WATER: The 2009 progress report on reducing water usage on construction sites

Sept 2011

Prepared by Carmen Waylen on behalf of the Strategic Forum for Construction

A contribution to delivering the targets in the joint government and industry Strategy for Sustainable Construction
WATER: A progress report on reducing water use on construction sites


This progress report was prepared by the Strategic Forum Water Subgroup: www.strategicforum.org.uk

The progress report has received funding support from WRAP.

WRAP (Waste & Resources Action Programme) is backed by government funding and aims to help business and individuals to reap the benefit of reducing waste, develop sustainable products and use resources in an efficient way. www.wrap.org.uk

The chief researchers for the report were Carmen Waylen and Huw Williams of WRc plc www.wrcplc.co.uk

Contributions have been provided by the UK Contractors Group, Glenigans and Mabbetts and Associates.

The “Delivering the Strategy Targets” series was initiated by Jane Thornback of the Construction Products Association. The Association is the umbrella body for construction product manufacturers and merchants. www.constructionproducts.org.uk
This progress report has been developed to ascertain the progress of the construction industry in reducing the volume of water used on construction sites. The report identifies the activities that the water sub-group has initiated and completed over the last year and presents available data on current levels of water use on construction sites for comparison against the 2008 baseline of 148 m³ water used per £million contractors output at constant (2005) prices, as published in the Water Action Plan¹.

The progress report is a contribution to delivering a water target within the joint government and industry Strategy for Sustainable Construction launched in July 2008. This report provides an assessment of progress towards the target of:

“By 2012, water usage in the manufacturing and construction phase to be reduced by 20% compared to 2008 usage”.

The progress report has been developed with contributions from members of the UK Contractors Group who routinely monitor water consumption on their construction sites. In addition Glenigans, who manage the industry KPIs have provided information relating to water use, and a further section details the preliminary outputs from water audit work the industry has been carrying out to better understand where water is used on sites. The progress report has been developed under direction from the Strategic Forum for Construction Water Subgroup.

The group is made up of key representatives from the construction and manufacturing industries who are in a position to take forward and lead work to reduce water consumption, as well as government officials and representatives from the regulatory agencies such as the Environment Agency. The Water Subgroup has been supported in its work by an expert secretariat provided by WRc Plc. Funding for the research support during 2010-2011 has been provided by WRAP.

The programme of work has resulted in:

• An agreed methodology for measuring water usage
• The declaration of a 2008 baseline using the agreed methodology
• Publication of an Action Plan for reducing water use on construction sites
• Development of a methodology for conducting water audits on construction sites
• Water audit activities being carried out by Mabbetts and Associates at a number of sites, with funding for the work provided by WRAP.

The 2009 water use on construction sites is calculated to be 140 m³ per £million contractors output at constant (2005) prices. This represents a 5.4% reduction on the 2008 baseline of 148 m³ per £million contractors output at constant (2005) prices.

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1. **Introduction**

1.1 This progress report details the activities that the Strategic Forum for Construction (SFfC) Water Subgroup has carried out during 2010-11. This progress report has been developed to ascertain the progress of the construction industry in reducing the volume of water used on construction sites. The progress report is a contribution to delivering a water target within the joint government and industry Strategy for Sustainable Construction launched in July 2008.

1.2 Within construction, the joint government and industry Strategy for Sustainable Construction published in 2008, highlighted the issue of water use by construction activities and included a number of targets pertaining to the more efficient use of water. One such target identified water usage on construction sites as a priority area. The target, identified by the industry itself, is that:

"By 2012, water use in the manufacturing and construction phase to be reduced by 20% compared to 2008 usage"

An Action Plan to address this target, that identifies the necessary actions to achieve it, has been developed by the SFfC Water Subgroup. The Action Plan was launched at an event held in June 2011.

1.3 The body responsible for delivering the water target is the Strategic Forum for Construction (SFfC) and this Action Plan has been developed by the SFfC Water Subgroup. The Subgroup comprises key representatives from the construction industry (through UK Contractors Group) and manufacturing who are in a position to take forward and lead work to meet the target, as well as Government officials and representatives from the regulatory agencies. The Water Subgroup has been supported in its work by research from an expert secretariat provided by WRc Plc. Funding support for the Secretariat has been provided by the government’s Department of Business, Innovation and Skills from 2008-09, Defra (2009-10) and currently WRAP (2010-11).

