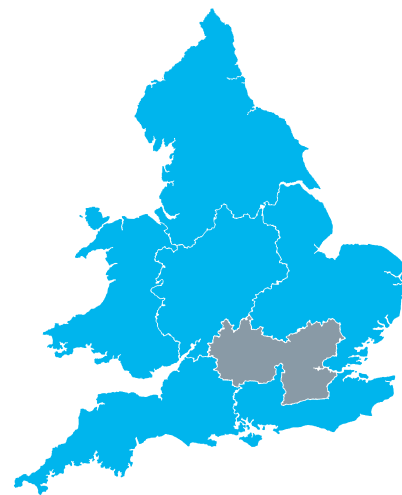


# Drinking water 2009

Thames region of England

**July 2010**

A report by the Chief Inspector of Drinking Water





## Drinking water 2009

### Thames region of England



Published by  
Drinking Water Inspectorate  
55 Whitehall  
London  
SW1A 2EY

Tel: 030 0068 6400

Website: <http://www.dwi.gov.uk>

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ISBN: 978-1-905852-44-4

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*Drinking Water 2009 is the annual report of the Drinking Water Inspectorate and comprises a number of parts.*

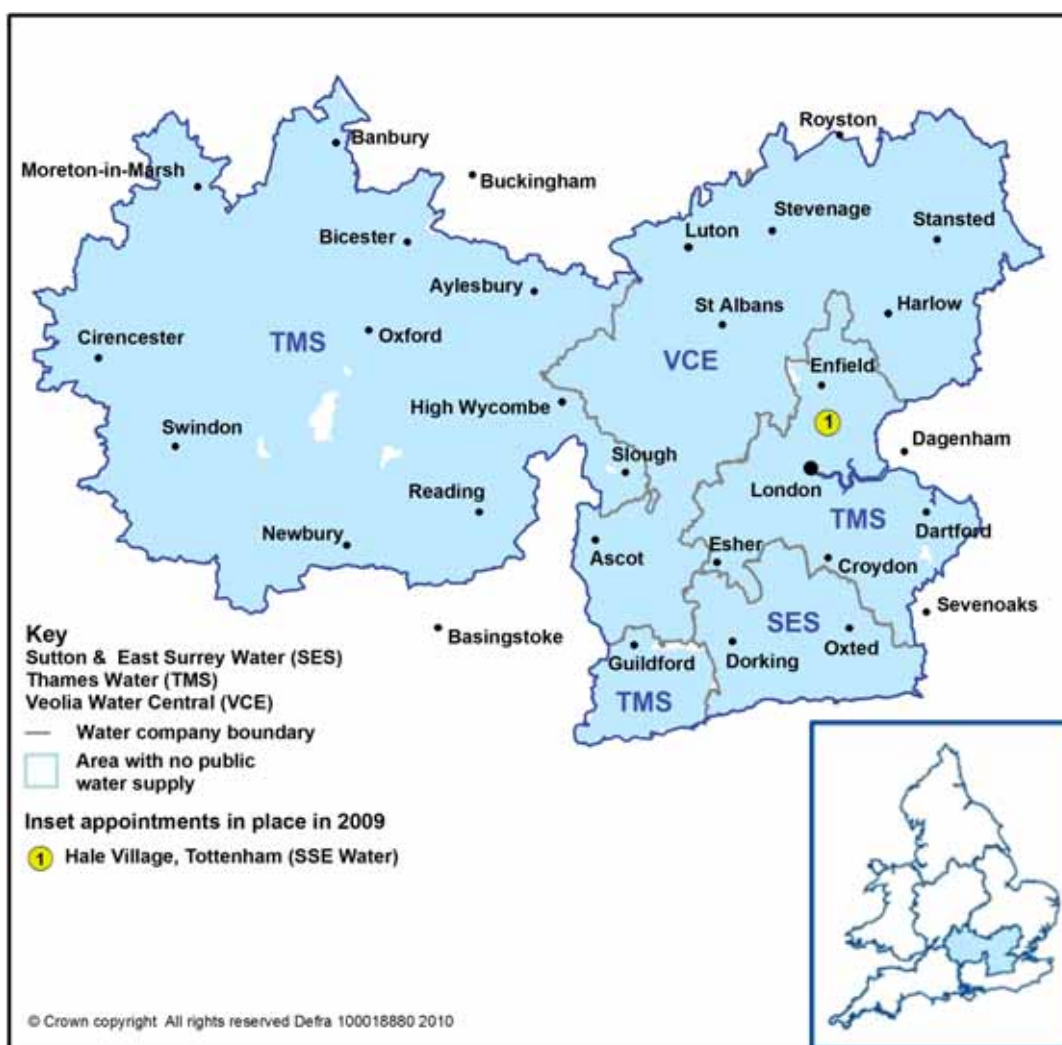
*This part describes drinking water quality in the Thames region. The Inspectorate also publishes a series of companion reports for other regions of England (Central, Eastern, Northern, Southern and Western regions) and a separate report for Wales.*

*All parts are available on the Inspectorate's website <http://www.dwi.gov.uk> and on the CD accompanying this report along with separate summary data for water company sampling programmes.*

## Introduction to the report for the Thames region

*Drinking Water 2009* is published as a series of seven reports covering Wales and the six regions of England. Each report presents information about drinking water quality in a form that meets the needs of those who have an interest in the quality and safe management of drinking water supplies from the consumer perspective, namely the local authorities and the regional committees of the Consumer Council for Water.

The report describes the key facts about the quality of drinking water in the Thames region, which is served by four water companies. These are Sutton and East Surrey Water, Thames Water, Veolia Water Central and the inset appointment of SSE Water, serving Hale Village in Tottenham, London. Together they deliver public water supplies to over 12 million consumers.



The results of testing in 2009 demonstrated that the overall quality of drinking water in the Thames region was good. The figure for compliance with drinking water standards at consumers' taps was 99.97%, unchanged from 2008 and above the industry figure of 99.95%. This figure is made up of the results of all the tests for 39 parameters with European or national standards. A single parameter, pesticides, has been a recent cause for concern due to metaldehyde, discussed in more detail below. However, the Inspectorate has calculated that if the companies' metaldehyde monitoring data is disregarded, then the region's compliance figure in 2009 would have been unchanged at 99.97%. The circumstances of the few failures of standards and the actions taken to safeguard public health are discussed in the body of the report.

When the Thames region is judged by the Inspectorate's four indices of water quality performance, which look in turn at water treatment, service reservoir integrity and network maintenance, the main change in 2009 was a lower figure for service reservoir integrity (99.96%) and also for network maintenance (99.92%). However, when compared to the other regions of England and Wales, the Thames region benefits from the best figures for water treatment. Individual water company figures are reported in *Annex 6*.

This is the first year where reporting on water quality events uses the Inspectorate's new risk-based approach to classification and assessment. Events are classified into five categories: Not significant, Minor, Significant, Serious and Major. In total, there were 64 events across the Thames region. Only a few (8) were of a type that necessitated a detailed investigation by an inspector and none were serious enough to warrant a major investigation. This compares very favourably with the other regions in respect of the risk-related resource demand on the Inspectorate. In terms of the nature of the events reported on this year, the most common risk related to microbiological failures. Detailed findings regarding all the significant events in 2009 can be found in *Annex 3*.

There is a longer term and positive improving trend in public confidence in the region's drinking water quality, as measured by consumers. The number of people across the region expressing concern about the quality of their tap water (appearance, taste and illness) has continued to fall. By comparison to the other regions in England and Wales, the Thames region has the lowest contact rates (1 per 1,000 population). Good progress has been made by all companies in reducing white water events, down to 3,500 contacts from more than 5,300 in 2006. In addition there are now fewer contacts due to black, brown or orange discolouration (3,000 compared to about 4,000 in 2006). This improving picture is also mirrored by a fall in chlorine taste and odour contacts which have fallen across the

region from the peak in 2008 of 2,200 to about 1,500. These public confidence figures demonstrate the benefits already realised by the industry's investment to date in drinking water quality. *Annex 4* provides information about the schemes of work delivered in 2009 and those planned for delivery over the next five years.

Looking forward, the standard for lead becomes stricter in 2013. Progress made towards meeting the future standard is shown in a graph in the body of the report. The Inspectorate has calculated that if the stricter standard had been in force in 2009 then the figure for overall regional compliance with drinking water standards would have been 99.94%, instead of 99.97%. This highlights the importance of companies delivering on their business plan and water safety plan commitments, to minimise consumer exposure to lead in older housing in collaboration with local authorities.

During 2009, the Government took steps to safeguard those consumers who are served by about 1,393 private water supplies in the Thames region. Details of the new risk-based regulations and how they will work are described in this report, together with a case example showing how the new powers have been put into immediate and good effect by one local authority in England. This change marks an important step forward; action can more readily be taken by local authorities to improve those private supplies that pose a risk to health and the information provided to the Inspectorate will enable open reporting on all drinking water supplies in the region.

Returning to the pesticide problem mentioned above, metaldehyde is a molluscicide commonly incorporated into some pellets used for the control of slugs. It has a low risk toxicological profile and it is a valuable agricultural product. The presence of metaldehyde in raw water first came to attention late in 2007 and once it was established that occurrence was more widespread, a national action group was formed. The Metaldehyde Stewardship Group (MSG) comprises the principal metaldehyde manufacturer and pellet formulators that reports to a wider industry steering group co-ordinated by the water companies of England and Wales, but also including the Environment Agency, Natural England, the Health and Safety Executive (Chemicals Regulation Directorate), the Inspectorate and agricultural industry representatives such as agronomists, slug pellet distributors, and catchment consultants.

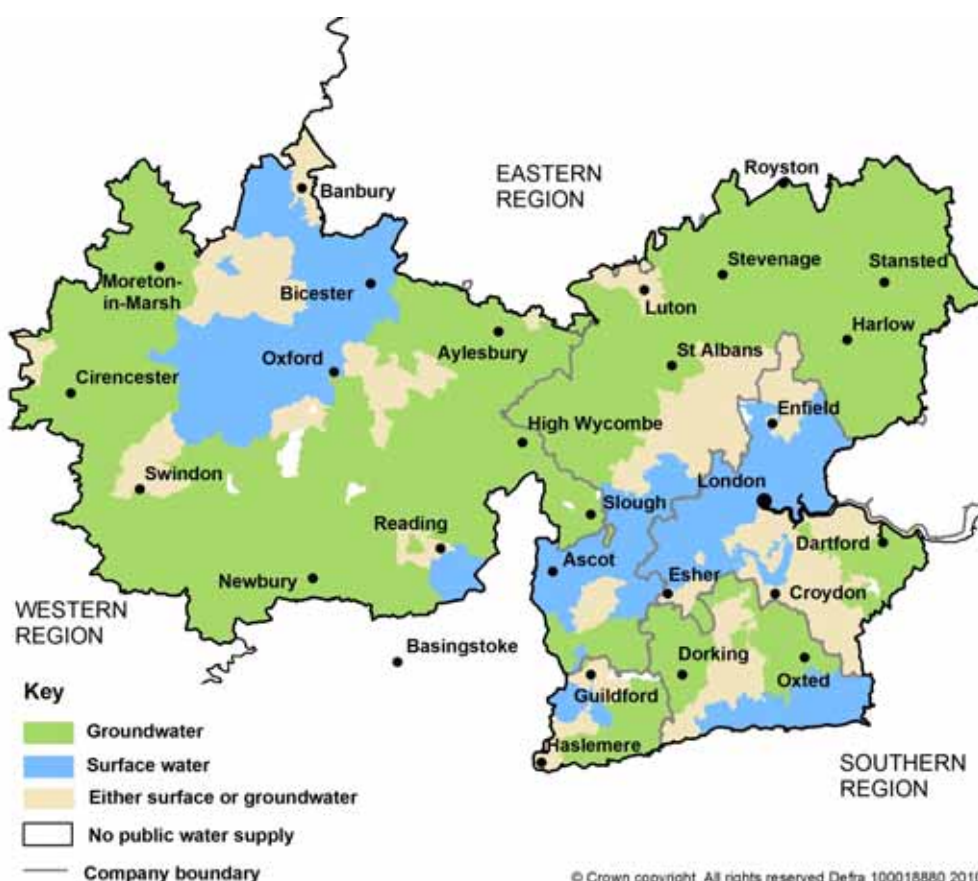
The work carried out to understand and remedy the problem since April 2008 has involved the MSG in advising, training and raising awareness of the issue with farmers and promoting best practice use of metaldehyde in agriculture. There has been sharing of data to identify the highest risk catchments and research into possible water treatment technologies. These activities support the legally binding programmes of work on

catchment control that the Inspectorate has put in place in relation to directly affected water supplies. During 2009, companies have reported that concentrations of metaldehyde in water sources have fallen. Additionally, slug pellet sales were approximately 70% lower than in 2008. Awareness of the issue among farmers has risen and practices relating to the supply, use and spreading of slug pellets have generally improved.

## Water supply arrangements

Four water companies now supply drinking water in the Thames region: Sutton and East Surrey Water (SES), Thames Water (TMS) and Veolia Water Central (VCE), with one inset appointment commencing operation in 2009; SSE Water (SSE) supplies water in Hale Village in Tottenham, London.

**Figure 1: Map illustrating sources of drinking water by zone across the region**



Much of the water supplied in the region is surface water (65%) abstracted from lowland rivers such as the Thames, Kennet, Eden, Cherwell and Tillingbourne. Most river water is held in large, raw-water storage reservoirs before being drawn off for treatment. Reservoirs like Farmoor (Oxford), Bough Beech (Edenbridge) and those around Heathrow airport and in the Lee Valley are strategic reserves replenished over the winter and drawn down in summer.

Groundwater provides a valuable water resource (34%) with most boreholes drawing from the chalk, oolitic limestone or greensand aquifers in the region. A small proportion (1%) of water supplies in the region can be drawn from either groundwater or surface water sources.

Summary facts about the drinking water supply infrastructure in the region are given in Tables 2 and 3 with outline geographical and demographic information.

**Table 2: Number of abstraction points (for Regulation 16a purposes)**

Company	Groundwater	Surface Water	Mix of ground and surface water	Total
Sutton and East Surrey Water	46	1	0	47
Thames Water	88	40	4	132
Veolia Water Central	153	4	0	157
<b>Total</b>	<b>287</b>	<b>45</b>	<b>4</b>	<b>336</b>

Note: SSE Water do not directly abstract water

**Table 3: Key facts about the Thames region supply arrangements**

Key facts			
Population supplied	12,275,492	Treatment works	193
Water supplied (l/day)	3,790 million	Service reservoirs	541
Number of local authorities (with a further 21 partially covering the region)	63	Water supply zones	328
Approximate number of private water supplies	1,393	Length of mains pipe (km)	49,446
Area of supply		Water composition	
Bedfordshire (part), Berkshire (part), Buckinghamshire (part), Essex (part), Gloucestershire (part), Hampshire (part), Hertfordshire, Kent (part), Inner London, Outer London (part), Oxfordshire, Surrey (part), West Sussex (part), Warwickshire (part), Wiltshire (part)		Surface sources	65%
		Groundwater sources	34%
		Mixed sources	1%

## Drinking water quality testing

Throughout 2009, water companies sampled drinking water across the region to test for compliance with the standards in the drinking water regulations. Close to half of the tests were carried out on drinking water drawn from consumers' taps selected at random. For monitoring purposes, company water supply areas are divided into zones based on population (maximum 100,000). Generally, zones are sampled at consumers' taps with

the number of required tests being greatest in zones with larger populations. Other sample locations are water treatment works and treated water (service) reservoirs. Collectively, the four water companies carried out a total of 653,214 tests during 2009. Only 259 of these tests failed to meet the standards set down in the regulations.

