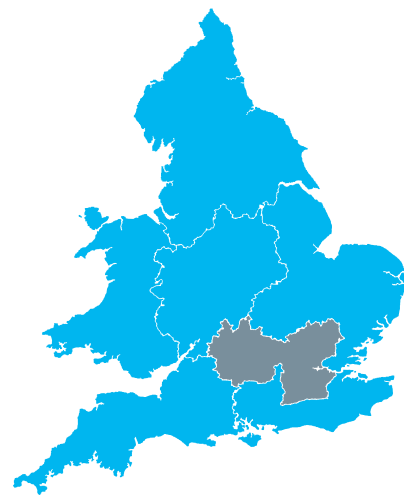


Drinking water 2008

Thames region of England

July 2009

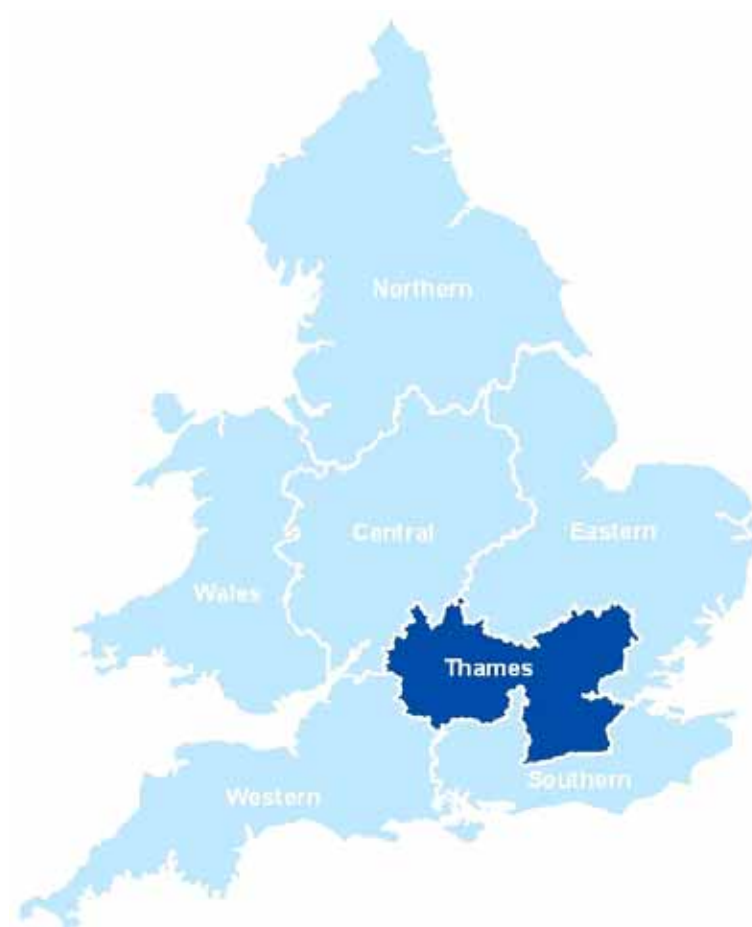
A report by the Chief Inspector of Drinking Water





Drinking water 2008

Thames region of England



Published by
Drinking Water Inspectorate
55 Whitehall
London
SW1A 2EY

Tel: 020 7270 3370

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

© Crown Copyright 2009

ISBN: 978-1-905852-35-2

Copyright in the typographical arrangement and design rests with the Crown.

This publication (excluding the logo) may be reproduced free of charge in any format or medium provided that it is reproduced accurately and not used in a misleading context. The material must be acknowledged as Crown copyright with the title and source of the publication specified.

Contents

Introduction to the report for the Thames region	4
Water supply arrangements	8
Drinking water quality testing	9
Drinking water quality results	10
Consumer perceptions of drinking water quality	32
Incidents in 2008	36
Technical audit activity in the region	38
Local authority engagement	39
Annex 1: Further sources of information	43
Annex 2: Glossary and description of standards	45
Annex 3: Incidents in the Thames region in 2008	58
Annex 4: Improvement programmes in the region	68
Annex 5: Competition in the water industry	69
Annex 6: Regulation 27 risk assessments by local authority	71
Annex 7: Water company data summary tables	74

Drinking Water 2008 is the annual report of the Drinking Water Inspectorate and comprises a number of parts.