1.4 Relatively little work has been carried out to date on water sustainability on construction sites. Water use is considered a relatively low priority in comparison to the focus on reducing waste and improving the carbon footprint. However, as water moves up the political and environmental agenda it is expected that this will change.

1.5 Current knowledge of where water is used on construction sites and the volumes involved is limited. The collection of additional data and identification of where water is wasted are the first steps identified in the Action Plan. To facilitate this process, the SFfC Water Subgroup has developed a number of materials including data collection pro-forma and an audit methodology; further information on these can be found in the annexes to the Action Plan.

1.6 Until such time as better water audit data is available, the SFfC Water Subgroup has calculated baseline water consumption on construction sites for 2008 against which progress can be measured.

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1.7 The Strategic Forum for Construction is pursuing similar work streams on targets relating to carbon, waste, responsible sourcing and biodiversity. There are some commonalities between the work streams including the units by which baselines are declared, and elements of construction life-cycle that are included and excluded from consideration.

1.8 This report details the work of the SFfC Water Subgroup during April 2010 to March 2011, including calculation of the 2009 water use on construction sites. This progress report also details the activities of the SFfC Water Subgroup during 2010-11, and brings together available data from members of the UK Contractors Group, and Glenigans who manage the industry KPIs. The report also includes details of the activities of the water audit work being undertaken by Mabbett and Associates in conjunction with the SFfC Water Subgroup and funded by WRAP. The final section of the report details the activities that will be undertaken by the SFfC Water Subgroup during 2011-12.

2. The 2008 baseline for water use on construction sites

2.1 The SFfC Water Subgroup has calculated the baseline water consumption on construction sites for 2008 against which progress can be measured. The agreed value for the 2008 baseline is 148m$^3$ per £million contractors output at constant (2005) price.

2.2 The baseline was derived from ‘bottom up’ construction site data, corroborated against ‘top down’ data derived from the Environment Agency National Abstraction License Database, and information on mains water use by the construction industry held by water utilities.

2.3 Progress against the baseline will be measured using primarily ‘bottom up’ project site water use data collected by the industry.

3. Activities of the Water Subgroup 2010-2011

3.1 The activities of the Water Sub-group have primarily been on further developing the Action Plan for reducing water use on construction sites. During the year the group have:

- Met four times to agree responsibilities for progressing actions.
- Worked with UKCG to identify a number of sites for water audit activity based upon sites where high priority activities (thought to be those activities where the largest volume of water is potentially wasted) are likely to be taking place during January to March 2011.
- Agreed with WRAP the need for water audit activity, which WRAP has agreed to fund.
- Worked with Glenigans to better understand the KPI water use reporting.
- Continued to collate water use data from construction sites.
- Undertaken a number of activities to raise the profile of better water use understanding including a presentation at Ecobuild, and the planning of a Water Action Plan launch event, held in June 2011.
### List of Contributors to the Progress Report

3.2 The following people have given generously of their time to contribute data and inform the development of this progress report.

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
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<tr>
<td>Jonathan Garrett</td>
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<td>Charlie Law</td>
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<td>Neil Fraser</td>
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<td>David Mason</td>
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</tr>
<tr>
<td>Richard James</td>
<td>Willmott Dixon</td>
</tr>
<tr>
<td>Jim Wiltshire</td>
<td>WRAP</td>
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4. Data available to understand water use on construction sites 2009-2010

4.1 Information relating to water use on construction sites during 2009 and 2010 has been sought both directly from members of the UK Contractors Group, and also from Glenigans who collate the industry KPI data.

4.2 Currently, information relating to 2009 water use on construction sites has been provided by:
   - Balfour Beatty
   - Willmott Dixon
   - KPI data provided by Glenigans

4.3 Currently, information relating to 2010 water use on construction sites has been provided by:
   - Balfour Beatty
   - BAM
   - Skanska
   - Willmott Dixon

4.4 In addition, clarifications are being sought from MACE UK in order to allow data provided by this company also to be used in this analysis.