**Table 4: Number of tests carried out by companies in the region**

Company	Place of sampling			Number of tests per company	Estimate of population
	Water treatment works	Service reservoirs	Consumers' taps (zones)		
SSE Water	0 (0)	0 (0)	119 (1)	118	690
Sutton and East Surrey Water	14,917 (8)	8,270 (32)	17,665 (20)	40,852	634,000
Thames Water	106,161 (93)	94,532 (373)	227,142 (237)	427,835	8,674,000
Veolia Water Central	78,132 (82)	34,370 (134)	71,907 (70)	184,409	2,976,000
<b>Region overall</b>	<b>199,210 (183)</b>	<b>137,172 (539)</b>	<b>316,833 (328)</b>	<b>653,214</b>	<b>12,284,690</b>
<p>Note 1: Numbers in brackets reflect the number of works, reservoirs or zones operated by that company in the region in 2009. Some companies are permitted to carry out some tests on samples taken from supply points rather than from consumers' taps.</p> <p>Note 2: Tests in the Thames Water Tidworth zone in the Western region have been omitted from the totals.</p>					

The regulations require companies to test for specified parameters at prescribed frequencies. Most of the testing is for parameters with European or national standards, however, water companies are also required by the regulations to test for other parameters such as ammonium, sulphate and colony counts.

Results of interest are discussed in this report. A full summary of the results of testing by each company can be found on the DWI website ([www.dwi.gov.uk](http://www.dwi.gov.uk)) and on the CD accompanying this report. The tables summarising the results of testing provide the annual minimum, maximum and mean levels for individual parameters for each company.

## Drinking water quality results

The key water quality results for the Thames region are presented in two tables, one showing the results for microbiological parameters (Table 5), the other dealing with chemical and physical parameters (Table 7).

The microbiological quality of water is discussed first. Companies report all the results of the tests on a monthly basis to the Inspectorate.

A summary of the results of the tests from each company is presented on the Inspectorate's website ([www.dwi.gov.uk](http://www.dwi.gov.uk)) and is also available on the CD accompanying this report. Additionally, statistics describing the performance of each company supplying in the region are summarised in *Annex 6*.

### Microbiological quality

To protect public health, microbiological standards have to be met at each individual treatment works and service reservoir. The results confirm the overall microbiological safety of drinking water supplies in the region.

The significance of the individual test results for each microbiological parameter at each location varies and a single positive result cannot be interpreted without other information. All companies are expected to follow best practice as set out in *The Microbiology of Drinking Water* published by the Standing Committee of Analysts (SCA), which can be found by visiting the Environment Agency's website ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)).

**Table 5: Microbiological tests**  
**The number of tests performed and the number of tests not meeting the standard**

Parameter	Current standard	Total number of tests	Number of tests not meeting the standard	Additional information
<b>Water leaving water treatment works</b>				
<i>E.coli</i>	0/100ml	32,047	2	TMS (2)
Coliform bacteria	0/100ml	32,047	14	TMS (9), VCE (5)
<i>Clostridium perfringens</i>	0/100ml	9,253	5	TMS (5)
Turbidity <sup>1</sup>	1NTU	32,029	12	TMS (9), VCE (3)
<b>Water leaving service reservoirs</b>				
<i>E.coli</i>	0/100ml	27,442	1	TMS (1)
Coliform bacteria	0/100ml in 95% of tests at each reservoir	27,442	22	TMS (19), VCE (3) All 539 reservoirs in the region met the 95% compliance rule
<b>Water sampled at consumers' taps</b>				
<i>E.coli</i>	0/100ml	31,474	7	TMS (7)
Enterococci	0/100ml	2,486	0	

<sup>1</sup>Turbidity is a critical control parameter for water treatment and disinfection.

### ***E.coli* at works and service reservoirs**

In 2009, a total of 32,047 tests at works were carried out by all the companies across the region and *E.coli* was detected in two samples (TMS). For service reservoirs, the total number of tests was 27,442 and just one contained *E.coli* (TMS). On detecting *E.coli*, companies are required to act promptly to protect public health. Their immediate response when finding *E.coli* at a works or service reservoir is to sample again, and more widely, to confirm that water being received by consumers is safe. In 2009, these additional tests gave satisfactory results in all cases and there were no subsequent *E.coli* failures.

In January, *E.coli* and coliforms were detected in a sample from Farmoor works (near Oxford). There were contractors working on site at the time and Thames Water concluded, in the absence of any other evidence, that the sample tap had been compromised hygienically. The tap was replaced in January with an auto-flushing system and there have been no further failures since.

*E.coli* and coliforms were found in December at Ogbourne works (near Swindon), operated by Thames Water. The results were considered

sufficiently unusual that the company notified the Inspectorate (see Annex 3). The site was taken out of supply at the time but no specific problem was identified. Since the works was returned to service in December, the company has been carrying out daily sampling. This enhanced monitoring has given satisfactory results.

In August 2009, a sample taken from Oddington A reservoir (near Bourton, in the Cotswolds) contained *E.coli*. The reservoir was immediately taken out of operation and the site investigated by Thames Water. All associated samples from the upstream works and in the network were satisfactory. The company verified that earlier remedial work had been completed and checked by inundation tests. This reservoir is supplied from Seven Springs works where the company's risk assessment identified an unacceptable residual risk relating to valve configurations potentially leading to water bypassing the disinfection system. The Inspectorate was minded to issue a Regulation 28(4) Notice, but the company has since completed work to install appropriate lock outs and covers to address the risk.

**Table 6: Detection of *E.coli* and Enterococci at treatment works, service reservoirs and consumers' taps**

Company	<i>E.coli</i> in water leaving treatment works	<i>E.coli</i> in water leaving service reservoirs	<i>E.coli</i> at consumers' taps	Enterococci at consumers' taps
SSE Water	0 – 0	0 – 0	0 – 4	0 – 2
Sutton and East Surrey Water	0 – 2,131	0 – 1,654	0 – 1,633	0 – 160
Thames Water	2 – 17,061	1 – 18,914	7 – 22,225	0 – 1,799
Veolia Water Central	0 – 12,855	0 – 6,874	0 – 7,612	0 – 525
<b>Region overall</b>	<b>2 – 32,047</b>	<b>1 – 27,442</b>	<b>7 – 31,474</b>	<b>0 – 2,486</b>
Note: Results are shown as the number of positive tests – the total number of tests.				

### Coliform bacteria at works

Testing for coliform bacteria gives reassurance that water entering the supply was treated adequately to remove bacterial and viral pathogens. Repeated occurrences of coliform bacteria in samples from the same works in one year are thus of concern and require action to be taken. In 2009, this situation occurred at just one site: Armitage Bridge/Thaxted works (VCE).

In May, coliforms were detected at Wansunt works, in south east London, operated by Thames Water. Follow-up samples from downstream zones in Thamesmead, Blackfen and Bexley all gave satisfactory results. No deficiencies in water treatment were found but the Inspectorate, noting that coliforms and *E.coli* were detected at this site in 2008, expects the company to update its risk assessment and scrutinise the adequacy of disinfection more closely.

At Grimsbury works (near Banbury) a sample taken by Thames Water, in May contained coliforms at a time of changing raw water quality and increased turbidity at the site. Disinfection was performing adequately at the time, but the company took the works out of supply in June for an inspection, which revealed ingress of water around a hatch cover on the contact tank. This integrity problem was remedied. There have been no further failures since the works was returned to use in August.

In December, coliforms were detected in samples taken by Veolia Water Central from Armitage Bridge/Thaxted works (near Thaxted, Essex) on two consecutive days. Throughout 2009 raw water has been free from coliforms and treatment was operating satisfactorily at the time of the failures. As a precaution the works was shut down. The company found that the sample tap had been used for hand washing by workmen. Alternative washing facilities have been made available at the site since.

A single coliform was detected in a sample from Whitehall works (near Stevenage, Hertfordshire) by Veolia Water Central in June. The company has since identified that the sample line was also serving the on-line chlorine and turbidity monitors creating a backsiphonage risk. The monitors were relocated to another supply line in November.

The Inspectorate has noted that out of a total of 32,047 tests, coliform bacteria were found in 14 samples from treatment works in the Thames region during the year, an improvement compared to the 17 positive samples in 2008. This information will be taken into account during the Inspectorate's risk-based programme of technical audit.

### ***Clostridium perfringens***

This organism is a spore-forming bacterium that is exceptionally resistant to unfavourable conditions in the water environment, such as extremes of temperature and pH, and disinfection processes such as chlorination and ultraviolet light. It is a normal component of the intestinal flora of up to 35% of humans and other warm-blooded animals. These characteristics make it a useful indicator of either intermittent or historical faecal contamination of a groundwater source or surface water filtration plant

performance. The detection of any *Clostridium perfringens* in the supply should trigger an investigation by the water company.

In 2009, out of 9,253 samples taken in the region, five contained *Clostridium perfringens* (5 TMS).

Samples taken from consumers' taps in Upshire zone in January, Highams Park zone in September, Lee Valley zone in October, and Clapton and East Ham zones in November, all contained *Clostridium perfringens*. These five zones receive water from Coppermills works. These resistant spores are probably widespread in historic deposits in the company's surface water distribution systems.

Guidance to companies (Information letter 10/2008) made clear the inadvisability of continued monitoring for this parameter at consumers' taps and, wherever practicable, companies should focus their monitoring efforts on supply points (which could include service reservoirs as well as works). The Inspectorate expects that a pattern of repeat detections in a zone should trigger a review of the Regulation 27 risk assessment of the supply system with action plans linking to the company's Distribution, Operation and Maintenance Strategy, with particular reference to local flushing regimes to clear historic deposits.

### **Turbidity at works**

Turbidity is a measure of how much light can pass through water and indicates the condition or 'cloudiness' of water. Turbidity is caused by particles suspended in the water and is an important critical control measure for disinfection. Turbidity is measured at two points in the water supply chain, at treatment works where a value of 1NTU applies and at consumers' taps where the standard of 4NTU applies. The following discussion focuses on the results of samples taken at treatment works. For information on tests taken at consumers' taps, see the heading *Turbidity* in the *Chemical quality* section.

During 2009 there were 12 occasions when a turbidity value of >1NTU was reported in samples of treated water leaving a works in the region (9 TMS, 3 VCE). This is a slight improvement compared to last year's figures (16 samples exceeding 1NTU).

Elevated turbidity was recorded in a sample from Lane End works (near Darenth, Kent) in May. This works has experienced turbidity problems for a number of years and remedial action (cleaning and flushing of the contact tanks) was undertaken in November 2008. Thames Water thought it had resolved the issue of sediment in the tank, but following the further failure

in May the company initiated further cleaning work. There have been no turbidity failures at this site since.

At Orpington works, a turbidity failure was recorded by Thames Water in June. The Inspectorate noted that the concentration of iron was higher in water leaving the contact tank than entering it. This was brought to the company's attention and they plan to inspect the tank in response to any further turbidity failures.

During the investigation at West Wickham works of a turbidity failure in June, Thames Water detected *Clostridium perfringens*. However, on-line turbidity data for the period was satisfactory. At Witheridge Hill works the company linked a turbidity failure in July to manual control which permits the contact tank to empty when the pumps from the borehole shutdown. When the pumps restart, sediment is disturbed. The other turbidity failures (5) reported by Thames Water in 2009 were attributed to sampling at times close to pump start up where sediments were mobilised. Companies are reminded that works must be operated in an adequate manner at all times.

Veolia Water Central reported turbidity >1NTU in two samples from Well Head works (near Hitchin, Hertfordshire) in March. Both samples were taken when the works had been returned to supply after the cleaning of boreholes. Chalk deposits were removed from the sample lines and results have been satisfactory since. Another elevated turbidity at Chartridge works (near Chesham, Buckinghamshire), in October, was attributed by Veolia Water Central to the sample line which was changed in November.

The Inspectorate has noted the 12 occasions when turbidity samples at treatment works in the Thames region exceeded the standard and this information will be taken into account during the Inspectorate's risk-based programme of technical audit.

### **Coliform bacteria at service reservoirs**

Testing for coliform bacteria gives reassurance that the quality of water held at these strategic points in the distribution system is adequately maintained. The national standard requires that at least 95% of no less than 50 samples collected from each service reservoir throughout one year are free from all coliform bacteria. In 2009, all reservoirs met the 95% national standard.

A sample taken by Thames Water from Farningham Hill West reservoir (near Farningham, Kent) in April failed for coliforms and further samples from the east and west cells contained coliforms in May. The reservoir was taken out of service and drained in June and a planned internal inspection was brought forward. Evidence of ingress and a rabbit hole heading

towards the roof of the reservoir were found. After repairs and testing the reservoir was put back into service in July. All subsequent samples have been satisfactory.

In July 2009, after two coliform failures at Kidderpore reservoir in West Hampstead, London, Thames Water carried out an internal inspection and found numerous signs of ingress. The reservoir was returned to service in October after repairs and subsequent results have been satisfactory.

Coliforms were found in samples taken from Blewbury reservoir (near Didcot, Oxfordshire) in May and then again in November. An inspection in December revealed minor ingress points. Repairs and inundation tests preceded the return to service of the reservoir in March 2010.

A sample collected by Thames Water from Upper Green Tank (near Hungerford, Berkshire) in August, contained coliforms. The investigation found a sample tap and a hatch cover in poor condition. The deficiencies were remedied in January 2010 and there have been no subsequent failures at this site.

In all the above cases, Thames Water took decisive action involving draining and inspecting the reservoirs. In each case integrity problems were found and repaired, highlighting the merits of adopting a water safety risk-based approach to reservoir maintenance.

In June, coliforms were reported from Allenby Road Tower (in Greenford, London). Veolia Water Central found that a booster chlorination unit at Allenby Road was not working due to a power cut on the previous day. This unit is designed to maintain chlorine residuals in the network and it had not been reset due to an oversight by an operator.

The Inspectorate has noted that coliform bacteria were found in 22 samples from service reservoirs in the Thames region during the year and this information will be taken into account during the Inspectorate's risk-based programme of technical audit.

### ***E.coli* and Enterococci at consumers' taps**

A total of 31,474 consumers' taps were tested in 2009 for *E.coli* and seven were positive (7 TMS). Like *E.coli*, the presence of Enterococci is indicative of faecal contamination and neither bacterium should be found in any sample. In 2009, the companies carried out 2,486 tests for Enterococci at consumers' taps and none were positive.

In Thames Water's Syon Park zone, *E.coli* was detected in a consumer's tap sample collected in February. All further samples were satisfactory and the company gave advice to the householder on tap hygiene.

In the other six zones, (Guildford District West, Isle of Dogs South, Roding Valley, East Lambeth, Wallingford Didcot, Goring and Kidbrooke) the company advised the occupants of each property to boil their water while further testing was undertaken. First draw samples from these taps confirmed that tap hygiene was the most probable cause as plumbing irregularities had been ruled out by water fittings inspections.

## Chemical quality

The drinking water regulations set out the minimum testing requirements for all chemical and physical parameters. A full summary of the results of testing by each company, including the results for indicator parameters is provided on the DWI website and on the CD accompanying this report.

The following text and Table 7 set out the results for those parameters where there has been a failure to meet a European or national standard (mandatory quality standards) and any other parameter of interest. In addition, at the request of local authorities, the results of testing for fluoride, iron, lead, manganese, nitrate, nitrite and pesticides are given.