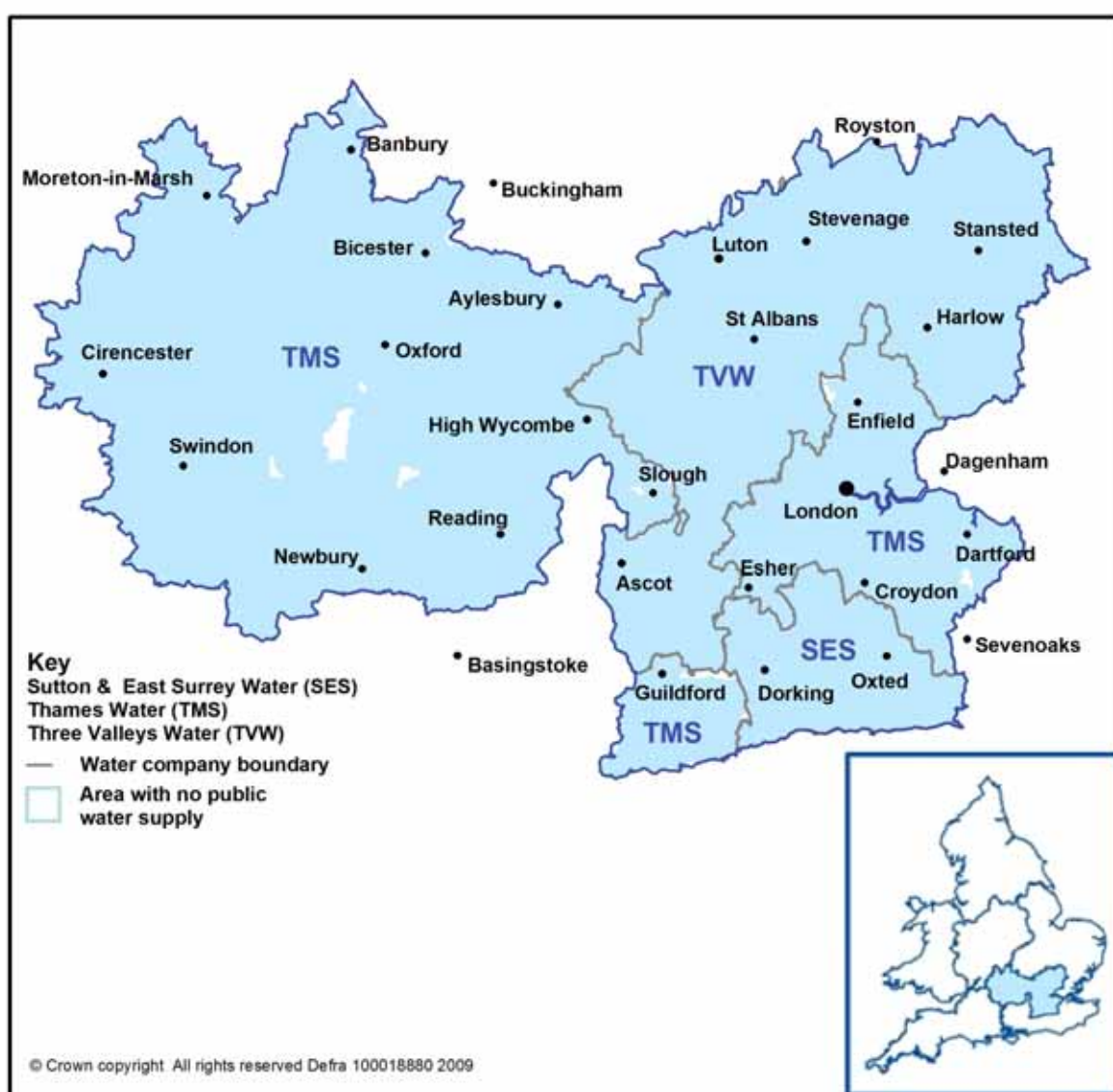
This part describes drinking water quality in the Thames region. The Inspectorate also publishes a series of companion reports for other regions of England (Central, Eastern, Northern, Southern and Western regions) and a separate report for Wales.

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 2008 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 three water companies (Sutton and East Surrey Water, Thames Water and Three Valleys Water) delivering public water supplies to over 12 million consumers.



The results of testing in 2008 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 99.98% in 2008, the

same as reported in 2007. This figure is made up of the results of all the tests for 39 parameters¹ with European or national standards.

The circumstances of the few failures and the actions taken to safeguard public health are discussed in the main body of the report.

At water treatment works in 2008 there was no substantive change in respect of coliform bacteria and turbidity monitoring results compared to 2007. The measurement of these three parameters verifies how well water companies are achieving their primary duty of making sure that all water is microbiologically safe before it is supplied to consumers. In 2008, a turbidity value of >1NTU occurred on more than one occasion at four out of a total of 193 works in the region. In each case the cause and remedy was different.

In 2008, the microbiological quality of treated water stored in service reservoirs improved with only 15 positive detections compared to 31 in 2007 and only a single *E.coli* failure. The purpose of this testing is verification that the quality of treated water held in these strategic storage structures is not being compromised as a consequence of the maintenance of the reservoir or its configuration. The Inspectorate is encouraged by the wider awareness shown by most companies of the need for regular maintenance of service reservoirs, particularly following the very wet autumn in 2007 which revealed structural issues allowing ingress at several sites. On a number of occasions in 2008, companies were able to identify the origin of coliform failures by carrying out timely sampling and internal inspections of service reservoirs.