4.5 A number of companies have indicated that they might have data, these are:
   - Bovis Lend-Lease
   - Sir Robert McAlpine
   - Seddon
   - Laing O’Rourke

4.6 Of the 11 members of the UK Contractors Group who were personally contacted to discuss the availability of data, 3 were unable to provide any data.

4.7 Although the data provided is by no means comprehensive, it does allow us to build a clearer picture than ever before on the variability of water use between construction sites, and of how water use on construction sites varies over time.
5. **Overall water use on construction sites 2009**

5.1 Data for calculating overall water use on construction sites in 2009 comes from three sources:

- KPI information provided by Glenigans.
- Data from Balfour Beatty and Willmott Dixon provided by themselves.
- Construction Statistics Annual to provide the constant price calculation required to make the water use value comparable to the 2008 baseline figure.

5.2 Glenigans have provided information to understand the difference between the reported KPI value for water use on construction sites (6.33m$^3$ per £100,000 construction value in 2009) and the values reported here, as the KPI value is consistently low. The KPI value represents the median value of water use on construction sites; a relatively small number of sites have very high water use that means the median is consistently lower than the value calculated to report progress. If the KPI data is used to calculate a total water use volume per £million contractors output, as used to calculate the baseline and for this progress report, the result is 319m$^3$ per £million contractors output at current prices.

5.3 The total (2009) value of projects represented by the data used to derive this 2009 water use progress report is £5,931 million, against a total industry value, for England, Wales and Scotland of £105,024 million taken from the Construction Statistics Annual. Hence the water used by the industry is equivalent to 127m$^3$ per £million contractors output at current (2009) prices.

5.4 To compare this value to the 2008 baseline, of 148m$^3$ per £million contractors output at constant prices, a simple conversion has been carried out to re-base against 2005 values. At current (2005) prices the contractors output for England, Wales and Scotland taken from the Construction Statistics Annual is £95,634 million.

5.5 The 2009 water use figure is therefore calculated to be 140m$^3$ per £million contractors output at constant prices. This represents a 5.4% reduction on the 2008 baseline.

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The 2009 water use on construction sites is calculated to be 140m$^3$ per £million contractors output at constant (2005) prices.

This represents a 5.4% reduction on the 2008 baseline of 148m$^3$ per £million contractors output at constant (2005) prices.
6. Variability in water use between sites and over time

6.1 Information provided by industry, and from KPI reporting provides valuable insight into the variation in water use both between construction sites, and over time at individual construction sites. It is also possible to look at the relationship between project value and water use through the KPI data.

6.2 There is a wide variation in the volume of water used between construction sites; at the present time there is no clear understanding of what drives these differences. The available data provided by Glenigans, for KPI reporting, is displayed in Figure 1.

Figure 1: Histogram of water use on construction sites (KPI data, 2009)

6.3 The aim of the SFfC Water Subgroup is to work towards a target reduction of 20% in water use on construction sites by 2012. This can be achieved if the highest water using sites improve in efficiency, resulting in a reduction in the mean water use of considerable volume. Over 75% of sites have water use of less than 18 m$^3$ per £million value. Over 90% of sites have water use of less than 57 m$^3$ per £million value.

6.4 The work of the SFfC Water Subgroup will focus on identifying the activities that result in very high water use on sites, with the aim of identifying and promoting efficient technologies and practices to reduce these.

6.5 Water use on construction sites also appears to vary over time; it is assumed that this variation is driven by particular water using activities occurring at different times in the project. However, currently the data does not allow activities to be mapped to consumption data. An example of variation in consumption over project duration is provided in Figure 2.
6.6 It is anticipated that the water audit work currently being carried out by Mabbett and Associates (see Section 8) will help inform the understanding of activities that use large volumes of water, and identify measures that can be implemented to reduce water use.

7. **Understanding water use on sites in 2010**

7.1 Several large contractors from the UK Contractors Group have been able to provide information on water use on construction sites during 2010. It is not currently possible to calculate a comparable water use figure as the process of data collation is still on-going and the relevant information regarding price adjustment to 2005 prices is not yet available.