**Table 7: Chemical and physical parameters**

**The number of tests performed and the number of tests not meeting the standard**

Parameter	Current standard or specified concentration <sup>1</sup>	Total number of tests	Number of tests not meeting the standard	Additional information
Aesthetic parameters				
– odour	No abnormal change	6,386	3	SES (1), TMS (2)
Aluminium	200µg/l	9,228	4	TMS (2), VCE (2)
Ammonium	0.5mg NH <sub>4</sub> /l	10,048	2	TMS (2)
Benzo(a)pyrene	0.01µg/l	2,509	2	TMS (1), VCE (1)
Chromium	50µgCr/l	2,499	1	TMS (1)
Copper	2mg/l	2,485	1	VCE (1)
Fluoride	1.5mg/l	2,407	0	
Iron	200µg/l	10,113	17	SES (3), TMS (11), VCE(3)
Lead (current standard)	25µg/l	2,488	8	SES (1), TMS (5), VCE(2)
Lead (future standard)	10µg/l	2,488	38	SES (1), TMS (28), VCE(9)
Manganese	50µg/l	9,093	0	
Nickel	20µg/l	2,485	7	TMS (4), VCE(3)
Nitrate	50mg/l	7,785	0	
Nitrite	0.5mg/l	7,784	0	
Pesticides – total	0.5µg/l	1,409	1	SES (1)
Pesticide – individual <sup>2</sup>	0.1µg/l	41,796	44	Carbetamide SES (1), VCE (1) Metaldehyde SES (8), TMS (27), VCE (7)
pH (Hydrogen ion)	6.5 – 9.5	11,321	1	TMS (1)
Polycyclic Aromatic Hydrocarbons (PAH)	0.1µg/l	2,509	1	VCE (1)
Turbidity (at consumers' taps)	4NTU	11,324	1	VCE (1)
Notes:				
<sup>1</sup> For comparison, 1mg/l is one part in a million, 1µg/l is one part in a thousand million.				
<sup>2</sup> A further 2,392 tests were done for aldrin, dieldrin, heptachlor, heptachlor epoxide, all of which met the relevant standard.				

## Aesthetic parameters

Consumers expect their drinking water to be clear and bright in appearance and free from discernible taste or odour. In recognition of this the regulations stipulate national standards for colour, odour and taste. In 2009, just three samples out of a total of 6,386 tests at consumers' taps in the region exhibited a positive odour (1 SES, 2 TMS). All 6,381 tests in the region met the standard for taste and all 10,034 tests met the standard for colour.

The positive detections of odour are summarised below in relation to their nature and cause as determined by the investigations carried out by the companies.

- **Oil/Solvent:** One (TMS); these descriptors relate to situations where there has been a spillage of central heating oil, petrol or diesel on the property and this has permeated through the plastic water supply pipe; the remedy is to advise the householder on the need to replace the affected pipe and to safeguard against future spills. An odour detected in a sample collected by Thames Water from the Ashton Keynes zone in June was taken from a tap located at a petrol station. Nearby properties were not affected. The supply pipe was found to be plastic and a letter was sent to the owner advising of the need to replace the supply pipe with barrier pipe.
- **Earthy/Musty:** One (SES); these descriptors can relate to situations where harmless, but objectionable, substances are produced by the growth of algae in raw water storage reservoirs or from the growth of fungi in poorly designed plumbing systems. The sample from Warlingham zone in March was reported to have a slight musty odour. Samples from neighbouring properties were satisfactory and the consumer had not detected any odour. Sutton and East Surrey concluded that the odour was most probably due to stagnation of the water in the domestic plumbing system. All repeat samples were satisfactory.
- **Woody:** One (TMS); this descriptor often relates to a substance associated with unapproved black plastic pipe, the remedy is to advise the householder to replace the pipe with approved medium density polyethylene pipe. A sample taken in Thames Water's Battersea zone in August was reported as exhibiting a slight woody odour. Further samples from the property and from neighbours were all satisfactory. The consumer was advised about the likely cause and remedy should the odour reappear.

## Aluminium

Aluminium can occur naturally in some drinking water sources. Also, aluminium-based water treatment chemicals may be used at surface water works to aid the process of filtration. In 2009, a total of 9,228 samples were tested for aluminium in the Thames region. Sutton and East Surrey Water achieved 100% compliance with the aluminium standard. Just four tests exceeded the standard (2 TMS, 2 VCE) and none of these were found to be related to process control at the works.

All four failures were isolated occurrences, attributed to localised disturbance of mains deposits accumulated in the distribution network. One sample, taken by Veolia Water Central from Harrow zone in April, also failed the standard for iron and turbidity (see *Iron* and *Turbidity* sections). There have been no other failures in any of these zones. The Inspectorate expects companies to use information about failures to inform their Distribution Operation and Maintenance Strategies (DOMS).

## Ammonium

Traces of these salts occur naturally in most waters and natural levels are highest in anaerobic groundwater. Intensive rearing of farm animals can give rise to much higher levels in surface waters. Ammonia is a major component of mammalian metabolism, so direct exposure from environmental sources has no health significance. However, ammonia can compromise water treatment (disinfection and filters for the removal of manganese) and its presence in water may be an indicator of more serious bacterial, sewage or animal waste pollution. Across the region in 2009, out of a total of 10,048 tests there were two which exceeded the standard of 0.5mg NH<sub>4</sub>/l (2 TMS).

A sample from the Lee Valley zone in August failed the standard for ammonium. Thames Water employs chloramine as the residual disinfectant in its North London supply area. The company investigation identified that an ammonium monitor at Waltham Abbey works was not functioning properly, causing overdosing of the treatment chemical, ammonium sulphate, which was not noticed due to the lack of an alarm. The faults with the monitor and alarm were remedied and dosing of ammonium sulphate was brought back within control limits. All subsequent samples have given satisfactory results.

Thames Water also reported a high ammonium value in a sample taken from Wandsworth Wandle zone in October. Checks at the Hampton works found no problem with the residual disinfectant process and all further samples have given satisfactory results.

The above two failures will be taken into account during the Inspectorate's forward programme of technical audits.

## Bromate

Normally, bromate is only formed in drinking water when bromide is present in surface water, which is treated with ozone. The process of chlorination may also produce bromate, for example, through the use of sodium hypochlorite solution containing bromide or when chlorine is generated on site by electrolysis. In recent years, companies have put in place control measures aimed at meeting the standard of 10µg/l. In the Thames region, all of the 1,479 tests met the standard.

In previous drinking water reports the Inspectorate has provided an update on the bromate pollution caused by a former industrial site in Sandridge, Hertfordshire, impacting on a strategic chalk aquifer which is a major source of water supplies for two companies in the region (Thames Water and Veolia Water Central). In November 2005, the Environment Agency issued remediation notices to two former owners of the site, Redland and Crest. Both parties lodged appeals with the Secretary of State against the notice and a public planning inquiry was held in 2007 to inform the Secretary of State's appeal decisions.

Following receipt of the planning inspector's recommendations, the Secretary of State was minded to decide the appeals in a way which significantly changed the remediation notice. The Contaminated Land Regulations 2006 require that consultation is carried out before a remediation notice can be changed in a way which is less favourable to any party to it. The Secretary of State therefore informed the parties to the case of his proposed appeal decision and provided them with an opportunity to make representations before reaching his final appeal decision and issuing it in July 2009. Both parties then applied for permission for judicial review of the Secretary of State's appeal decision. In February 2010, the High Court found that neither party had identified sufficient grounds and their applications were dismissed.

The former owners are now starting to take action to understand and remediate the pollution that has affected this valuable groundwater source. In the interim period both water companies have continued to manage the bromate pollution by operating scavenge pumping at Hatfield, which has brought about a significant reduction in bromate concentrations in their raw water sources. Under the terms of the remediation notice Redland and Crest are required to pay the ongoing costs for this scavenge pumping. The concentrations of bromate in the New River have remained below 10µg/l.

The risk to drinking water relates to the plume of bromate moving through the aquifer potentially affecting supplies to Hatfield and the surrounding area served by treatment works at Hornsey (TMS) and North Mymms (VCE). The companies completed legally binding programmes of work in the spring of 2010 to install additional treatment at both sites: at Hornsey the additional processes installed are dissolved air filtration, rapid gravity filtration and catalytic granular activated carbon adsorption. At North Mymms, options explored during 2007 and initial tests on two new alternative borehole sources proved unsuccessful in terms of yield. In early 2008, the Inspectorate accepted a revised legally binding agreement from the company for a series of additional control measures which involve reducing the output from its Essendon works and increasing abstraction from boreholes at East Hyde and Wheathamstead.

## Chromium

Chromium is not normally present in water sources. In 2009, out of a total of 2,499 tests, all but one (1 TMS) met the chromium standard of 50µg/l.

In a sample from a consumer's tap in the South Lambeth zone in December, chromium was detected at a level of 62.6µgCr/l. This sample also failed the standard for iron (see *Iron* section). Chromium was not detected in any of the follow-up samples from neighbouring properties and from the original tap. Thames Water's investigation at the property found nothing to account for this unusual result but noted that a new kitchen had been fitted.

## Copper

Copper in drinking water usually derives from copper pipes and fittings in household plumbing. In general, water supplies in the UK are not aggressive towards copper, but there can be occasional problems with new plumbing installations. In 2009, a total of 2,485 tests were carried out for copper across the region and all but one (VCE) met the standard (2mg/l).

A level of 2.08mg/l copper was reported in a sample from a consumer's tap in the St. Albans zone. Veolia Water Central found that there were elevated levels of copper in pre-flush samples from the same tap, while all samples from neighbouring properties were satisfactory. The company have advised the householder that the most likely cause of the problem is the internal plumbing.

## Fluoride

Traces of fluoride occur naturally in many water sources, particularly in groundwaters. For example, fluoride is found in water abstracted by Veolia Water Central from the Reading Beds in West Essex and in an area south of Reading (around Burghfield and Tadley) supplied by Thames Water. Consumers can obtain specific information on the level of fluoride in the drinking water supply to their home or workplace from their water company.

Fluoride is not removed by conventional water treatment. Some companies fluoridate water supplies at the request of the local health authority as a protection against tooth decay. There are no fluoridation schemes in the Thames region. In 2009, all 2,407 tests for fluoride taken across the region met the regulatory standard (1.5mg/l). For more information on fluoridation please refer to the DWI website ([www.dwi.gov.uk](http://www.dwi.gov.uk)).

## Iron

Iron may be present naturally in raw water, iron compounds may be added as part of water treatment or it can be released as a consequence of the corrosion of iron mains. Effective water treatment prevents these problems arising at source. Nowadays, most samples failing the standard for iron are from places where the distribution network contains a large proportion of old cast iron pipes. When deposits in these pipes are disturbed by an operational problem (such as a burst main) they turn the water orange-brown. Elevated levels of iron are objectionable to consumers because the water may appear turbid, it may have an astringent or bitter taste and the deposits are unsightly and may stain water fittings. Discolouration of water supplies often prompts consumers to contact their water company.

Companies in the Thames region completed their long-term strategic programmes of mains renovation work by 2005 and delivery of ongoing compliance with the standard for iron is through companies' Distribution, Operation and Maintenance Strategies (DOMS). In 2009, there were 17 failures of the iron standard at consumers' taps, compared to 18 failures in 2008.

A sample from Bough Beech zone taken by Sutton and East Surrey Water in March failed the iron standard. A subsequent investigation sample also failed. The probable cause of the failure has been identified as an unlined section of main close to the property. The company are managing the situation by a regular flushing programme. Another iron failure in a sample from the Outwood zone in March was attributed by the company to an error in sampling. Since summer 2008, the company had been collecting first draw instead of post-flush samples. In consultation with the Inspectorate

the company has changed its procedures and there have been no further failures in this zone.

In 2009, Thames Water reported 11 failures of the iron standard, five of which were isolated events caused by a localised disturbance of the main, dealt with by flushing at the time and not indicative of a wider problem. One sample, from South Lambeth zone in December, also failed the standard for chromium (see *Chromium* section). Two failures from Banbury zone in April and December and a failure from Faringdon Town zone in July could not be cleared by flushing. The company is reviewing data and this will inform the company's Distribution, Operation and Maintenance Strategy (DOMS). There were three failures of the iron standard from samples in Chipping Norton zone in July, August and September. In response, the company is carrying out strategic flushing in the zone with further investigational sampling. The Inspectorate expects Thames Water to use the additional information to prioritise work to renovate or replace sections of newly identified cast iron mains.

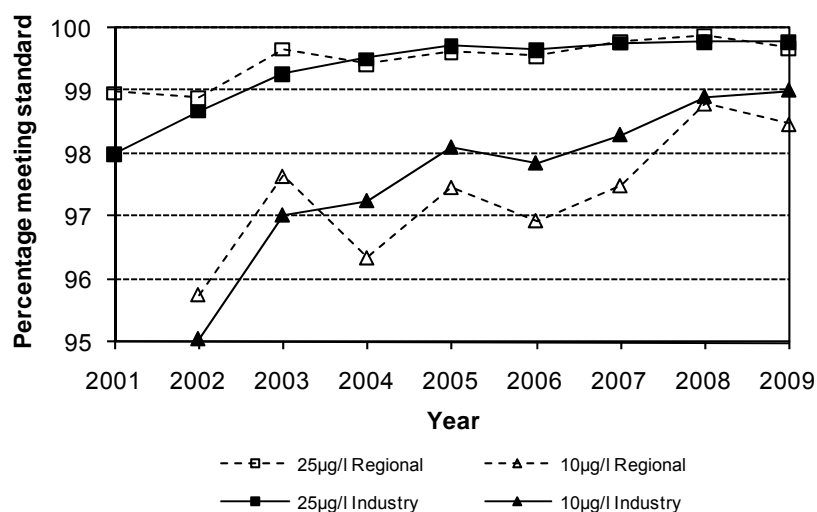
In 2009, Veolia Water Central reported three failures of the iron standard. Each case was considered to be an isolated event caused by a localised disturbance of the main, dealt with by flushing at the time and not indicative of a wider problem. A sample taken by Veolia Water Central in April from the Harrow zone, also failed the standards for aluminium and turbidity. The cause was work to replace a leaking ferrule on the local main. All further samples from the zone have been satisfactory since.

## Lead

The pipe connecting a property to the water company main, together with internal plumbing, is the most common source of lead in drinking water. Properties built or renovated since 1970 are unlikely to have lead pipes and lead solder was banned for use with copper drinking water installations in the early 1970's. The only other recognised source of lead in drinking water in some buildings is fittings made from brass. The extent of lead pick up depends on various factors; temperature, acidity (pH), water hardness, the length of pipe and the time that water is left to stand in the pipe (stagnation) before it is drawn off.

The monitoring data collected by companies during 2009 has been added by the Inspectorate to that gathered in previous years to provide an updated picture of progress in the region and for the industry, towards meeting the future standard for lead of 10µg/l by the end of 2013 (see Figure 8).

**Figure 8: Percentage of tests meeting the current and future standard for lead between 2001 and 2009 in the region**



Water companies notify both the consumer and the relevant local authority whenever a failure of the lead standard occurs. In 2009, the Inspectorate was notified of a total of eight failures of the current standard in the region (1 SES, 5 TMS, 2 VCE) compared to three failures in 2008. Across the region in 2009, out of a total of 2,488 tests, there were 38 samples which exhibited a lead value above the future standard of 10µg/l (1 SES, 28 TMS, 9 VCE) compared to 30 in 2008. This confirms the major challenge faced by the region in terms of meeting full compliance with the future lead standard by 2013.