During 2008, metaldehyde, the active ingredient of some slug pellets, has been identified by Sutton and East Surrey Water, Three Valleys Water and Thames Water as a new pesticide hazard in some water sources in the region. A similar situation has been reported elsewhere in the country by Anglian Water, Bristol Water, Essex and Suffolk Water, Severn Trent Water, South East Water, Southern Water, South Staffordshire Water and Wessex Water. The Health Protection Agency has advised that no adverse health effects are expected from the levels found. The Inspectorate has initiated enforcement action to enable the companies to develop and implement catchment management control with the Environment Agency, other regulators and other stakeholders to minimise the occurrence of this pesticide in raw water sources in the Thames region.

In 2008, companies in the region have brought the frequency of testing for lead into line with the regulations. The results reported this year show that progress that has been made towards compliance with the current and

¹ For 2008 the calculation is based on 39 parameters, in previous years this was 40 parameters. The pH parameter is no longer a national standard.

future standards for lead of 10µg/l as a consequence of the companies' investment in water treatment (phosphate dosing) over recent years. Companies in the region have included an integrated package of measures in their final business plans (PR09) to address the risk to consumers of exposure to lead at levels above the future standard. The measures include targeted lead communication pipe replacement in high risk areas, joint action with local health professionals (Health Protection Agency and Primary Care Trusts) to address the risk to vulnerable consumers and to educate consumers on the benefits of lead pipe replacement, opportunistic lead communication pipe replacement as part of pre-planned work on the distribution system and lead communication pipe replacement at a property where a sample result fails the future standard of 10µg/l. In addition, Thames Water have included plumbosolvency schemes for five works.

In previous *Drinking Water* reports, updates have been provided about the bromate pollution of a strategic chalk aquifer from a former industrial site in Sandridge, Hertfordshire. A public planning inquiry was held in 2007 and afterwards two appeals were lodged for decision by the Secretary of State. A provisional appeal decision was made in November 2008, which proposed changes to the remediation notice. As required under the Contaminated Land Regulations 2006, a further period of consultation has taken place and it is likely that the Secretary of State will announce the final decision before the summer parliamentary recess in July. Further information is provided in the main body of the report under the heading *Bromate* in the section *Chemical quality*.

Companies in the Thames region notified the Inspectorate of 83 events, of which 13 were classified as water quality incidents requiring an independent investigation by the Inspectorate. Overall, there were fewer incidents in 2008 compared to 2007. The theme of incidents during the year was a failure to manage alarms generated by on line equipment at works, which in turn led to inadequate treatment and, in one case, water which had not been disinfected entered supply. Regulation 26 imposes a duty on companies to adequately treat all water before it enters supply and the Inspectorate will take an increasingly tough line over deficiencies of this type.

Three Valleys Water dealt successfully this year with a relatively unusual incident in Hertfordshire, which came to light as a result of a consumer complaint. A cross connection between a private water supply and the public supply was quickly identified and measures to protect consumers were taken jointly with the local authority. The company successfully prosecuted the private supply owner. A summary of the nature, cause and duration of all incidents in the region in 2008 is set out in *Annex 3*.

The Inspectorate carried out three audits in the Thames region in 2008. Although the findings were generally satisfactory, a common factor

identified by inspectors was weaknesses in the training and knowledge of water company operational staff.

Across the region there was an 8% increase in the number of consumers reporting a problem with their drinking water quality. In particular, there was an increase in the number of customers of Three Valleys Water experiencing discoloured water since the completion in 2005 of distribution refurbishment programmes (36% more in 2008 compared to 2006). This highlights the importance of companies continuously taking data into account in their Distribution, Operation and Maintenance Strategies (DOMS).

The Inspectorate received more complaints from consumers in the Thames region, 12 in 2008 compared to 9 in 2007. One noteworthy case reviewed in the report relates to the problem of cloudy water due to aeration and how this problem, which is particularly prevalent in the Thames region, adversely affects public confidence in the safety of drinking water.

