Bangladeshi; Other Asian Background; Chinese; Black Caribbean; Black African; Other Black background; Other ethnic group |
| 1b | Is somebody usually at the house during the day? (e.g. Mon-Fri; 9-6) |
| | Retired, young children, unemployed, work from home |
| 1c | Do you own the home, or are you renting? |
| | Owner occupier; private rental; social rental |
| | How long have you lived here? |
| 1d | Who in the house is generally responsible for managing/paying bills? |
| | Water; energy; other bills |
| 1e | How old is the property? [may be identified by interviewer] |
| | Age of property; type of property; outdoor space |
| 2 | Awareness |
| 2a | How would you describe water usage in your household? |
| | Do you think you use more or less than the average household? Why? |
| | When going about your daily routine, are there particular times or activities when you think about how much water you're using? When do you think you use the most water? |
| | Do you think the different members of your household use water in different ways? |
| 2b | Do you think there is a need to conserve water in your area/London/UK? |
| | Can you broadly describe why you think there [is/is not] a need? |
| | Who do you think is responsible for addressing this? |
| | Do you ever worry about the amount of water you use? |
| | What about energy, is this important to conserve? Would you say this is more or less important than water? |
| 3 | Water saving actions |
| 3a | Do you, or anyone in your household, do anything particular to manage the amount of water you use? |
| 3b | Have you ever installed a device, or chosen a product or device, to try to reduce the amount of water you use? |
| | Have you ever changed a behaviour or routine to try to reduce the amount of water you use? |
| | What did you install? Was it free or did it cost money? How much? |
| | What made you decide to install/choose [...]? |
| | Did you feel it was worthwhile/successful? In what way? |
| | Do you still do use/have [...]? If not, why did you stop? |
| 3c | What about your energy use, or any other bill you pay, have you ever taken any steps to reduce this? |
| | What were they? |
| | What made you decide to take [...] step? |
| | Did you feel it was worthwhile/successful? In what way? |
| | Do you still do/use [...]? If not, why did you stop? |
| 3d | Thinking about the activity where you currently use the most water, how do you think this could be reduced? |
| | Would any particular way be preferrable |
| | Can you think of anything that might prevent you adopting this change? |

| | |
|---|---|
| | What sort of positive or negative effects might this have on your lifestyle? |
| | Where do you think you could make a reduction with the least impact on your day-to-day lifestyle? |
| 3e | **Have you ever tried anything 'radical' or 'a little bit funny' to try to reduce your water or energy use?** |
| | Can you think of anything outrageous that you or other people might try, or that you have heard of elsewhere? |
| 4 | **Communication & Advice** |
| 4a | **Where would you go for advice on... home improvements, utility bills, water/energy saving?** |
| | What channels do you normally use for information or advice? |
| | What sort of information most captures your attention? Which sources do you proactively go to? |
| 4b | **Do you remember receiving water saving advice or education from anywhere in the past?** |
| | Where was this from? |
| | Do you remember what it said? |
| | Did you take any action in response? |
| | Have you ever heard any advice that you thought would lead to wasting water? |
| 4c | **What sort of advice would you like to have received on water (or energy) efficiency, if any?** |
| | Where/when would you like to receive this from? Who would you most trust to provide it? |
| | Would you prefer information on these to be provided at the same point of contact or from separate sources? |
| | What sort of advice and information do you think would work best to encourage people to use water more carefully? |
| 5 | **Intervention Programmes** |
| 5a | **What are your thoughts about water meters as the way to monitor and pay for water use?** |
| | Do you think that it is better for households to pay a fixed rate for water, or for what they use? |
| 5b | **What would your views be on everyone being made to switch to metered water use?** |
| | What might be some good or bad outcomes of this? |
| | Can you think of any problems that this would cause for your household? For others in your neighbourhood? |
| | What sort of information do you think would help you feel comfortable about having a water meter installed? |
| | What sort of incentives or benefits would encourage you to view this more favourably? |
| 5c | **Would you be interested in having more information on your water use available to you?** |
| | Do you think this would help you reduce/improve your water using activities? In what way? |
| | What sort of information would help you? - cost; usage by device; usage by time/day; tailored advice for your household |
| | How would you like to receive this information? - online portal; in-home display; paper bill |
| | Would you be more likely to use this if it was in combination with your energy use? |