7.2 It is clear, however, that the level of data collection of water use on construction sites is increasing. This includes collecting regular (monthly) reads, monitoring consumption of both mains and other water sources, and the sub-monitoring of, for instance, welfare facilities and other site usage. It is therefore likely that in the next annual progress report, with a 2010 water consumption figure published, it will be possible to both calculate a water consumption figure to measure progress to the Sustainable Construction Target of a 20% reduction by 2012, but also to provide further insight into the factors driving high water use on sites.

7.3 The SFIC Water Subgroup will continue to collate information regarding 2010 water consumption as it becomes available.
8. Water audits on construction sites

8.1 A prerequisite for understanding how to reduce water usage on construction sites is to have a clear understanding of where water is used, how much is used, where water is being wasted, and what behaviours and/or technologies can be introduced to successfully reduce water wastage.

8.2 The UK Contractors Group (UKCG), a member organisation of the Strategic Forum for Construction, greatly facilitated this understanding by developing a matrix of water using processes and best practices relating to these processes.

8.3 Key water using processes on construction sites are considered to be:

- Site cabins and temporary accommodation,
- General site activities including tool washing,
- Wet trades, such as brickwork, screeding, concreting and plastering,
- Groundworks, including grouting and drilling,
- Dust suppression, including road and wheel washing,
- Hydro-demolition,
- Cleaning of tools and plant equipment, lorry washing,
- Commissioning and testing of building plant and services.

8.4 To support the evidence base for understanding where water is used on sites and in what quantities, WRAP is funding a series of water audits on construction sites, that are being carried out by Mabbett and Associates Ltd. The audits are being conducted on a range of sites with the aims of:

- Developing robust primary data quantifying where water is wasted and the associated range of water using processes on construction sites; and
- Establishing an evidence base of good practice for reduction of water use in the construction process.

8.5 The audits are being conducted using the methodology developed by the SFfC Water Subgroup and published in the Action Plan. The methodology has been refined by Mabbett and Associates to allow audits to be completed within a tight timescale. During late February and March 2011, a total of 9 audits have been completed across a range of infrastructure, leisure and retail construction sites.

8.6 Key findings from the audit work are presented here. These have been drawn from a report produced by Mabbett and Associates Auditing of water use on construction sites – Phase I for WRAP, published in 2011 and available at www.wrap.org.uk.
### Water Supply

Sites are supplied with mains water, water abstracted from groundwater or water abstracted from surface water. Each site is either charged for mains water on a volumetric basis or a flat fee rather than. This initially appears to be a key factor in influencing site behaviour towards water efficiency.

### Monitoring

The amount of monitoring on-site varied from no monitoring to regular weekly meter readings being taken by on-site staff.

### Housekeeping

The cultural differences across the audits undertaken so far is vast, ranging from those that believe water use should be minimised (almost regardless of cost impact) to those that view water as a cheap commodity with a 'don't pay, don't care' attitude.

### Dust Suppression (Damping down)

Methods range from simple pouring or spraying of water to the use of bowser for larger areas (e.g. roads). Simple raising staff awareness of water costs and impacts to motivate the use of spraying versus pouring of water will improve water efficiency. The use of water efficient nozzle technology to create a more efficient spray pattern for dust suppression and/or the use of dust wetting additives will improve water efficiency of the bowser.

### Wheel Wash

The audits have identified elements of poor practice in this activity on some sites. For instance, leaving the inlet to the wheel wash storage tank open during normal hours of operation results in water being unnecessarily used on a continual basis. Estimated savings of 75% have been identified from the installation of simple engineering controls.

### Cleaning

A number of different cleaning activities have been identified; there is potential to improve the water efficiency of all of these. For instance, through the use of high pressure, low volume pressure washers and the use of trigger operated spray guns on hoses.

### Welfare facilities

Across all sites that have been audited there is potential for water efficiency improvements across welfare facilities that include hand wash basis, toilets, urinals, showers and canteens. The combined total water use by these activities can be significant and the consumption also occurs during all phases of the construction process. Basic water saving measures offers the potential for up to 40% savings on total site water use.

### Concrete batching

Generally, water use is as an ingredient and was observed during audits to be efficient. There is potential for better collection of rinse water from lorries to maximise the recycling of unused product and water that could improve water efficiency. Furthermore the possibility of reduced costs associated with wastewater disposal are being investigated; the cost savings from this could be used to offset the cost of water efficiency measures for other areas of the construction site.