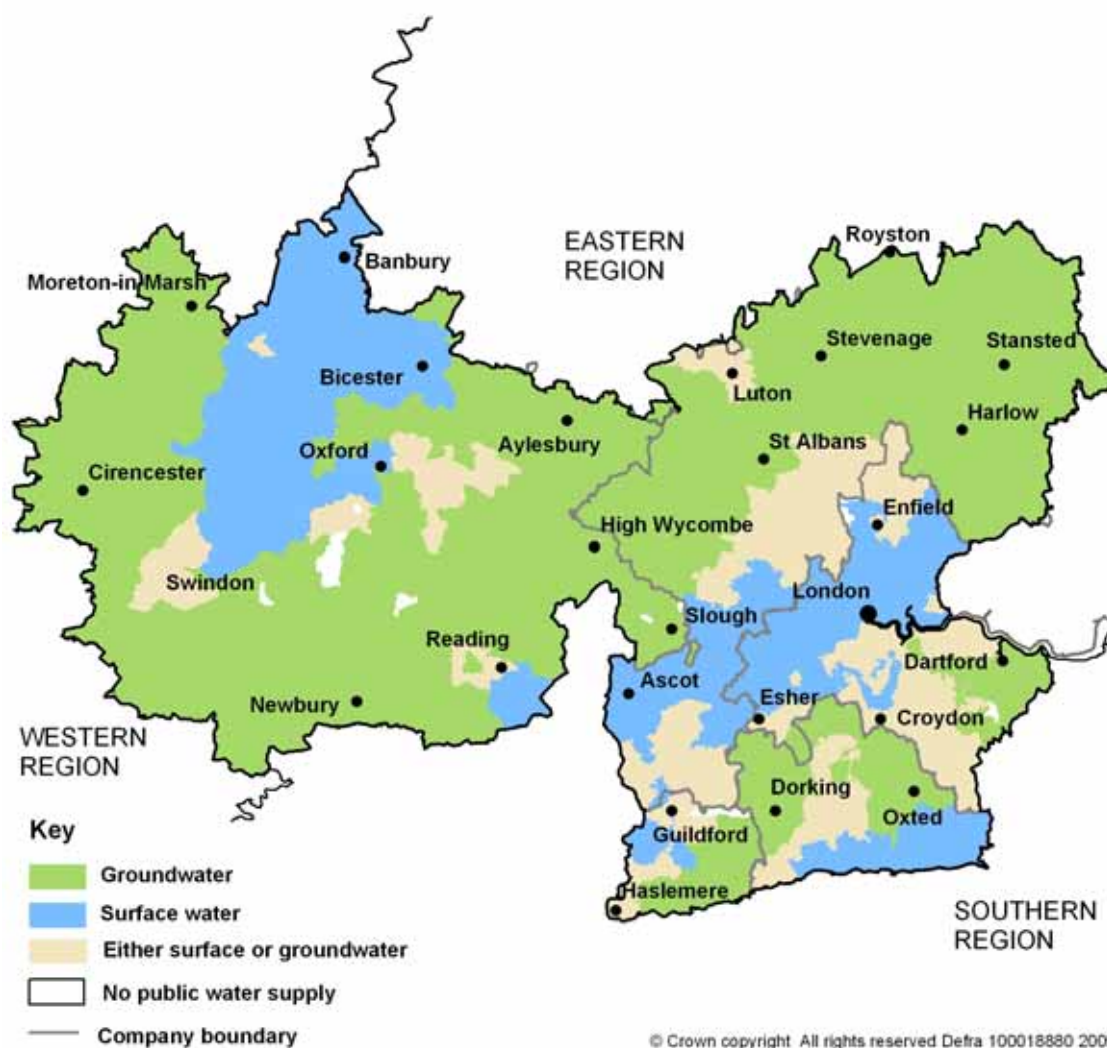
In this year's report we highlight a number of occasions when failures, (both chemical and microbiological) appear not to be representative of the water supply, instead they are due to errors made in the collection and testing of samples. In addition, the Inspectorate has identified a variable quality of analytical work within the industry through its general audit work. The regulations require companies to employ 'competent persons' to carry out drinking water monitoring. The Inspectorate has been working with the industry to support the development and maintenance of the high standard of analytical science skills required. During 2008 this has resulted in the development, by the Open University, of a foundation degree in analytical science which allows school leavers and staff working in laboratories to access a qualification which can be undertaken on a part-time basis to enable them to begin the first stages of obtaining the status of 'competent person'.

In 2008, over 30,000 consumers in the Thames region benefited from improved drinking water quality through the completion by companies of three legally binding programmes of work to install additional water treatment to secure compliance with drinking water standards for nitrate, bromate and pesticides at three treatment works.

Water supply arrangements

Three water companies supply drinking water in the Thames region: Sutton and East Surrey Water (SES), Thames Water (TMS) and Three Valleys Water (TVW).

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 of the region are given in Table 2 with outline geographical and demographic information.

Table 2: Key facts about the Thames region supply arrangements

Key facts			
Population supplied	12,254,391	Treatment works	193
Water supplied (l/day)	3,901 million	Service reservoirs	538
Number of local authorities	63	Water supply zones	327
(with a further 21 partially covering the region)		Length of mains pipe (km)	49,346
Approximate number of private water supplies	1,393		
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 2008, 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 three water companies carried out a total of 665,677 tests during 2008. Only 206 of these tests failed to meet the standards set down in the regulations.

Table 3: 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)		
Sutton and East Surrey Water	15,542 (8)	8,480 (32)	17,538 (20)	41,560	644,650
Thames Water	118,035 (93)	93,974 (367)	228,949 (237)	440,958	8,633,741
Three Valleys Water	77,366 (80)	33,418 (131)	72,375 (70)	183,159	2,976,000
Region overall	210,943 (181)	135,872 (530)	318,862 (327)	665,677	12,254,391

Note 1: Numbers in brackets reflect the number of works, reservoirs or zones operated by that company in the region in 2008. Some companies are permitted to carry out some tests on samples taken from supply points rather than from consumers' taps.