The Inspectorate’s *Guidance on the Regulations* issued in 2008 reminded companies that they should be notifying local authorities of breaches of the future (as well as the current) standard and giving advice to householders whenever lead is found in a tap sample. Figure 8 illustrates the importance of companies and local authorities acting now to secure compliance with the future lead standard by 2013.

Sutton and East Surrey Water detected elevated lead in a sample taken from a customer’s tap in Kent Hatch zone in September 2009. The company were unable to regain access to the property. The main supplying this property was replaced during 2001 in ductile iron, and the service and communication pipes are made of polyethylene. The company wrote to the consumer advising on measures to reduce lead levels due to plumbing within the property.

In 2009, Thames Water reported five failures of the standard in the following zones: Tooting, Willesden, South Ealing, Roding Valley and Childrey and Wantage West. The company’s investigation pointed towards domestic plumbing as the cause in each case and wrote to the

householders giving advice on actions to take to minimise lead levels in their drinking water.

There were two failures of the current lead standard in Veolia Water Central's Hadstock zone (April) and Northwood/Ruislip zone (August). Following replacement of the lead communication pipe at the property in the Northwood/Ruislip zone, the company still found elevated lead levels on a first draw sample. The company has written to both householders with advice about minimising levels of lead due to the internal plumbing.

The business plans of Thames Water and Sutton and East Surrey Water for the next five year investment period (AMP5) include an integrated package of measures to address the residual risk of consumer exposure to lead above the future standard. The companies have since entered into a legally binding agreement with the Inspectorate to deliver the specified activities. The Inspectorate will be reviewing the approach to lead risk assessments taken by all companies in the region.

In addition, during 2009, companies in the region have responded to 430 consumer requests to check the level of lead in drinking water in their property.

## Manganese

Manganese occurs naturally in many sources of water. It can be removed from raw water by converting the soluble form to an insoluble precipitate (oxidation). Treatment can be simple to achieve (aeration), but for some waters more complex processes are needed. If effective treatment is not in place then black deposits may collect in the distribution pipes.

When disturbed, such deposits may turn the water black. Even small traces of manganese are objectionable to consumers. Typical complaints relate to the staining of laundry or the discolouration of vegetables during washing or cooking. The purpose of the standard for manganese is to minimise these problems. In 2009, all 9,093 tests in the region met the manganese standard (50µg/l).

## Nickel

Nickel may be present in coatings on modern tap fittings. In 2009, a total of 2,485 tests were carried out for nickel and all but seven (4 TMS, 3 VCE) met the standard (20µg/l).

Levels between 20.4µg/l and 47.2µg/l of nickel were reported in the four samples from consumers' taps collected from the Cirencester zone (May), South Enfield zone (August), Chipping Campden North Cotswold zone

(October) and Hoddesdon zone (November). In each case, Thames Water found higher levels of nickel in pre-flush compared to post-flush samples. Thames Water wrote to the householders with advice about chrome taps. Veolia Water Central reported similar findings in relation to three failures of the nickel standard recorded in the Weybridge/Woodham zone (January), Beaconsfield/Chalfont St Giles zone (June) and East Barnet zone (August). The levels of nickel ranged between 35.5µg/l and 48.2µg/l.

## Nitrate and nitrite

Nitrate occurs naturally in all source waters due to the decay of vegetable material in soil. Nitrogenous fertilisers used on arable farmland are a significant source of nitrate in groundwater. Rainfall washes nitrate from the soil into lakes, rivers and streams. Nitrate levels can be reduced by water treatment or by blending with another, low nitrate, water source. In 2009, all 7,785 tests for nitrate across the Thames region met the standard of 50mg/l.

During 2009, Veolia Water Central completed a legally binding improvement programme to address nitrate at Offley Bottom works near Hitchin, Hertfordshire. This involved the introduction of controlled blending which has resulted in improved water quality to around 37,000 consumers.

From extensive information gathered by the water companies in the Thames region, a likelihood of drinking water supplies in the region failing the nitrate standard in the longer term has been confirmed at some sites. As a consequence, legally binding agreements are in place for additional treatment, if required, at two Thames Water sites: Wantage and Westerham and one Veolia Water Central site: King Walden. All these improvements are planned to be delivered before the end of March 2014.

Table 9 shows the number of raw water abstraction points in the region that are monitored for nitrate and the percentage of those points where nitrate above 50mg/l has been detected in 2009. Annex 4 lists the planned work to address nitrate in the region and blending is already in place at some sites.

**Table 9: Numbers of raw water abstraction points monitored for nitrate and percentage exceeding 50mg/l in 2009**

Company	Groundwater		Surface Water <sup>1</sup>	
	Number of abstraction points monitored for nitrate	Percentage with sample(s) exceeding 50mg/l in 2009	Number of abstraction points monitored for nitrate	Percentage with sample(s) exceeding 50mg/l in 2009
Sutton and East Surrey Water	24	0%	1	0%
Thames Water	108	8%	13	0%
Veolia Water Central	147	3%	4	0%
<b>Total</b>	<b>279</b>	<b>4%</b>	<b>18</b>	<b>0%</b>
Notes: <sup>1</sup> Surface water figures contain groundwater abstraction points influenced by surface water				

Nitrite may be formed when chloramine is used as the residual disinfectant to maintain the microbiological quality in the distribution network. The formation of nitrite is controlled by careful optimisation of the chloramination process. Chloramine is used as the residual disinfectant throughout the areas supplied by Sutton and East Surrey Water and Thames Water in central London. Additionally, chlorine residual in the form of chloramine is used in Veolia Water Central's Luton supply area (derived from Anglian Water's Grafham works). Nitrite can also form in samples of water, after collection and before analysis, especially if the sample is not kept cool. In 2009, all 7,784 tests carried out across the region for nitrite met the standard (0.5mg/l).

### Pesticides and related products

This group of substances, generically called pesticides, includes many organic chemicals ranging from weed killers, to insecticides and fungicides. Water sources may contain traces of pesticide residues as a result of agricultural use (pest control on crops) and non-agricultural uses (herbicides for weed control on highways etc.). Water companies are required to assess the risk to drinking water supplies of pesticide use in their catchments and test for those which might be present. Companies have documented potential and actual pesticide hazards

through their Regulation 27 risk assessments which are informed by raw water monitoring and identify the control measures in place.

When pesticides are first detected, water companies will enhance their monitoring of raw water and notify the Environment Agency to facilitate appropriate action to safeguard drinking water quality.

In 2009, one of the tests in the region exceeded the standard for total pesticides from 1,409 tests (SES). There was 100% compliance (2,392 tests) for the four pesticides with a standard of 0.03µg/l. Out of a total of 41,796 tests for those individual pesticides (with a standard of 0.1µg/l) 44 exceeded the standard. The circumstances and substances involved are summarised below.

### **Carbetamide**

Carbetamide is a moderately soluble herbicide which is used to control some types of grasses and broad-leaved weeds.

In February, a carbetamide level of 0.34µg/l was reported by Sutton and East Surrey Water from its Bough Beech works (near Edenbridge, Kent) and notified to the Inspectorate as an event (see *Annex 3*).

Monitoring demonstrated that the episode of contamination of the raw water source was short lived, with samples from March onwards being satisfactory. The National Centre of Environmental Toxicology confirmed no adverse health effects would be expected at these concentrations. The Inspectorate is pleased to note that the company has identified the source of carbetamide usage in the catchment and adopted a water safety plan approach by putting in place a catchment management plan with other interested parties to implement control measures for streams feeding into the impounding reservoir.

Veolia Water Central also found carbetamide at a level of 0.21µg/l in a sample from Greenford/Northolt zone in March. The investigation confirmed a short sharp spike of carbetamide in the River Thames which the ozone and granular activated carbon at Iver works could not completely remove. Veolia Water Central and Thames Water are working with the Environment Agency to look at catchment-related control measures as they both draw water from the River Thames.

### **Metaldehyde**

During 2009, metaldehyde, the active ingredient of some slug pellets, has been identified by Sutton and East Surrey Water, Thames Water and Veolia Water Central, as a new pesticide hazard in a number of their

catchments. When detected in samples, the levels found range from 0.10µg/l to 0.37µg/l. The Health Protection Agency has advised that no adverse health effects are expected from these levels in drinking water. The companies have initiated a sampling programme to monitor the levels of metaldehyde in both raw and treated waters from each of the 'at risk' treatment works. Legally binding programmes of work have been put in place detailing short, medium and long-term plans to mitigate the impact of this pesticide (see *Annex 4*).

## pH (Hydrogen ion)

pH is a measure of the acidity of the water. Where water is supplied from upland areas the water naturally picks up iron and humic acids from the peaty soils, resulting in slightly acidic water with a low pH, which is commonly described as 'soft water'. Such water has an increased potential to corrode iron pipes and leach material from cement lined mains. Acidity can also be affected when water is artificially softened by a treatment device in a consumer's property. The standard is a range of 6.5–9.5.

In the Thames region, out of a total of 11,321 tests, the standard was exceeded on one occasion in 2009 (1 TMS).

A pH value of 5.8 was reported from the Windsor and Slough East zone during March. The investigation identified a treatment device (reverse osmosis) connected to the drinking water tap. Thames Water advised the householder of the need to retain a tap connected directly to the mains for drinking and cooking when installing point of use treatment units.

## Polycyclic aromatic hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are present in coal tar. Before 1970, coal tar was widely used to line iron pipes. Therefore PAHs including benzo(a)pyrene may be present in the water as a result of degradation of these linings. In 2009, throughout the region, one test (VCE) failed the standards for PAH (0.1µg/l) and two tests (1 TMS, 1 VCE) exceeded the benzo(a)pyrene standard (0.01µg/l).

In the Pirbright/Send zone a sample collected in December failed the standard for PAH and benzo(a)pyrene. Veolia Water Central found that the sample had been collected when gas mains work had disturbed a 4" cast iron dead end main that was over 60 years old. The wider zone does not have a history of PAH problems and follow-up sampling gave satisfactory results.

A sample from the Petts Wood zone collected by Thames Water in December failed the standard for benzo(a)pyrene. The supply is by means of a cast iron main, but there was no evidence of other work that may have disturbed any mains deposits. There have been no other failures in this zone. The Inspectorate expects such information to inform the company's Distribution, Operation and Maintenance Strategy (DOMS).

## Turbidity

Turbidity is the cloudiness of water as determined by measuring the degree of scattering of a beam of light as it passes through the water. Turbidity may be measured by on-line instruments, usually located at a water treatment works, in addition to tests carried out on samples sent to a laboratory. The national turbidity standard for water at the consumer's tap is 4NTU. Failures of this standard are usually associated with the disturbance of sediment within water mains.

Additionally, and importantly, water companies must measure turbidity at the water treatment works. Treated water entering the distribution system must not exceed the regulatory turbidity specification of 1NTU.

The following discussion focuses on the results of samples taken from consumers' taps. For information on tests taken at water treatment works, see the heading *Turbidity* in the *Microbiological quality* section.

In 2009, a total of 11,324 samples from consumers' taps across the region were tested for turbidity and all but one (VCE) met the standard of 4NTU.

A value of 10NTU was recorded by Veolia Water Central in a sample from a consumer's tap in Harrow zone in April, which also failed the standards for aluminium and iron (see *Aluminium* and *Iron* sections). The failures occurred following work to replace a leaking ferrule on the local main.

## Private water supplies

New private water supply regulations came into effect in England on 1 January 2010. These regulations implement the 1998 European Drinking Water Directive and replace the previous 1991 regulations. Initial guidance for local authorities on the implementation of the new legislation is available on [www.privatewatersupplies.gov.uk](http://www.privatewatersupplies.gov.uk) and the Inspectorate's website ([www.dwi.gov.uk](http://www.dwi.gov.uk)). Whereas in the past the approach to improving these small water supplies has been informal and based on advice and encouragement, it is now an enforceable duty for these supplies to be risk assessed, reported and enforcement action taken whenever there is

evidence of a breach of the drinking water standards or a potential risk to public health. The principle changes are summarised below.

### Private distribution systems

The new regulations close a gap in the old legislation which could not be used to improve the quality of drinking water from privately operated distribution systems. The new regulations now cover water that is *'...supplied by a water undertaker or licensed water supplier and then further distributed by a person other than a water undertaker or licensed water supplier...'*

Private water distribution systems occur when the water originates from a public water supply, but is then distributed on to buildings/properties within premises whose occupants are often charged for the supply by a person other than the public water supply company. Typical examples of where this type of private supply may be found are:

- caravan and camp sites;
- military establishments;
- hospitals, school, college and university campuses where water is distributed to buildings which are occupied by other organisations;
- shopping centres where the water is distributed to organisations in shopping outlets, administration offices and other public buildings;
- airports/ports/train stations where water is distributed to organisations in various buildings within the transport site; and
- estates where water is distributed to organisations occupying other buildings such as the National Trust.

Local authorities will work in collaboration with water companies to identify those situations where a distribution system is subject to the private water supply regulations. Water companies will provide guidance on situations controlled by the Water Supply (Water Fittings) Regulations 1999.

### Main duties on local authorities

Local authorities must keep and maintain records of all private water supplies and forward these each year to the Inspectorate. This ensures that in future, national reports about drinking water quality will include information on all supplies to consumers apart from those serving a single private household where there is no commercial activity.

Local authorities must risk assess all private supplies in their area within five years. Once completed these risk assessments must be kept under regular review. See the Inspectorate's website ([www.dwi.gov.uk](http://www.dwi.gov.uk)) or [www.privatewatersupplies.gov.uk](http://www.privatewatersupplies.gov.uk) for guidance on carrying out a risk assessment.

Local authorities must continue to monitor all 'large' private supplies in accordance with frequencies set according to the volume of water used. However, risk assessment enables local authorities to tailor the scope of monitoring and exclude parameters where there is reliable data to verify compliance with the drinking water standard. Large supplies are those providing 10m<sup>3</sup>/day or more (serving more than 50 persons). Monitoring is also required for any supply, irrespective of size which is part of a commercial or public activity.

Local authorities have more discretion over monitoring smaller supplies and private distribution systems. Within five years, each of these supplies must be tested for a few very important parameters (known as Regulation 10 monitoring) and any other parameters as indicated by the risk assessment.

Private supplies serving a single dwelling are exempt, but a local authority must carry out monitoring if requested to do so by the occupant or owner.

Local authorities must take steps to safeguard consumers if, as a consequence of their risk assessment or monitoring, a potential danger to human health is identified. These steps involve serving a Notice to prohibit or restrict the use of the supply until appropriate remedial action has been taken. It is an offence for the relevant person not to comply with a Notice and the local authority can have the Notice enforced on application to the Magistrates' courts. The relevant person also has the right of appeal to the Magistrates' courts, if they are aggrieved by the Notice.

Local authorities must investigate and determine the cause of all breaches of standards and ensure that appropriate remedial action is taken by the serving of a Notice. Local authorities may provide advice and negotiate with owners on the exact nature of the improvements required.

### **Implementing the new private water supply regulations – case example**

The first Notice under the new English private water supply regulations was served by Sevenoaks District Council on the 23 March 2010.