## A5 Water Energy Calculator survey script

Table 24 Water Energy Calculator script and response options

| Number | Question |
|---|---|
| 1 | How many people live in your home?<br>1-20 |
| 2 | How do you heat your water?<br>Electricity; gas; solid fuel; oil; biomass; LPG |
| 3 | Do you have an A rated boiler?<br>Yes; no; I don't know |
| 4 | Do you have a water meter?<br>Yes; no |
| 5 | Which water company are you with?<br>[all alphabetical] |
| 6 | How many times do you use your washing machine per week?<br>1-20+ |
| 7 | What temperature do you generally wash your clothes at?<br>30; 40; 60; 90 |
| 8 | What is the energy rating of your washing machine?<br>A+: A: B or below; I don't know |
| 9 | Do you fully load the washing machine before using it?<br>Yes; No |
| 10 | How many times does your household use the kettle each week?<br>0-50+ |
| 11 | Do you boil more water than you need?<br>Yes; No |
| 12 | How many times does your household wash up by hand each week?<br>0-30+ |
| 13 | Do you use a bowl for washing up?<br>Yes; No I use a running tap |
| 14 | How many times do you use your dishwasher per week?<br>0-20+ |
| 15 | How old is your dishwasher? (bought before or after 2000)<br>Pre 2000; post 2000; I don't know |
| 16 | Do you use the eco setting? (If dishwasher is post 2000)<br>Yes; No |
| 17 | Do you fully load the dishwasher before using it?<br>Yes; No |
| 18 | How many baths does your household take per week?<br>0-30+ |
| 19 | Do you fill the bath up every time you use it?<br>Yes; No |
| 20 | What kind of shower do you have?<br>Power; Electric; Standard; None |
| 21 | Do you have a low flow or eco shower head (not suitable for electric showers)?<br>Yes; No |
| 22 | How many showers does your household take per week?<br>0-30+ |
| 23 | How many minutes, on average, does one shower last?<br>0-30+ |

| Number | Question |
|---|---|
| 24 | Do you leave the tap running when you clean your teeth?<br>Yes; No |
| 25 | Do you ensure taps are fully turned off to prevent drips?<br>Yes; No |
| 26 | When was your toilet manufactured?<br>Pre 1940; 1940-1980; 1980-2001; After 2001; I don't know |
| 27 | Does your toilet have a dual flush mechanism?<br>Yes; No |
| 28 | Do you use a toilet displacement device (water hippo etc...)?<br>Yes; No |
| 29 | Do you have a car?<br>Yes; No |
| 30 | Do you use a hose to clean your car?<br>Yes; No I use a bucket and sponge |
| 31 | How many times do you wash your car at home each year?<br>0-100+ |
| 32 | Do you have a garden?<br>Yes; No |
| 33 | Do you use the hose to water the garden?<br>Yes; No |
| 34 | Do you have a trigger operated spray gun for your hose?<br>Yes; No |
| 35 | Do you own a water butt?<br>Yes; No |
| 36 | Do you use the water collected in your butt in the garden, to wash the car etc?<br>Yes; No |

## About the Energy Saving Trust

We're here to help people save energy every day, whether at home, when travelling or in work. We also help organisations and businesses help their customers.

We're independent and impartial so the advice we give is all about helping you.

## What we believe in

Climate change is a major threat to mankind, fuel bills continue to rise and our reliance on imported energy continues to grow. The UK is committed to achieving an 80 per cent reduction in carbon emissions by 2050. To address these challenges we all need to reduce our energy consumption and accelerate a move to sustainable, low carbon lifestyles.

## Two decades of unparalleled experience

We've developed into one of the leading, and most trusted, organisations in our field. Our experts speak with millions of householders every year, deliver first class programmes for governments and provide consultancy to UK businesses and international companies that want change to happen. All that we do is underpinned by our pioneering world-renowned research.

We would like to thank our funders of At Home with Water 2:
Defra, P&G, Thames Water, Consumer Council for Water, and Save Water Save Money.

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