Note 2: Tests in the Thames Water Tidworth zone in the Western region have been omitted from the totals.

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 (<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 results for microbiological parameters (Table 4), the other dealing with chemical and physical parameters (Table 6).

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

A summary of the results of the tests from each company is presented on

the Inspectorate's website <http://www.dwi.gov.uk> and is also available on the CD accompanying this report. Additionally, statistics describing the performance of each company supplying drinking water in the region are summarised in Annex 7.

Microbiological quality

Table 4: 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
Water leaving water treatment works				
<i>E.coli</i>	0/100ml	33,116	1	SES (1)
Coliform bacteria	0/100ml	33,116	17	SES (1), TMS (4), TVW (12)
<i>Cryptosporidium</i> *	< 1 oocyst per 10 litres. Treatment standard (see note)	4,982	0	Monitored at 16 works in the region determined to be at risk out of a total of 183
<i>Clostridium perfringens</i>	0/100ml	9,455	6	TMS (6)
Turbidity**	1NTU	33,102	16	TMS (9), TVW (7)
Water leaving service reservoirs				
<i>E.coli</i>	0/100ml	27,177	1	TVW (1)
Coliform bacteria	0/100ml in 95% of tests at each reservoir	27,177	15	TMS (10), TVW (5) All 530 reservoirs in the region met the 95% compliance rule
Water sampled at consumers' taps				
<i>E.coli</i>	0/100ml	31,518	5	TMS (1), TVW (4)
Enterococci	0/100ml	2,484	0	
<p>Notes: *The standard for <i>Cryptosporidium</i> ceased to exist when regulations changed from 22 December 2007 but the regulatory monitoring related to <i>Cryptosporidium</i> risk assessments continued until 1 October. **Turbidity is a critical control parameter for water treatment and disinfection. Summary details of all microbiological tests undertaken by each water company can be found on the DWI website or on the CD accompanying this report.</p>				

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 (2002)* published by the Standing Committee of Analysts (SCA) which can be located on the Environment Agency's website at <http://www.environment-agency.gov.uk> under the 'Commercial Services' section.

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

In 2008, a total of 33,116 tests at works were carried out by all the companies across the Thames region and *E.coli* was detected in only one sample (SES). Likewise, out of 27,177 samples collected from service reservoirs just one contained *E.coli* (TVW). 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 July, at Bough Beech works (near Edenbridge, Kent), a sample of treated water contained *E.coli* and coliforms. The initial results were considered sufficiently unusual that the company notified the Inspectorate. Sutton and East Surrey Water quickly established that the works was operating normally and all further samples gave normal results. The company's investigation then focused on its laboratory at Redhill, where it was found that the organisms found in the original sample were identical to the reference strain used as a positive control to verify the performance of the analytical method. The company concluded the sample had been deliberately contaminated and a member of laboratory staff was suspended. This highlights the importance of the security of analytical arrangements and the need for companies to regularly audit these. Regulation 16 specifies that analysis must be supervised by a competent person. The Inspectorate is working with the Open University to provide a route for school leavers entering the water industry to obtain a foundation degree in analytical science and take the first steps in achieving the competent person status.

A sample taken in August, at Chishill reservoir, in Hertfordshire, operated by Three Valleys Water contained *E.coli* and the company took the reservoir out of service while an investigation was carried out. The internal inspection found no integrity defects apart from a gap between the sample line and the conduit which could have allowed access to the body of the

reservoir. This was sealed before the reservoir was chlorinated and returned to service. All subsequent samples have been satisfactory.

Table 5: 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
Sutton and East Surrey Water	1 – 2,168	0 – 1,696	0 – 1,657	0 – 160
Thames Water	0 – 18,407	0 – 18,797	1 – 22,253	0 – 1,794
Three Valleys Water	0 – 12,541	1 – 6,684	4 – 7,608	0 – 530
Region overall	1 – 33,116	1 – 27,177	5 – 31,518	0 – 2,484

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 2008, this situation occurred at two sites, Sacombe works and Northmoor works (2 TVW).

At Ashford Common works there was a single failure in April which Thames Water linked to problems with one slow sand filter which had been operating outside the companies best operating practice and flow control for the filter was not operational. The filter was taken out of service until satisfactory sample results were obtained. The company reported a further detection of *E.coli* in July and on this occasion the company concluded the same filter needed refurbishment and these repairs commenced at the end of 2008.

A sample taken in July from Wansunt works operated by Thames Water contained coliforms and also Enterococci. The company notified the results to the Inspectorate as a water quality event. This works supplies the Thamesmead, Blackfen and Bexley areas and follow-up samples taken from these zones all gave satisfactory results. No deficiencies in water treatment were identified by the company's investigation at the works.