This Regulation 18 Notice identified that a private water supply serving 76 domestic dwellings and four commercial properties was a potential danger to human health due to the presence of organisms indicative of faecal contamination (*E.coli*, coliform bacteria and *Clostridium*

*perfringens*). The risk assessment and investigation by the local authority and the private water supply manager identified structural and integrity issues with a storage reservoir. The new regulations enabled the local authority to document in the Notice the nature of the steps that need to be taken to improve the water supply, such as requiring a structural report identifying the remedial measures needed to prevent ingress of contaminants. The benefit of the new type of Notice to the local authority and consumers is that non-compliance by the relevant person (owner, operator etc) is an offence so the provisions of the Notice can be enforced relatively straightforwardly by the courts, if necessary.

Sevenoaks District Council had tested the supply six times a year under the old private supply regulations in England. Although some of the samples had given unsatisfactory results and despite the local authority being aware that maintenance of the supply had been sporadic and not sufficient, the prescriptive regime of relatively infrequent monitoring meant that the contamination went largely unobserved. The absence of successive failures of the drinking water standards made it difficult for the local authority to take action because monitoring was insufficient to confirm that the failures were not trivial and likely to recur.

Sevenoaks District Council are to be commended for promptly taking advantage of the risk-based approach in the new regulations by assessing the whole supply, including the network, and identifying appropriate remedies that will safeguard water quality and consumers in the future. This case example clearly demonstrates the deficiencies of infrequent monitoring of small supplies, which was at the heart of the old style approach to private water supplies. The Inspectorate looks forward to supporting other local authorities in improving drinking water quality for all consumers reliant on small supplies.

## Risk assessments

The changes to the drinking water regulations in 2007 required water companies to risk assess all of their water supply systems using methodology based on the water safety plan approach in the World Health Organisations' *Guidelines for Drinking Water Quality*. The approach includes identifying actual and potential hazards throughout the water supply system from the catchment to consumers' taps. For each identified hazard, the company determines the associated risk considering any control measures already in place. In some cases the company will conclude that the risk is sufficiently mitigated through existing controls. Where this is not the case, the residual risk is highlighted as needing further mitigation measures and an action plan put in place.

The regulatory reporting process required companies to provide the Inspectorate, by October 2008, with information about the hazards which the company considers to be adequately controlled, together with details of the action plans relating to those hazards for which further mitigating measures have been identified as necessary. Where the Inspectorate considers that there has been or may be a risk of supplying water that would constitute a potential risk to public health it may serve a Regulation 28(4) Notice to enforce and, if needs be, vary the mitigating steps set out by the company in its action plan. The Notices typically specify the following types of actions: maintenance, regular reviews and audits of controls, conditions under which supply is prohibited, progress reporting and information requirements.

**Table 10: Outputs of risk assessments within the region**

Company	Number of risk assessments	Number of Reg 28(4) Notices <sup>1</sup>	What is Notice about?			
			Source protection	Change in source of supply	Distribution maintenance	Improvements at works
SSE Water	4	-	-	-	-	-
Sutton and East Surrey Water	9	-	-	-	-	-
Thames Water	70	13	-	-	3	10
Veolia Water Central	80	-	-	-	-	-
<b>Region overall</b>	<b>163</b>	<b>13</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>10</b>
<b>England and Wales</b>	<b>857</b>	<b>238</b>	<b>7</b>	<b>28</b>	<b>52</b>	<b>159</b>

<sup>1</sup>Some notices are classified under more than one category

Table 10 shows the mitigation actions being carried out by companies in the Thames region as a result of their risk assessment of drinking water supplies. Out of a total of 163 supply system risk assessments in the Thames region, the Inspectorate has put in place 13 Regulation 28(4) Notices. These notices mainly relate to improvements at works operated by Thames Water.

The action plans delivered through Notices make up part of the overall, rolling, drinking water quality improvement programme of each water company. *Annex 4* summarises all legally binding schemes of work (known as undertakings) put in place through the Periodic Price Review process together with remedial work specified in Regulation 28(4) Notices.

An important element of the risk assessment and risk management processes now in place is the monitoring of raw water quality. Each water company has put in place a regulatory raw water monitoring programme for each of its abstraction points. The main purpose of this testing is to inform the management of risk and to ensure that all hazards are identified promptly and controlled effectively. During 2009, companies have worked with the Inspectorate (and carried out pilot studies) to facilitate the future transfer of raw water quality data to the regulators. Table 11 summarises the scope and scale of the raw water quality monitoring data gathered by water companies in the Thames region in 2009. This water company information is being shared by the Inspectorate with the Environment Agency and contributes to the overall monitoring of environmental water quality required by European law.

**Table 11: Numbers of tests taken at abstraction points in 2009**

Nature of parameter	Company			
	Sutton and East Surrey Water	Thames Water	Veolia Central Water	Total
Natural properties	1,257	27,538	10,401	39,196
General water quality indicators	2,885	41,079	32,434	76,398
Microbiological indicators	1,994	15,597	18,461	36,052
Microbiological pathogens	54	2,793	147	2,994
Pesticides	1,191	32,393	17,159	50,743
Chemicals other than pesticides	527	22,418	15,197	38,142
<b>Total tests</b>	<b>7,908</b>	<b>141,818</b>	<b>93,799</b>	<b>243,525</b>
Number of abstraction points	47	132	157	336

### **Catchment risk assessment – case example**

An important element of the water safety plan methodology, that underpins regulatory risk assessments, is dialogue between water companies and other stakeholders to identify hazards and manage risks within specific water supply catchments. An example of such work in the region is identification of the pesticide metaldehyde as a potential raw water hazard at Bough Beech reservoir in 2008. In addition to contributing to the national Metaldehyde Stewardship Group, Sutton and East Surrey Water has also been working locally with ADAS consultants and the Environment Agency (EA) to target agronomists, contractors and farmers working in the River Eden catchment. Meetings in December 2008 and February 2010 were attended by a number of agronomists (including some that carry out National Register of Sprayer Operators training), contractors and farmers from the Eden catchment. Discussion topics have expanded to include other pesticides in the catchment. The company has also shared information at other meetings hosted by agronomists for the benefit of their clients (Crop Management Partners in December 2009 and Rutherfords in June 2010). Working locally with the EA, an 'Eden catchment newsletter' was published in August 2009 and this was delivered with product specific literature to all major farmers (approximately 85) in the Eden catchment.

## **Drinking water quality events**

From 1 January 2009, in line with the Hampton Principles in the *Regulator's Compliance Code*, the Inspectorate has applied an updated approach to the assessment of water quality events. The risk-based approach enables the Inspectorate to target resources where they can be most effective in terms of maintaining public confidence in drinking water quality. Based on the preliminary information provided by the company (three day report), an event is classified into one of following five categories:

**Not significant (category 1):** no further information required by inspector to assess the event.

**Minor (category 2):** no further information required by inspector to assess the event.

**Significant (category 3):** full company report required to enable inspector to assess the event.

**Serious (category 4):** in addition to a full company report, the assessment requires action by more than one inspector.

**Major (category 5):** in addition to a full company report, the assessment requires action by senior inspectors.

In 2009 companies in the Thames region notified the Inspectorate of 64 events. Table 12 shows how these events were classified.

**Table 12: Water quality events in the region in 2009**

Nature of event	Risk assessment category (DWI)				
	1	2	3	4	5
Air in water	-	-	-	-	-
Chemical	-	1	-	-	-
Discoloured water	-	1	2	-	-
Inadequate treatment	-	-	-	-	-
Loss of supplies/poor pressure	-	11	-	-	-
Microbiological	8	9	4	-	-
Taste/Odour	1	6	-	-	-
Health concern	-	1	-	-	-
Public concern	7	6	1	-	-
Other	1	4	1	-	-
<b>Region overall</b>	<b>17</b>	<b>39</b>	<b>8</b>	<b>-</b>	<b>-</b>
<b>England and Wales</b>	<b>63</b>	<b>213</b>	<b>141</b>	<b>4</b>	<b>1</b>
Category 1 = Not significant, Category 2 = Minor, Category 3 = Significant, Category 4 = Serious, Category 5 = Major.					

A summary of the nature, cause and duration of each event categorised as significant, serious or major, along with details of the Inspectorate's findings are set out in *Annex 3*. Most events were of relatively short duration and the company took action to inform and safeguard consumers and other stakeholders as appropriate.

One-eighth (8 out of 64) of the events in the Thames region during 2009 were of a type that necessitated a detailed investigation by an inspector. None were serious enough to warrant a major investigation by the Inspectorate. This compares very favourably to the other regions in England where a much greater amount of inspector time was spent on investigating events.

Two events which occurred in 2009 are summarised below because of the learning points highlighted by the findings of the Inspectorate's investigation.

### **Detection of *E.coli* and coliforms, Great Rissington service reservoir**

- In August, higher than normal colony counts were detected in samples from Thames Water's Great Rissington service reservoir. Seven out of eight investigational samples collected at the same time contained *E.coli* and coliforms. The company immediately isolated and inspected the reservoir and issued a precautionary boil water notice to consumers living in the 189 downstream properties. No clear cause was found for the microbiological contamination, despite a thorough investigation, and enhanced monitoring was put in place. The Inspectorate is pleased to acknowledge the use of colony counts to inform the company's proactive risk-based approach to inform service reservoir maintenance.

### **Discoloured and aerated water, Guildford**

- In May, Thames Water supplied approximately 500 properties in Guildford with discoloured and aerated water following depressurisation of the network. A compartment of Pewley service reservoir had been taken out of service and drained down for a planned inspection. When Ladymead works shut down automatically a non-return valve located at the reservoir prevented the back up supply for the network coming into effect. When the works was restarted and network pressures were restored, consumers received discoloured and aerated water. The cause of this event was a lack of knowledge about the non-return valve by those planning and executing the work on the reservoir. The Inspectorate expects companies to have accurate records for all their assets, especially where strategically significant. Such records should be verified when work is planned.

No offences are currently under consideration by the Inspectorate in connection with any of the events that occurred in the region in 2009.

## **Technical audit activity**

The Inspectorate has operated a risk-based approach to technical audit since 2005. In line with better regulation principles, no technical audit takes places without a reason and those that are carried out are targeted on the basis of an assessment of risk.

The Inspectorate's tool for generating the technical audit programme looks at the critical components of the safe management of drinking water supplies, including information on water quality monitoring, event assessments, previous audits, consumer complaints and other relevant intelligence. Through this ranking of all relevant water company assets,

procedures and practices, inspectors are able to prioritise and focus their technical audit work where it will have most benefit.

Information on the key findings of the technical audits undertaken during 2009 in the Thames region is set out in Table 13.

**Table 13: Summary of the Inspectorate's technical audits in the region**

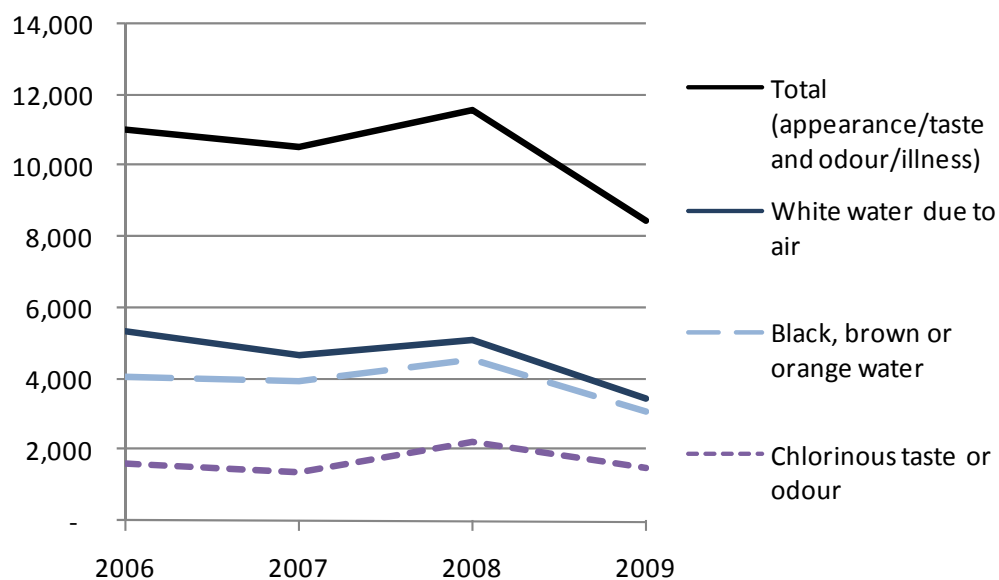
Site name	Audit topic	Main findings from audit
<b>Sutton and East Surrey Water</b>		
Sutton and East Surrey Water, Redhill, laboratory	Investigation of quality control, chemistry and microbiology.	Unsatisfactory. Recommendations were made relating to: <ul style="list-style-type: none"> <li>• Training and competence.</li> <li>• Sample transportation.</li> <li>• Chemistry internal analytical quality control (AQC), method validation and limit of detection.</li> <li>• Microbiology internal AQC</li> </ul>
<b>Thames Water</b>		
Farmoor works	Disinfection events.	Unsatisfactory. Recommendations were made relating to: <ul style="list-style-type: none"> <li>• Labelling of chemical delivery points.</li> <li>• Training.</li> <li>• Filter backwashing.</li> <li>• Alarms and associated settings.</li> <li>• Recording information on record sheets.</li> <li>• Handheld equipment for calibration.</li> <li>• Calibration and operation of monitors.</li> </ul>
Cleeve works	Turbidity and <i>Cryptosporidium</i> , event.	Generally satisfactory. Recommendations were made relating to: <ul style="list-style-type: none"> <li>• The operation and maintenance of filters,</li> <li>• Location of compliance sample tap chlorine concentration/time (Ct) studies.</li> </ul>
Grimsbury works	Flood event and ozone dosing.	Generally satisfactory. Recommendations were made relating to: <ul style="list-style-type: none"> <li>• Chlorine alarms and associated testing.</li> <li>• Mechanism for alerting operator of alarms and its maintenance.</li> <li>• Security of site.</li> <li>• Recording of calibration changes to on site equipment.</li> </ul>

## Public confidence in drinking water quality

When consumers have a question or a concern about drinking water quality their first point of contact is the water company. All companies record these contacts using definitions agreed with the Inspectorate.

In the Thames region, the number of consumers reporting concerns about the quality of their tap water (appearance, taste and odour, or illness) has continued to decline and the improvement made during 2009 was mainly driven by a fall in the number of consumers reporting discoloured water due to entrained air (white water) or contacts about black, brown or orange water. This is illustrated in Figure 14.