9.2 Throughout 2011-2012 the work of the SFfC Water Subgroup will focus on implementing the actions detailed, and working towards reduction of water use on sites. The Subgroup have agreed the following immediate steps in support of the Action Plan.

### A: Identify water use on construction site by process/activity

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<th>Action (as detailed in the Action Plan)</th>
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| **1 Identification of water use on construction sites**  
Throughout 2011, collect data through water audits on construction sites to measure against the 2008 baseline. | Ensure that all UKCG members are aware of the need to collect and collate water use data on sites. |
| **2 Identification of water use by process/activity on construction sites**  
By December 2011, conduct water audits on construction sites to allow the water use by specific processes/activities to be defined. | Identify gaps in audit work completed to date. Scope additional audits required and work with WRAP to commission auditing activities. |
| **3 Value the benefit of implementing efficient practice and behaviours**  
By December 2011, value the economic benefit of reducing water use associated with different activities to support prioritisation of activities. Case studies developed from the water audits can be used to define and justify the benefit of implementing efficient practice and behaviours. | Create a short ‘how to’ guide based upon current available evidence that includes initial assessment of the value of implementing efficient practice and behaviours. |
| **4 Prioritisation of water using processes/activities on sites for focus to reduce water use**  
By December 2011, develop prioritisation of water using processes on construction sites. Identify which use the majority of water; but also which processes are considered to waste the majority of water. Consider the water hierarchy (type of water e.g. displacing mains water with rainwater). | Create a short ‘how to’ guide based upon current available evidence that includes hierarchy of likely changes to make on site based upon water usage and wastage evidence from completed audit work. |
| **5 Identification of water reduction actions for priority processes/activities**  
By April 2012, identify, using best practice information, steps that can be taken for each priority area to reduce water use. | Create a short ‘how to’ guide based upon current available evidence that includes methods of reducing water use for identified priority areas. |
### Action (as detailed in the Action Plan) | Short-term SFfC Water Subgroup activity
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1. **Identification of best practice**<br>By December 2011, identify best practice behaviours, processes and technologies for water using activities on construction sites. | Include within scope of additional audit work.
2. **Promotion of best practice**<br>By December 2011, liaise with SFfC Carbon and Waste sub-groups and identify how and where to promote best practice. | Ensure engagement with other work streams through the Sustainable Construction Task Group.
3. **Promotion of best practice**<br>At all times, use relevant construction events to promote best practice. | All members to identify suitable events for presentation and presence.
4. **Promotion of best practice**<br>By April 2012 produce best practice guidance document for reducing water use on construction sites, based upon best available knowledge. | An interim ‘how to’ guide will be produced by the group based upon current knowledge and audit work completed to date. Detail of content is listed under Activities A3 – A5 (above).
5. **Promotion of best practice**<br>Initiate discussion during 2011 to incorporate pre-design stage standards for water efficient construction sites into relevant schemes e.g. BREEAM and CEEQUAL. | Individual members of the Water Subgroup have offered to initiate discussions with schemes on this subject.
6. **Implementation of best practice**<br>Initiate discussion during 2011 to specify a standard procurement requirement for water efficient construction sites, including accommodation, processes and materials within tender documentation for:<br>• Short term - Government construction procurement.<br>• Medium term – Major construction clients (project value over £300,000) | A focus on procurement and implementing this action will be given at the next Water Subgroup meeting. Invites will be issued to relevant contacts identified by Subgroup members.
7. **Implementation of best practice**<br>Ensure appropriate training available for:<br>• Incorporating water efficient construction practice at tender stage in design of sites.<br>• Environmental managers.<br>• Site managers.<br>Consider review and revision of ‘toolbox talks’ to move towards standard environmental training accepted across industry. | The group will return to this topic following drafting of the ‘how to’ guide.
8. **Implementation of best practice**<br>During 2011, engage with the Module and Portable Building Association to discuss the development of water efficient site accommodation. | A member of the Subgroup has offered to initiate discussion with the Association to identify if opportunities to work together exist.
9.3 The group will continue to monitor progress towards the target of 20% reduction in water use compared to a 2008 baseline of 148 m$^3$ water use per £million contractors output at constant (2005) prices.