In November, Musley Lane works exhibited a coliform failure which prompted Three Valleys Water to carry out an audit of the regular sampler at this works. Checks carried out at the works found that treatment was operating normally and all further samples have proved satisfactory.

The audit did not identify any deficiencies in practice which could have given rise to contamination of samples. The same sampler had been associated with higher than normal numbers of failing samples over a two-week period. There were two failures at Three Valleys Water's Thundridge works and Wadesmill Road works in November. The company has since undertaken to introduce regular sampling audits.

At Sacombe works there were two failures in July and September. The works uses ultraviolet (UV) for disinfection. Three Valleys Water thoroughly checked the performance of the works and reviewed raw water quality and found no abnormalities. The company has attributed these failures, along with another detection of coliform bacteria at Chalfont St Giles works to errors made in analysis. The organism that was isolated from the failing sample could be traced back to reference material used in the laboratory. The Inspectorate has been working with companies to improve laboratory practices and develop staff competence. These occurrences will be taken into account during the Inspectorate's risk-based audit programme in 2009.

During August, coliforms were reported on two days in the same week, in samples collected from Northmoor works serving Hemel Hempstead, Chesham and Chorleywood. The groundwater source provides consistently good quality raw water. Three Valleys Water concluded that the sample was not representative of water entering supply because their checks identified problems with the sampling line which was made from an unapproved material and exhibited a build up of deposits. The company has since replaced the sample line and all further samples have proved satisfactory.

It is very disappointing to note that in 2008 the cause of most failures across the Thames region was poor sampling and analytical practices by two companies (TVS, SES). It is vital to public confidence in drinking water quality that the results of monitoring are beyond question as regards accuracy. The Inspectorate will initiate enforcement action to require the companies to improve their scientific services if there is any repetition of poor sampling and analytical practices.

Cryptosporidium at works

The regulations relating to *Cryptosporidium* specific risk assessments and associated monitoring were replaced by comprehensive multi-hazard risk assessments for each treatment works and associated supply system. Under the new regime, raw water monitoring becomes a regulatory requirement.

In 2008, monitoring under the old regulations was required to be undertaken at 17 works (1 SES, 13 TMS, 3 TVW).

All results met the former treatment standard of <1 oocyst per 10 litres and there were no reports of mains water supply-related outbreaks of cryptosporidiosis in the region during 2008.

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 2008, out of 9,455 samples taken in the region, six contained *Clostridium perfringens* (6 TMS).

In January, *Clostridium perfringens* was found in a sample collected from a consumer's tap in Stepney zone. The follow-up samples taken at the property contained coliforms in addition to Clostridia. Thames Water's sampling at Coppermills works and elsewhere in the zone gave satisfactory results until a week later when there was a further failure in a sample taken from a hydrant. The company then arranged for a water fittings inspection at the property and this found various irregularities, such as a lack of non-return valves and issues with a combination boiler. Action was taken with the owner of the premises to rectify the faults. All subsequent samples in the zone have proved satisfactory.

In April 2008, there were two failures in Lee Valley and Bromley Town zones and in both cases, samples taken at the works, upstream reservoirs and neighbouring properties were satisfactory. The failures were probably due to disturbance of localised historic mains deposits which typically contain low levels of Clostridia when the supply is derived from surface water.

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 of the performance of 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 section titled *Chemical quality*.

During 2008 there were 16 occasions when a turbidity value of >1NTU was reported in samples of treated water leaving a works (9 TMS, 7 TVW) equalling last year's figures.

On two consecutive days in January, a value above the 1NTU standard was recorded at Darenth works (TMS). Thames Water took the borehole out of service to investigate. Surface water ingress into the borehole which is generally of good quality was ruled out and analysis of the sample suggested that the turbidity was due to fine particles of brick dust which the company believed to be derived from the lining of the borehole. The company ran the borehole to waste before returning it to service. All further samples have proved satisfactory.

In response to a turbidity value in excess of 1NTU, in July at Lane End works, Thames Water carried out a survey of raw water turbidity and final water turbidity which led to the conclusion that changes in velocity through the works on pump start up had the potential to suspend pipe deposits. The company made changes to the operating regime, but a further elevated turbidity result occurred in October. On this occasion the company took the works out of supply and carried out maintenance including inspection and cleaning of the chemical and chlorine contact tanks. The Inspectorate was critical of the time taken by Thames Water to carry out this maintenance which was essential work to prevent a recurrence.

When a value of >1NTU was recorded at Latton (Masey Hampton) works in January, Thames Water found issues with the configuration of pumps for start up of borehole pumps and inappropriate alarm settings for on-line turbidity monitoring equipment which was not calibrated. The company has since taken the works out of supply to clean out the contact tank. Turbidity monitors at this works and alarm settings have been reviewed and since these works were done results have been satisfactory.