**Figure 14: Numbers of consumer contacts 2006-2009**



Figures 15 and 16 illustrate consumer contact rates for appearance in 2006 and 2009

Figure 15: Rate of consumer contacts per 1,000 population for appearance 2006

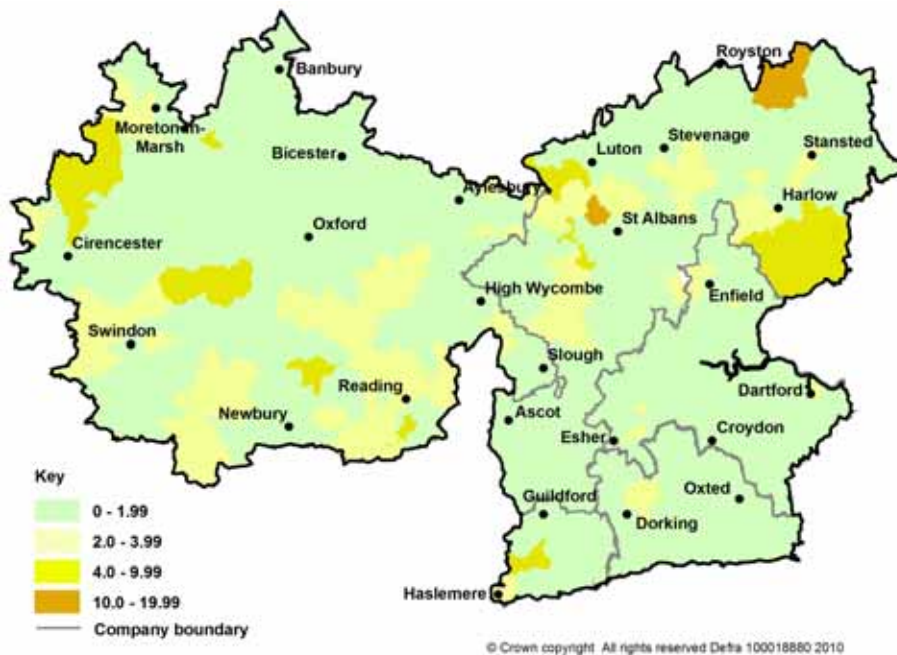
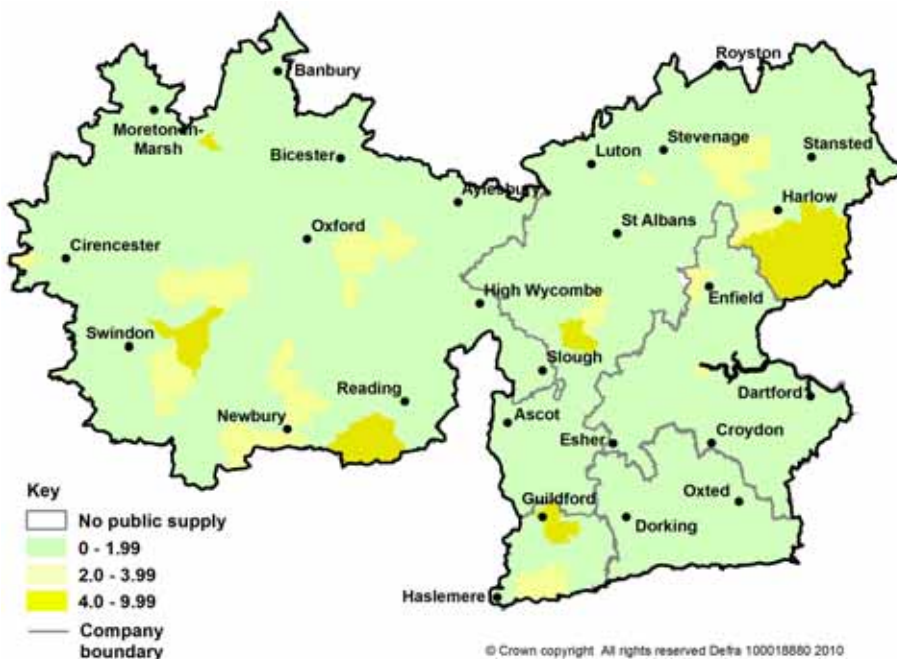


Figure 16: Rate of consumer contacts per 1,000 population for appearance 2009



The two maps illustrate the general fall in contact rates in areas north of Cirencester, between Luton and Slough and north of Reading. Higher than average contacts about appearance persist near Swindon, Harlow and to the south of Reading.

### **White water – air**

Consumers contact their water companies when they experience water that appears white due to entrained air and this is the main concern for consumers in the Thames region. During 2009 there has been an encouraging fall in the number of white water events to 3,500 contacts, compared to over 5,300 in 2006. All companies in the region contributed to this improvement.

### **Discoloured water – black, brown or orange**

Compared to other regions of England and Wales, the Thames region exhibits the lowest contact rate for black, brown or orange water at 0.3 contacts per 1,000 population. Nonetheless, it is still the second most frequent reason for consumers expressing dissatisfaction with their tap water quality. The number of discoloured water contacts in 2009 was about 3,000, lower than the 4,000 reported in 2006, with all companies showing lower figures this year.

### **Taste and odour – chlorine**

Last year the Inspectorate reported a substantial rise in the number of consumers reporting a chlorine taste and odour nationally and this increase was mirrored in the Thames region. The picture in 2009 is more encouraging, with the figures showing an improvement; chlorine taste and odour contacts across the region have reduced from their peak of close to 2,200 in 2008 to just over 1,500 in 2009 and again all companies reported lower figures.

### **Complaints to the Inspectorate**

When the response of a company to a consumer contact about drinking water quality fails to provide the necessary reassurance or remedy then the consumer may contact the Inspectorate for advice. In 2009, there were eight consumers sufficiently dissatisfied with the water company's initial response to raise the matter further with the Inspectorate and the reasons for contacting the Inspectorate are provided in Table 17.

**Table 17: Contacts from consumers in the region received by the Inspectorate**

Category <sup>1</sup>	Number of contacts
Appearance	2
Taste and odour	6
Report of illness	0
Water quality concern	0
Number of contacts to DWI from consumers by company. TMS (6), VCE (2)	
<sup>1</sup> Categories are as defined in Information Letter 1/2006	

**Case example**

In October, the Inspectorate received a complaint from a Thames Water customer about a chlorine taste and odour in their drinking water supply. The customer had been in contact with the company on two occasions before contacting the Inspectorate. On both these occasions the company's call centre had referred the complaint on to the water quality scientists to deal with but the customer did not answer their call backs.

Following the involvement of the Inspectorate the company initiated an investigation, sampling at the consumers property on two separate days. These results confirmed a significant variation in residual chlorine concentration over a short time period. The company traced this to the intermittent operation of a booster chlorination facility, in particular the high chlorine set point, which was reduced from 0.8mg/l to 0.7mg/l (free chlorine).

This case illustrates the need for companies to regularly review their residual chlorine policies and check that residual chlorine limits are appropriate on a site-by-site basis taking into account consumer contact information. The aim of a residual chlorine policy should be to maintain hygienic conditions in the network without compromising consumer acceptability.

*For further information on the Water Supply (Water Quality) Regulations 2000, or the microbiological and chemical parameters covered by the regulations please refer to the DWI website ([www.dwi.gov.uk](http://www.dwi.gov.uk)).*

*If you have a need for more specific information than that on our website, please contact us on the DWI enquiry line: 030 0068 6400.*

## Annex 1

### Further sources of information

The publication *Drinking water 2009* comprises the regional reports for England and a report covering Wales. There are six regional reports for England (Central, Eastern, Northern, Southern, Thames and Western) and one for Wales (in two languages). Each report presents information from 2009 under the following headings:

- Introduction to the report.
- Water supply arrangements.
- Drinking water quality testing.
- Drinking water quality results.
- Private water supplies.
- Risk assessments.
- Drinking water quality events.
- Technical audit activity.
- Public confidence in drinking water quality.

The reports and other content are published on the DWI website ([www.dwi.gov.uk](http://www.dwi.gov.uk)).

### Content of the CD

The CD supplied with the printed report holds all of the above content and additionally it contains:

#### Water company look-up tables

These summarise all the results of water company monitoring in 2009. They provide information on:

- what was tested;
- how many tests were performed;
- the range of the results of testing; and
- how many tests failed to meet the standards.

#### Significant drinking water quality events in England and Wales 2009

To promote shared learning, the Inspectorate has compiled a list of all incidents that occurred in 2009 which illustrate the nature and cause of each incident, the main actions by the company and findings from the inspectors' assessments. Relevant content from this overall list is contained in an annex to each regional report.

## Annex 2

### Glossary and description of standards

These definitions will assist the understanding of the report where technical terms have been used.

<b>1,2-Dichloroethane</b>	is a solvent that may be found in groundwater in the vicinity of industrial sites. Where necessary it can be removed by special water treatment. A European health-based standard of 3µg/l applies.
<b>Acrylamide</b>	European health-based standard. A monomer is not normally found in drinking water. It is produced in the manufacture of polyacrylamides occasionally used in water treatment. Its presence in drinking water is limited by control of the product specification. Standard is 0.1µg/l.
<b>Aggressive</b>	a term used to indicate that the water has a tendency to dissolve copper (and other metals) from the inner surface of a pipe or water fitting such as a tap.
<b>Aesthetic</b>	associated with the senses of taste, smell and sight.
<b>Alkali</b>	a solution containing an excess of free hydroxyl ions, with a pH greater than seven.
<b>Aluminium</b>	occurs naturally in some source waters. It is removed from drinking water by conventional water treatment (coagulation and filtration). Aluminium sulphate and polyaluminium chloride may be used as water treatment chemicals at some water treatment works. A national standard of 200µg/l applies.
<b>Ammonium</b>	salts are naturally present in trace amounts in most waters. Their presence might indicate contamination of sanitary significance and they interfere with the operation of the disinfection process. An indicator parameter with a guide value of 0.5mg/l.
<b>Analytical quality control (AQC)</b>	the method used to ensure that laboratory analysis methods are performing correctly.

<b>Antimony</b>	is rarely found in drinking water. Trace amounts can be derived from brass tap fittings and solders. A European health-based standard of 5µg/l applies.
<b>Aquifer</b>	water-containing underground strata.
<b>Arsenic</b>	occurs naturally in only a few sources of groundwater. Specific water treatment is required to remove it. A European health-based standard of 10µg/l applies.
<b>Authorised departure</b>	authorisation for a water company to temporarily supply water exceeding a drinking water standard, granted by the authorities only when there is no risk to human health.
<b>Benzene</b>	is present in petrol. It is not found in drinking water, but it can migrate through underground plastic water pipes if petrol is spilt in the vicinity. Some bottled waters and soft drinks which include sodium benzoate as an ingredient have been reported as containing benzene. A European health-based standard of 1µg/l applies.
<b>Benzo(a)pyrene (BaP)</b>	is one of several compounds known as polycyclic aromatic hydrocarbons (PAHs). Their source in drinking water is as a result of deterioration of coal tar, which many years ago was used to line water pipes. Due to extensive water mains refurbishment and renewal it is now rare to detect this substance in drinking water. A European health-based standard of 0.01µg/l applies.
<b>Boron</b>	in surface water sources comes from industrial discharges or from detergents in treated sewage effluents. The very low concentrations found in some drinking waters are not a concern to public health. A European health-based standard of 1mg/l applies.
<b>Bromate</b>	can be formed during disinfection of drinking water through a reaction between naturally occurring bromide and strong oxidants (usually ozone). It may be generated in the manufacture of sodium hypochlorite disinfectant. Exceptionally, groundwater beneath an industrial site can become contaminated with bromate. A European health-based standard of 10µg/l applies.

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<b>Bulk supply</b>	water supplied in bulk, usually in treated form, from one water company to another.
<b>Cadmium</b>	is rarely detected in drinking water and trace amounts are usually due to dissolution of impurities from plumbing fittings. A European health-based standard of 5µg/l applies.
<b>Chloramine</b>	a substance formed by reaction between chlorine and ammonia, used as a disinfectant in distribution systems because of its long-lasting properties compared to chlorine.
<b>Chloramination</b>	the process of generating a chloramine disinfectant residual in water leaving a treatment works.
<b>Chloride</b>	is a component of common salt. It may occur in water naturally, but it may also be present due to local use of de-icing salt or saline intrusion. An indicator parameter with a guide value of 250mg/l.
<b>Chlorine residual</b>	the small amount of chlorine or chloramines present in drinking water to maintain its quality as it passes through the water company's network of pipes and household plumbing.
<b>Chromium</b>	is not present in drinking water. A European health-based standard of 50µg/l applies.
<b><i>Clostridium perfringens</i></b>	is a spore-forming bacterium that is present in the gut of warm-blooded animals. The spores can survive disinfection. The presence of spores in drinking water indicates historic contamination that requires investigation. The standard is 0 per 100ml.
<b>Coagulation</b>	a process employed during drinking water treatment to assist with the removal of particulate matter.
<b>Coliform bacteria</b>	are widely distributed in the environment often as a result of human or animal activity, but some grow on plant matter. Their presence in a water supply indicates a need to investigate the integrity of the water supply system. The standard is 0 per 100ml.

<b>Colony counts</b>	are general techniques for detecting a wide range of bacteria, the types and numbers being dependent on the conditions of the test. These counts, if done regularly, can help to inform water management, but they have no direct health significance. The standard is 'no abnormal change'.
<b>Colour</b>	occurs naturally in upland water sources. It is removed by conventional water treatment. A national standard of 20mg/l on the Platinum/Cobalt (Pt/Co) scale applies.
<b>Communication pipe</b>	the connection from the water main to the consumer's property boundary.
<b>Compliance assessment</b>	a comparison made by the Inspectorate of data gathered by water companies against standards and other regulatory requirements.
<b>Compound</b>	a compound consists of two or more elements in chemical combination.
<b>Concessionary supplies</b>	historical free supplies of water for a householder, established when a company wanted to lay mains across land and the landowner might agree, subject to a permission, to take a supply of water from the main.
<b>Conductivity</b>	is a non-specific measure of the amount of natural dissolved inorganic substances in source waters. An indicator parameter with a guide value of 2,500 $\mu$ S/cm.
<b>Contact tank</b>	a tank, normally situated on a treatment works site, which forms part of the disinfection process. A disinfectant chemical (normally chlorine) is dosed into the water as it flows into the tank. The period of time that the water takes to flow through the tank allows sufficient 'contact' time for the chemical to kill, or deactivate, any viruses or pathogenic organisms that may be present in the water.
<b>Contravention</b>	a breach of a regulatory requirement.
<b>Copper</b>	in drinking water comes mostly from copper pipes and fittings in households. In general, water sources are not aggressive towards copper, but problems very occasionally occur on new housing estates. These 'blue water' events can be avoided by good plumbing practices. A European health-based standard of 2mg/l applies.

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<b><i>Cryptosporidium</i></b>	is a parasite that causes severe gastroenteritis and can survive disinfection. In the UK, continuous monitoring is undertaken at works classified by the company as being at significant risk.
<b>Cyanide</b>	is not present in drinking water. A European health-based standard of 50µg/l applies.
<b>Dead leg</b>	refers to a piece of piping which is stopped off at one end, but is connected to the supply at the other end and can result in stagnant water in the pipework.
<b>Distribution systems</b>	a water company's network of mains, pipes, pumping stations and service reservoirs through which treated water is conveyed to consumers.
<b>Drinking water standards</b>	the prescribed concentrations or values listed in regulations.
<b>EC Drinking Water Directive</b>	Council Directive 98/83/EC December 1998 – setting out drinking water standards to be applied in member states.
<b>Enforcement action</b>	the means, as set out in the Water Act 1989 and consolidated into the Water Industry Act 1991, by which the Secretary of State requires a water company to comply with certain regulatory requirements.
<b>Enterococci</b>	see <i>Escherichia coli</i> .
<b>Environment Agency</b>	the Environment Agency is responsible for maintaining or improving the quality of fresh, marine, surface and underground water in England and Wales.
<b>Epichlorhydrin</b>	can be found in trace amounts in polyamine water treatment chemicals. Its presence in drinking water is limited by control of the product specification. A European health-based standard of 0.1µg/l applies.
<b>Epidemiology</b>	a process of studying the distribution of cases of disease within a population in relation to exposure to possible sources of the infection, with a view to establishing the actual source of the infection.

<b><i>Escherichia coli</i> and Enterococci</b>	are bacteria present in the gut of warm-blooded animals. They should not be present in drinking water and, if present, immediate action is required to identify and remove any source of faecal contamination that is found. The standard is 0 per 100ml.
<b>Event</b>	water companies have to inform the Inspectorate about occasions when water quality or sufficiency is affected or when public confidence in drinking water quality may be impacted. The Inspectorate refer to these instances as 'Events'.
<b>Filtration</b>	the separation of suspended particulate matter from a fluid.
<b>Fluoride</b>	occurs naturally in many water sources, especially groundwater. It cannot be removed by conventional water treatment so high levels must be reduced by blending with another low fluoride water source. Some water companies are required by the local health authority to fluoridate water supplies as a protection against tooth decay. The drinking water standard ensures levels are safe in either circumstance. Fluoridation of water is a Department of Health policy. A European health-based standard of 1.5mg/l applies.
<b>Geosmin</b>	a substance produced by the growth of algae, normally in surface waters which gives rise to a characteristic 'earthy' or 'musty' taste or odour.
<b>Granular activated carbon</b>	an adsorbent filtration media used to remove trace organic compounds from water.
<b>Groundwater</b>	water from aquifers or other underground sources.
<b>Hydrogen Ion (pH)</b>	gives an indication of the degree of acidity of the water. A pH of 7 is neutral; values below 7 are acidic and values above 7 are alkaline. A low pH water may result in pipe corrosion. This is corrected by adding an alkali during water treatment. A specification of between 6.5 and 9.5 applies.
<b>Improvement programmes</b>	water company improvement works, these are legally binding on the company and each programme will remedy an actual or potential breach of a drinking water standard within a specified time period.

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<b>Indicator parameter</b>	something that is measured to check that control measures, such as water treatment, are working effectively.
<b>Indicator organism</b>	an organism which indicates the presence of contamination and hence the possible presence of pathogens.
<b>Information Letter</b>	formal guidance to water companies given by the Inspectorate and published on the Inspectorate's website at <a href="http://www.dwi.gov.uk">www.dwi.gov.uk</a>
<b>Inspectorate</b>	The Drinking Water Inspectorate.
<b>Iron</b>	is present naturally in many water sources. It is removed by water treatment. Some iron compounds are used as water treatment chemicals. However, the commonest source of iron in drinking water is corrosion of iron water mains. A national standard of 200µg/l applies.
<b>Lead</b>	very occasionally occurs naturally in raw waters, but the usual reason for its presence in drinking water is plumbing in older properties. If the water supply has a tendency to dissolve lead then water companies treat the water to reduce consumer exposure. The permanent remedy is for householders to remove lead pipes and fittings. A European health-based standard of 25µg/l applies, but 10µg/l will apply from 2013 onwards.
<b>Manganese</b>	is present naturally in many sources and is usually removed during treatment. A national standard of 50µg/l applies.
<b>Mean zonal compliance percentage</b>	a measure of compliance with drinking water standards introduced by the Inspectorate in 2004.
<b>Mercury</b>	is not found in sources of drinking water. A European health-based standard of 1µg/l applies.
<b>Microbiological</b>	associated with the study of microbes.
<b>m<sup>3</sup>/d</b>	cubic metre per day.
<b>mg/l</b>	milligram per litre (one thousandth of a gram per litre).

<b>MI/d</b>	megalitre per day (one MI/d is equivalent to 1,000 m <sup>3</sup> /d, or to 220,000 gallon/d).
<b>µg/l</b>	microgram per litre (one millionth of a gram per litre).
<b>Nickel</b>	occurs naturally in some groundwater and where necessary special treatment can be installed to remove it. Another source of nickel in drinking water is the coatings on modern taps and other plumbing fittings. A European health-based standard of 20µg/l applies.
<b>Nitrate</b>	occurs naturally in all source waters although higher concentrations tend to occur where fertilisers are used on the land. Nitrate can be removed by ion exchange water treatment or through blending with other low nitrate sources. A European health-based standard of 50mg/l applies.
<b>Nitrite</b>	is sometimes produced as a by-product when chloramine is used as the essential residual disinfectant in a public water supply. Chloramine is the residual disinfectant of choice in large distribution systems because it is more stable and long-lasting. Careful operation of the disinfection process ensures levels of nitrite are kept below the standard. A European health-based standard of 0.5mg/l applies.
<b>Odour</b>	can arise as a consequence of natural processes in surface waters, particularly between late spring and early autumn. Water treatment with activated carbon or ozone will remove natural substances causing taste. The standard relates to the evaluations of a panel of people assessing samples in the laboratory.
<b>Ofwat</b>	the water industry's economic regulator.
<b>Oocyst</b>	the resistant form in which <i>Cryptosporidium</i> occurs in the environment, and which is capable of causing infection.
<b>Organoleptic</b>	characteristics of a substance as detected by our senses, for example taste, odour or colour.
<b>Ozone process (ozonation)</b>	the application of ozone gas in drinking water treatment.

<b>Parameters</b>	the substances, organisms and properties listed in Schedule 2 and Regulation 3 of the regulations. Parameter definitions can be found further on in this annex.
<b>Pathogen</b>	an organism which can infect humans and cause disease.
<b>PCV</b>	see 'Prescribed concentration or value'.
<b>Periodic review</b>	the economic regulator's process of setting water prices.
<b>Pesticides</b>	any fungicide, herbicide, insecticide or related product (excluding medicines) used for the control of pests or diseases.
<b>Pesticides – organochlorine compounds (aldrin, dieldrin, heptachlor, heptachlor epoxide)</b>	are no longer used in the UK because they are persistent in the environment. They are not found in drinking water. A European chemical standard of 0.03µg/l for each compound applies.
<b>Pesticides – other than organochlorine compounds</b>	is a diverse and large group of organic compounds used as weed killers, insecticides and fungicides. Many water sources contain traces of one or more pesticides as a result of both agricultural and non-agricultural uses, mainly on crops and for weed control on highways and in gardens. Where needed, water companies have installed water treatment (activated carbon and ozone) so that pesticides are not found in drinking water. Water companies must test for those pesticides used widely in their area of supply. Pesticide monitoring thus varies according to risk. A European chemical standard of 0.1µg/l for each individual substance and 0.5µg/l for the total of all pesticides applies.
<b>Phosphate dosing</b>	treatment of water that results in a protective film building up on the inside of pipes minimising the likelihood of lead being present in drinking water supplied through lead pipes.
<b>Plumbosolvency</b>	the tendency for lead to dissolve in water.
<b>Polycyclic aromatic hydrocarbons (PAHs)</b>	is a group name for several substances present in petroleum-based products such as coal tar. (see Benzo(a)pyrene listed above for more information). A European health-based standard of 0.1µg/l for the sum of all the substances applies.

<b>Powdered activated carbon (PAC)</b>	powdered activated carbon is employed in treatment processes to remove pollutants.
<b>Pre- and post- renovation assessment (PPRA)</b>	a programme of assessment before and after mains renovation to demonstrate justification for the work, and the improvements achieved by the renovation.
<b>Prescribed concentration or value (PCV)</b>	the numerical value assigned to drinking water standards defining the maximal or minimal legal concentration or value of a parameter.
<b>PR09</b>	the periodic review process for setting water prices for 2010-2015.
<b>Private supplies</b>	water taken from private sources or supplied by non-licensed suppliers; supplies of water provided otherwise than by a statutorily appointed water undertaker.
<b>Protozoan parasites</b>	a single cell organism that can only survive by infecting a host.
<b>Public Register</b>	drinking water quality information made available to the public by water companies as required by regulations.
<b>Public supplies</b>	water supplied by a company licensed for that purpose.
<b>Raw water</b>	water prior to receiving treatment for the purpose of drinking.
<b>Regulations</b>	The Water Supply (Water Quality) Regulations 2000 (England), 2010 (Wales).
<b>Remedial action</b>	action taken to improve a situation.
<b>Residual disinfectant</b>	the small amount of chlorine or chloramines present in drinking water to maintain its quality as it passes through the water company's network of pipes and household plumbing.
<b>Secretary of State</b>	Secretary of State for Environment, Food and Rural Affairs.
<b>Selenium</b>	is an essential element and a necessary dietary component. Amounts in drinking water are usually well below the standard. A European health-based standard of 10µg/l applies.

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<b>Service connection</b>	connection between the water company's main to a consumer's property.
<b>Service pipe</b>	the service pipe is the pipe that connects the consumer's property to the water company main. It comprises two parts – the communication pipe, which is the connection from the water main to the consumer's property boundary (normally at the outside stop tap), and the supply pipe, which runs from the boundary of the property to the consumer's inside stop tap.
<b>Service reservoir</b>	a water tower, tank or other reservoir used for the storage of treated water within the distribution system.
<b>Sodium</b>	is a component of common salt. It is present in seawater and brackish groundwater. Some treatment chemicals contain sodium. Concentrations in drinking water are extremely low, but some water softeners can add significant amounts to drinking water where they are installed in homes or factories. A national standard of 200mg/l applies.
<b>Springs</b>	groundwater appearing at the surface at the outcrop of the junction of a permeable stratum with an impermeable stratum.
<b>Sulphate</b>	occurs naturally in all waters and is difficult to remove by treatment. An indicator parameter with a guide value of 250mg/l.
<b>Supply pipe</b>	pipe connecting between the boundary of a consumer's property to the inside stop tap.
<b>Supply point</b>	a point other than a consumer's tap authorised for the taking of samples for compliance with the regulations.
<b>Surface water</b>	untreated water from rivers, impounding reservoirs or other surface water source.
<b>Taste</b>	can arise as a consequence of natural processes in surface waters, particularly between late spring and early autumn. Water treatment with activated carbon or ozone will remove natural substances causing taste. The standard relates to the evaluations of a panel of people assessing samples in the laboratory.
<b>Technical audit</b>	the means of checking that water companies are complying with their statutory obligations.

<b>Tetrachloroethane and Trichloroethene</b>	are solvents that may occur in groundwater in the vicinity of industrial sites. Where necessary they are removed by specialist treatment. A European health-based standard of 10µg/l for the sum of both substances applies.
<b>Tetrachloromethane</b>	is a solvent that may occur in groundwater in the vicinity of industrial sites. Where necessary it is removed by specialist water treatment. A national standard of 3µg/l applies.
<b>Time of supply</b>	the moment when water passes from the water company's pipework into a consumer's pipework.
<b>Total indicative dose</b>	is a measure of the effective dose of radiation the body will receive from consumption of the water. It is calculated only when screening values for gross alpha or gross beta (radiation) are exceeded. An indicator parameter with a guide value of 0.10mSv/year.
<b>Total organic carbon</b>	represents the total amount of organic matter present in water. An indicator parameter with a guide value of 'no abnormal change'.
<b>Toxicology</b>	the study of the health effects of substances.
<b>Treated water</b>	water treated for use for domestic purposes as defined in the regulations.
<b>Trihalomethanes</b>	are formed during disinfection of water by a reaction between chlorine and naturally occurring organic substances. Their production is minimised by good operational practice. A European health-based standard of 100µg/l applies.
<b>Tritium</b>	is a radioactive isotope of hydrogen. Discharges to the environment are strictly controlled and there is a national programme of monitoring surface waters. An indicator parameter with a guide value of 100Bq/l.

<b>Turbidity</b>	<p>is a measure of the cloudiness of water.</p> <p>At treatment works, measurement is an important non-specific water quality control parameter because it can be monitored continuously on line and alarms set to alert operators to deterioration in raw water quality or the need to optimise water treatment. An indicator parameter with a guide value of 1NTU.</p> <p>When detected at the consumer's tap it can arise from disturbance of sediment within water mains. A national standard of 4NTU applies in this case.</p>
<b>Vinyl chloride</b>	<p>may be present in plastic pipes as a residual of the manufacturing process of polyvinyl chloride (PVC) water pipes. Its presence in drinking water is controlled by product specification. A European health-based standard of 0.5µg/l applies.</p>
<b>Water supply zone</b>	<p>a pre-defined area of supply for establishing sampling frequencies, compliance with standards and information to be made publicly available.</p>
<b>WHO</b>	<p>World Health Organisation.</p>
<b>Wholesome/wholesomeness</b>	<p>a legal concept of water quality which is defined by reference to standards and other requirements set out in the regulations.</p>

## Annex 3

### Significant drinking water quality events

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
05 Feb 2009 For 20 days (SES)	Bough Beech works, supplying an area west of Sevenoaks, Kent	30,620	Pesticide (carbetamide).	<p>The Inspectorate classified this event as significant.</p> <p><b>Sutton And East Surrey Water action:</b></p> <ul style="list-style-type: none"> <li>• Sampled affected area.</li> <li>• Additional granular activated carbon (GAC) being installed which will provide adequate treatment for carbetamide at the concentrations found in the raw water.</li> <li>• Engaged with the landowner to improve the management within the catchment.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• Once installed, GAC should deal with future carbetamide challenges.</li> </ul>
15 Apr 2009 For 3 days (VCE)	Pinner Road, Harrow	80	Microbiological contamination following mains connection work.	<p>The Inspectorate classified this event as significant.</p> <p><b>Veolia Water Central action:</b></p> <ul style="list-style-type: none"> <li>• Flushed mains.</li> <li>• Sampled affected area.</li> <li>• Issued a boil water notice.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• No recommendations made, well managed event resulting from unusual circumstances.</li> </ul>

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
19 May 2009 For 2 days (TMS)	Guildford	1,250	Brown discolouration.	<p>The Inspectorate classified this event as significant.</p> <p><b>Thames Water action:</b></p> <ul style="list-style-type: none"> <li>• Removed service reservoir from supply.</li> <li>• Repaired faulty equipment.</li> <li>• Sampled affected area.</li> <li>• Shut down treatment works.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• Inadequate contingency planning.</li> <li>• Inadequate risk assessment.</li> </ul>
06 Aug 2009 For 3 days (TMS)	Great Rissington service reservoir serving Great Rissington village	470	Microbiological contamination at reservoir.	<p>The Inspectorate classified this event as significant.</p> <p><b>Thames Water action:</b></p> <ul style="list-style-type: none"> <li>• By-passed service reservoir.</li> <li>• Issued a boil water notice.</li> <li>• Provided bottled water on request.</li> <li>• Repaired main.</li> <li>• Sampled affected area.</li> <li>• Flushed mains.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• Company to review reservoir procedures with respect to valving positions.</li> <li>• Company should incorporate lessons from this event into water safety plans.</li> </ul>

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
08 Oct 2009 For 3 days (TMS)	Shalford works supplying Godalming, Witley and South Guildford, Surrey	50,000	<i>Cryptosporidium</i> and coagulation problems.	<p>The Inspectorate classified this event as significant.</p> <p><b>Thames Water action:</b></p> <ul style="list-style-type: none"> <li>• Repaired faulty equipment.</li> <li>• Company is currently introducing flow alarms for ferric dosing which will reduce the risk of a recurrence.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• Suggest the company considers whether separate dosing lines with automatic pump change over may be beneficial in minimising risk of a blockage.</li> </ul>
16 Oct 2009 For 5 days (TMS)	Hackney, North London	15	Boil water advice due to event associated with a private mains system.	<p>The Inspectorate classified this event as significant.</p> <p><b>Thames Water action:</b></p> <ul style="list-style-type: none"> <li>• Sampled affected area.</li> <li>• Installed a non-return valve to protect mains network.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• Undertake an adequate investigation in response to microbiological contraventions.</li> <li>• Update its risk assessment for this particular supply system to reflect the findings of this event.</li> <li>• Company commended for its ongoing liaison with property owner.</li> </ul>

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
03 Nov 2009 For 4 days (TMS)	Binsey, Oxfordshire	47,000	Aeration due to planned work.	<p>The Inspectorate classified this event as significant.</p> <p><b>Thames Water action:</b></p> <ul style="list-style-type: none"> <li>• Flushed mains.</li> <li>• Provided an alternative supply by tanker/bowser.</li> <li>• Retrained staff.</li> <li>• Review of procedures.</li> <li>• Sampled affected area.</li> <li>• Investigation into remedial actions for the crandallite deposits ongoing.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• Supplied unwholesome water in breach of regulations.</li> <li>• Inadequate procedures.</li> <li>• Company did not have adequate procedures for addressing the increased turbidity caused by crandallite.</li> </ul>
01 Dec 2009 For 1 day (TMS)	Ogbourne works	28,000	Microbiological contamination.	<p>The Inspectorate classified this event as significant.</p> <p><b>Thames Water action:</b></p> <ul style="list-style-type: none"> <li>• Shut down treatment works.</li> <li>• Carried out enhanced monitoring on return to service.</li> <li>• Thorough treatment investigation carried out and no issues identified.</li> </ul> <p><b>DWI comments and findings:</b></p> <ul style="list-style-type: none"> <li>• No evidence found of contamination or treatment issue.</li> <li>• No further microbiological detections during follow-up investigation or routine sampling since the event.</li> </ul>

Note: A complete table of significant events in England and Wales in 2009 can be found on the CD in the folder. It is named **Significant drinking water quality events in England and Wales 2009.pdf**. It is also available on the DWI website ([www.dwi.gov.uk](http://www.dwi.gov.uk)).