Elevated turbidity was recorded in January and March at Blackford works. Three Valleys Water has identified the risk of failing the manganese standard at this works and a proposal to install additional treatment has been included in the company's business plan (PR09). Deposition of manganese deposits in the sample line was the probable cause of the adverse turbidity results and after a third high result in April the company replaced the sample line, which has secured acceptable representative results for the rest of the year.

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 2008, coliforms were detected in samples at 15 of the 530 service reservoirs (including water towers) in the Thames region, although all met the 95% national standard.

Following two coliform positive samples in July and October at Salisbury Hill reservoir compartment B, Thames Water identified faults with the design of the sampling arrangements; initially this related to a cross connection on the sample line between the two reservoir compartments. There was extensive maintenance work at the site in 2008 to replace the membrane over the reservoir roof. The adverse result in October occurred at a time when new sampling facilities were commissioned and this time it was found that the company's contractor had altered the design without authorisation. The contractor was formally warned about this deviation from the company's method statement and the company has since reviewed other work carried out by this contractor.

In February, Thames Water was unable to collect a routine sample from Campden reservoir during one week because the level within the reservoir was too low for water to reach the gravity fed sample line, as the company was draining down the cells in preparation for an internal inspection of the integrity of the reservoir. A decision was taken to collect a sample from an alternate location which was a consumer's tap at a property downstream. The failing sample proved not to be representative of water leaving the service reservoir as evidenced by satisfactory dip samples taken in response. Samples from neighbouring properties were free from coliforms, but repeat samples from the same consumer's tap were positive again. A single household boil water notice was issued while the company carried out a water fittings inspection. Irregularities were found and advice given to the consumer; after remedies were implemented, including cleaning of the tap which was in poor condition, satisfactory results were obtained. This case provides evidence to underpin the messages for householders provided in the Water UK publication *Looking after water in your home – a consumer's guide* promoted by the Inspectorate in *Drinking Water 2007* and on the Inspectorate's website.

Mill Hill East reservoir, supplying the Mill Hill area of North London, exhibited a coliform failure in cell B (of the two cells) in June after the 10 year internal inspection of cell A at this site, as part of Thames Water's routine maintenance programme. The company concluded that during this work there may have been cross contamination between the two cells. The

company removed cell B for cleaning and inspection in July and further samples have given satisfactory results.

During July 2008 there was a coliform positive sample from Chigwell C reservoir which serves the Hainault and Roding Valley area. There was no chlorine residual detected at the time of sampling and a review of chlorine residual data for the site by Thames Water pointed towards the probability that the water in the reservoir was older than desirable. The company put in place measures to ensure water stored in the reservoir was refreshed on a weekly basis resulting in satisfactory results for the remainder of the year.

The Inspectorate has noted that coliform bacteria were found in 15 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 31,518 consumer tap samples were tested in 2008 for *E.coli* and five were positive (1 TMS, 4 TVW). Like *E.coli*, the presence of Enterococci is indicative of faecal contamination and neither bacterium should be found in any sample. In 2008, the companies carried out 2,484 tests for Enterococci at consumers' taps and none were positive.

There was no indication, from information gathered by the two water companies, of a faecal contamination event affecting other properties in these zones.

In Thames Water's West Oxford and Kidlington zone, *E.coli* was detected in a consumer's tap sample collected in December. After a thorough investigation, including satisfactory checks at the upstream works, and further samples from the property, the company gave advice to the householder on tap hygiene.

During November, in the Ware zone in Hertfordshire, a sample collected by Three Valleys Water contained *E.coli*. The sampler noted that the tap was of the type which contains an aeration insert making it difficult to keep clean. The company verified there was not a wider problem by enhanced sampling of properties in the local area and gave advice to the householder to prevent a recurrence.

The Inspectorate is pleased to note that during 2008 Three Valleys Water has introduced best practice by enhancing local monitoring to verify water quality in response to the detection of *E.coli* in a consumer's tap sample. The Inspectorate has been observing work by the water industry through an UKWIR project entitled *Validating the cause of coliform occurrences*, which aims to update and publish best industry practice.

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 6 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 6: Chemical and physical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting the standard	Additional information
Aesthetic parameters				
– colour	20mg/l Pt/Co scale	10,030	0	
– odour	No abnormal change	6,263	5	SES (2), TMS (2), TVW (1)
– taste		6,257	4	TMS (4)
Aluminium	200µg/l	9,222	2	TMS (1), TVW (1)
Copper	2mg/l	2,482	1	TVW (1)
Fluoride	1.5mg/l	2,381	0	
Iron	200µg/l	10,243	18	SES (1), TMS (15), TVW (2)
Lead (current standard)	25µg/l	2,490	3	TMS (3)
Lead (future standard)	10µg/l	2,490	30	TMS (27), TVW (3)
Manganese	50µg/l	9,104	2	TVW (2)
Nickel	20µg/l	2,481	2	TMS (2)
Nitrate	50mg/l	7,810	0	
Nitrite	0.5mg/l	7,810	0	
Pesticides – total	0.5µg/l	1,503	2	SES (2)
Pesticide – individual (see note 3)	0.1µg/l	42,102	10	Carbendazim TMS (1) Glyphosate SES (1), Metaldehyde SES (7) Monuron TMS (1)
pH (Hydrogen ion)	6.5 – 9.5	11,323	3	TMS (3)
Turbidity (at consumers' taps)	4NTU	11,324	2	TMS (2)
Notes: For summary details of all tests undertaken by each water company refer to the DWI website or the CD accompanying this report.				
For comparison, 1mg/l is one part in a million, 1µg/l is one part in a thousand million.				
A further 2,384 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. From the start of this year companies have been required to report all positive detections of a taste and odour because the national standard was brought into line with the EU Drinking Water Directive with effect from 22 December 2007. Previously, companies only reported on samples where a taste or odour was detected at a level of three dilutions or stronger.