## Annex 4 Planned drinking water quality improvements

Company	Parameter, hazard or driver	Site	Due for completion	Status	Legal instrument
SES	Lead	Distribution system	31-Mar-15	Ongoing	Undertaking
SES	Metaldehyde	Bough Beech	31-Mar-15	Ongoing	Undertaking
TMS	Bromate	Hornsey	31-Jan-09	Completed 29-Jan-09	Undertaking
TMS	<i>Cryptosporidium</i>	Marlborough	31-Mar-12	Ongoing	Notice
TMS	<i>Cryptosporidium</i>	Fairford	31-Mar-12	Ongoing	Notice
TMS	<i>Cryptosporidium</i>	Playhatch	30-Jun-12	Ongoing	Notice
TMS	Inadequate disinfection	Honor Oak	31-Mar-12	Ongoing	Notice
TMS	Inadequate disinfection	Radnage	31-Mar-12	Ongoing	Notice
TMS	Integrity	Kidderpore	31-Mar-12	Ongoing	Notice
TMS	Integrity	Dancers end	31-Mar-12	Ongoing	Notice
TMS	Lead	Aylesbury East plumbosolvency control	31-Dec-11	Ongoing	Undertaking
TMS	Lead	Henley plumbosolvency control	31-Dec-11	Ongoing	Undertaking
TMS	Lead	Distribution system	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde	Coppermills and Chingford South	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde	Farmoor and Swinford	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde	Fobney	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde	Grimsbury	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde	Hornsey	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde	West London surface treatment works	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde and Total Pesticides	Finmere Bulk Supply	31-Mar-15	Ongoing	Undertaking
TMS	Metaldehyde	Shalford	31-Mar-15	Ongoing	Undertaking

<b>Company</b>	<b>Parameter, hazard or driver</b>	<b>Site</b>	<b>Due for completion</b>	<b>Status</b>	<b>Legal instrument</b>
TMS	Monuron, Atrazine and Picloram	Woods Farm	31-Dec-12	Ongoing	Undertaking
TMS	Process optimisation	Farmoor	TBC	Ongoing	Notice
TMS	Process optimisation	Brixton	TBC	Ongoing	Notice
TMS	Network maintenance	Haslemere network	31-Mar-10	Ongoing	Notice
TMS	Nitrate	Wantage	31-Mar-12	Ongoing	Undertaking
TMS	Nitrate	Westerham	31-Mar-12	Ongoing	Undertaking
TMS	Pesticides	Harpsden	31-Mar-15	Ongoing	Undertaking
TMS	Pesticides	Sheafhouse	31-Mar-15	Ongoing	Undertaking
TMS	Unreliable power supply	Ashford Common	TBC	Ongoing	Notice
TMS	Unreliable power supply	Hampton	TBC	Ongoing	Notice
TMS	Unreliable power supply	Coppermills	TBC	Ongoing	Notice
VCE	Bromate	North Mymms	31-Mar-10	Completed 30-Mar-10	Undertaking
VCE	<i>Cryptosporidium</i>	Chorleywood	31-Mar-11	Ongoing	Undertaking
VCE	Manganese	Roydon	31-Mar-14	Ongoing	Undertaking
VCE	Manganese	Blackford	31-Mar-15	Ongoing	Undertaking
VCE	Metaldehyde	Anglian bulk supply to Sundon (Grafham)	31-Mar-15	Ongoing	Undertaking
VCE	Metaldehyde	Essex and Suffolk bulk supply to Brentwood Rd	31-Mar-15	Ongoing	Undertaking
VCE	Nitrate	Offley Bottom	31-Mar-10	Completed 11-Aug-09	Undertaking
VCE	Nitrate	King Walden	31-Mar-14	Ongoing	Undertaking
VCE	Total Pesticides and Metaldehyde	Chertsey	31-Mar-15	Ongoing	Undertaking
VCE	Total Pesticides and Metaldehyde	Egham	31-Mar-15	Ongoing	Undertaking

<b>Company</b>	<b>Parameter, hazard or driver</b>	<b>Site</b>	<b>Due for completion</b>	<b>Status</b>	<b>Legal instrument</b>
VCE	Total Pesticides and Metaldehyde	Iver	31-Mar-15	Ongoing	Undertaking
VCE	Total Pesticides and Metaldehyde	North Mymms	31-Mar-15	Ongoing	Undertaking
VCE	Total Pesticides and Metaldehyde	Walton	31-Mar-15	Ongoing	Undertaking

## Annex 5

### Competition in the water industry

The following table indicates the extent of competition in the water industry in England and Wales.

#### **Inset appointments in place in 2009**

<b>Site</b>	<b>Appointee</b>	<b>Incumbent and region</b>	<b>Status</b>
Buxted Chicken, Flixton	Anglian Water	Essex and Suffolk Water, Eastern region	Supplying water
Shotton Paper, Shotton	Albion Water	Dŵr Cymru, Wales	Supplying water
Fairfield Park and Lower Wilbury Farm, Arlesey	Veolia Water Central	Anglian Water, Eastern region	Supplying water
The Portway, near Salisbury	SSE Water	Wessex Water, Western region	Supplying water
Wynyard, near Wolviston	Hartlepool Water	Northumbrian Water, Northern region	Supplying water
Long Croft Road, Corby	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Priors Hall, Corby	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Great Billing Way, Northampton	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Media City, Salford Quays	Peel Water Networks Ltd	United Utilities, Northern region	Supplying water
MoD Tidworth near Andover	Veolia Water Projects	Wessex Water, Western region	Supplying water
Hale Village, Tottenham	SSE Water	Thames Water, Thames region	Supplying water

#### **New inset appointments in place for 2010 (by 31 May 2010)**

<b>Site</b>	<b>Appointee</b>	<b>Incumbent and region</b>	<b>Status</b>
Llanilid Park, South Wales	SSE Water	Dŵr Cymru, Wales	Appointment granted
Kennet Island, Reading	SSE Water	Thames Water, Thames region	Supplying water
Brooklands, Milton Keynes	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Bromley Common, Bromley	SSE Water	Thames Water, Thames region	Supplying water
Park Views, Epsom	SSE Water	Thames Water, Thames region	Supplying water
The Bridge, Dartford	Independent Water Networks Ltd	Thames Water, Thames region	Appointment granted

### Water supply licenses in place in 2010

<b>Name of company</b>	<b>License type</b>	<b>Date license granted by Ofwat</b>	<b>Status</b>
Aquavitae	Combined	1 December 05	Licence revoked
Watercall Ltd	Combined	1 December 05	Inactive
Severn Trent Water Select Ltd	Combined	1 December 05	One retail customer Eastern region
YorWater Ltd	Retail	21 March 06	Not yet operating
Satec Ltd	Combined	24 May 06	Not yet operating
UU Water Sales Ltd	Combined	3 January 07	Not yet operating
Osprey Water Services Ltd	Combined	5 January 07	Not yet operating
Business Stream	Retail	23 January 09	Not yet operating

## Annex 6

### Water company indices

#### Sutton and East Surrey Water plc

##### Water supply arrangements

Company assets		Water supplied	
Number of treatment works	8	Water supplied (MI/day)	156
Number of service reservoirs	32	Percentage from surface sources	15
Number of water supply zones	20	Percentage from ground sources	85
Length of mains pipe (km)	3,439	Percentage from mixed sources	0
Population served		Area of supply	
Population supplied	634,000	Parts of Surrey, Sussex, Kent, LB Sutton, LB Croydon, LB Merton	
Number of local authorities	13		

##### Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
<b>Overall drinking water quality<sup>1</sup></b>	99.99%	99.89%	99.92%	99.95%
<b>Water treatment</b>				
Process Control Index	100%	100%	100%	99.97%
Disinfection Index	99.99%	99.98%	100%	99.94%
<b>Distribution systems</b>				
Distribution Maintenance Index	99.92%	99.86%	99.84%	99.86%
Reservoir Integrity Index	99.97%	100%	100%	99.96%
<b>Building water systems</b>				
Parameters influenced by domestic water systems	100%	99.96%	99.92%	99.87%

##### Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
<b>Informing consumers</b>				
Total number	67	97	142	N/A
Rate per 1,000 population	0.10	0.15	0.22	1.38
<b>Acceptability of water to consumers</b>				
Total number	415	499	365	N/A
Rate per 1,000 population	0.64	0.77	0.58	2.21
<b>Complaints to the Drinking Water Inspectorate</b>				
No consumers of Sutton and East Surrey Water plc directly contacted DWI in 2009.				

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at [www.dwi.gov.uk](http://www.dwi.gov.uk)

<sup>1</sup>Overall drinking water quality as represented by mean zonal compliance for 39 parameters.

## SSE Water

### Water supply arrangements

Company assets		Water supplied	
Number of treatment works	0	Water supplied (l/day)	63,000
Number of service reservoirs	0	Percentage from surface sources	55
Number of water supply zones	2	Percentage from ground sources	45
Length of mains pipe (km)	3	Percentage from mixed sources	0
<b>Population served</b>		<b>Area of supply</b>	
Population supplied	1,000	Old Sarum, near Salisbury Hale Village, Tottenham	
Number of local authorities	2		

### Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
<b>Overall drinking water quality<sup>1</sup></b>	N/A	100%	100%	99.95%
<b>Water treatment</b>				
Process Control Index	N/A	N/A	N/A	99.97%
Disinfection Index	N/A	N/A	N/A	99.94%
<b>Distribution systems</b>				
Distribution Maintenance Index	N/A	100%	100%	99.86%
Reservoir Integrity Index	N/A	N/A	N/A	99.96%
<b>Building water systems</b>				
Parameters influenced by domestic water systems	N/A	100%	100%	99.87%

### Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
<b>Informing consumers</b>				
Total number	0	0	1	N/A
Rate per 1,000 population	N/A	0	0.74	1.38
<b>Acceptability of water to consumers</b>				
Total number	0	0	0	N/A
Rate per 1,000 population	N/A	0	0	2.21
<b>Complaints to the Drinking Water Inspectorate</b>				
No consumers of SSE Water directly contacted DWI in 2009.				

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at [www.dwi.gov.uk](http://www.dwi.gov.uk)

<sup>1</sup>Overall drinking water quality as represented by mean zonal compliance for 39 parameters.

## Thames Water Utilities Ltd

### Water supply arrangements

Company assets		Water supplied	
Number of treatment works	104	Water supplied (MI/day)	2,774
Number of service reservoirs	381	Percentage from surface sources	75
Number of water supply zones	238	Percentage from ground sources	25
Length of mains pipe (km)	31,507	Percentage from mixed sources	0
Population served		Area of supply	
Population supplied	8,674,000	Bedfordshire (part), Berkshire (part), Buckinghamshire (part), Essex (part), Gloucestershire (part), Hampshire (part), Hertfordshire, Kent (part), Inner London, Outer London (part), Oxfordshire, Surrey (part), West Sussex (part), Warwickshire (part), Wiltshire (part)	
Number of local authorities	63		

### Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
<b>Overall drinking water quality<sup>1</sup></b>	99.98%	99.99%	99.98%	99.95%
<b>Water treatment</b>				
Process Control Index	99.97%	>99.99%	>99.99%	99.97%
Disinfection Index	99.98%	99.97%	99.95%	99.94%
<b>Distribution systems</b>				
Distribution Maintenance Index	99.95%	99.94%	99.92%	99.86%
Reservoir Integrity Index	99.94%	99.97%	99.94%	99.96%
<b>Building water systems</b>				
Parameters influenced by domestic water systems	99.87%	99.93%	99.91%	99.87%

### Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
<b>Informing consumers</b>				
Total number	26,423	40,877	49,541	N/A
Rate per 1,000 population	3.17	4.73	5.71	1.38
<b>Acceptability of water to consumers</b>				
Total number	7,904	8,753	7,251	N/A
Rate per 1,000 population	0.95	1.01	0.84	2.21

### Complaints to the Drinking Water Inspectorate

A total of six consumers of Thames Water Utilities Ltd directly contacted DWI in 2009.

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at [www.dwi.gov.uk](http://www.dwi.gov.uk)

<sup>1</sup>Overall drinking water quality as represented by mean zonal compliance for 39 parameters.

## Veolia Water Central

### Water supply arrangements

Company assets		Water supplied	
Number of treatment works	83	Water supplied (MI/day)	866
Number of service reservoirs	134	Percentage from surface sources	40
Number of water supply zones	70	Percentage from ground sources	55
Length of mains pipe (km)	14,500	Percentage from mixed sources	5
Population served		Area of supply	
Population supplied	2,976,000	Hertfordshire, Bedfordshire, Essex, Buckinghamshire, Berkshire, Surrey and 9 London Boroughs	
Number of local authorities	35		

### Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
<b>Overall drinking water quality<sup>1</sup></b>	99.98%	99.98%	99.95%	99.95%
<b>Water treatment</b>				
Process Control Index	99.97%	99.99%	99.99%	99.97%
Disinfection Index	99.95%	99.95%	99.96%	99.94%
<b>Distribution systems</b>				
Distribution Maintenance Index	99.91%	99.92%	99.97%	99.86%
Reservoir Integrity Index	99.90%	99.95%	99.98%	99.96%
<b>Building water systems</b>				
Parameters influenced by domestic water systems	99.94%	99.94%	99.85%	99.87%

### Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
<b>Informing consumers</b>				
Total number	1,786	1,818	1,585	N/A
Rate per 1,000 population	0.60	0.61	0.53	1.38
<b>Acceptability of water to consumers</b>				
Total number	5,556	6,590	4,305	N/A
Rate per 1,000 population	1.87	2.21	1.45	2.21
<b>Complaints to the Drinking Water Inspectorate</b>				
A total of two consumers of Veolia Water Central directly contacted DWI in 2009.				

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at [www.dwi.gov.uk](http://www.dwi.gov.uk)

<sup>1</sup>Overall drinking water quality as represented by mean zonal compliance for 39 parameters.



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