In 2008, a total of nine samples from consumers' taps in the Thames region exhibited a positive taste or odour. The standard for colour was met in all 10,030 tests in the region.

The positive detections of taste and odour are summarised below in relation to their nature and cause as determined by the investigations carried out by companies. From this information it can be seen that many were confined to pipes and fittings in a single property. In other instances there was a problem with the way the water company followed the analytical method. The Inspectorate has issued guidance to companies to prevent these problems arising in future years.

- **Bitter/Flat:** a sharp bitter taste was reported in a sample collected by Thames Water from a consumer's tap in the Keston and Forestdale zone. The company identified the cause as a poorly maintained water softener within the property. the remedy in such cases is for householders to be advised to draw water for drinking and cooking from a tap connected directly to the mains (or to fit a mains fed tap if one does not exist).
- **Oil/Solvent:** a sample from a consumer's tap collected by Thames Water from the Burghfield and Tadley Zone exhibited an odour described as 'polish/solvent'. The sample was taken from a tap in an outhouse rather than the kitchen tap used for drinking water. Chemical analysis of first draw samples taken at the property showed the presence of hydrocarbons and a water fittings inspection identified irregularities which were subsequently rectified by the property owner. Companies are reminded that random samples collected for compliance monitoring should only be collected from drinking water taps.
- **Earthy/Musty:** a sample from a consumer's tap, taken by Thames Water in the Slough area exhibited a musty/saline taste. This type of taste is often due to situations where harmless, but objectionable, substances are produced by the growth of fungi when household plumbing is poorly designed or unapproved materials are used; the

remedy is to advise the householder on necessary changes to the design and maintenance of the plumbing system.

- Chlorinous: this odour was reported in a single sample by Three Valleys Water in March 2008. This and similar descriptors relate to a variety of circumstances which relate to the level of residual chlorine in the mains water supply; the remedy is to optimise the level of residual chlorine in water received by all customers in the zone.

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 2008, a total of 9,222 samples were tested for aluminium in the Thames region. Sutton and East Surrey Water achieved 100% compliance with the aluminium standard. Just two tests exceeded the standard (1 TMS, 1 TVW) and none of these were found to be related to process control at the works.

A failure in the Swindon North zone in July was associated with elevated levels of iron in samples taken from the local network following a burst main in the area. This indicated the cause was accumulation of historic mains deposits, which had been disturbed following the mains burst. The area is served by works operated by Thames Water where treatment was improved during the 1990s. The failure in the Rickmansworth/Ickenham zone in September was also attributed to a disturbance of mains deposits by Three Valleys Water and subsequent samples have proved satisfactory in both cases.

Bromate

Normally, bromate is only formed in drinking water when bromide is present in the surface water, some of which is then 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 in 2008, all of the 1,532 tests met the standard.

In previous *Drinking Water* reports updates have been provided about the bromate pollution from a former industrial site in Sandridge, Hertfordshire of a strategic chalk aquifer which is a major source of water supplies for two companies in the region (Thames Water and Three Valleys Water).

A public planning inquiry was held in 2007 and afterwards two appeals were lodged for decision by the Secretary of State. A provisional appeal decision was made in November 2008, which proposed changes to the remediation notice. As required under the Contaminated Land Regulations 2006, a further period of consultation has taken place and it is likely that the Secretary of State will announce the final decision before the summer parliamentary recess in July.

The risk to drinking water supplies relates to a plume of bromate moving through the aquifer potentially affecting supplies in the Hatfield and surrounding area from treatment works at Hornsey (TMS and North Mymms (TVW)). The companies completed legally binding programmes of work in the spring of 2009 to install additional treatment at two sites: at Hornsey the additional processes are aeration, rapid gravity and granular activated carbon (GAC) filtration. At North Mymms, options were explored during 2007 and initial tests on two new alternative borehole sources proved unsuccessful in terms of yield. In early 2008, the company submitted a revised undertaking which included a series of measures such as reducing the output from its Essendon works and increasing abstraction from existing boreholes at East Hyde and Wheathamstead. This programme of work is now due to be completed by March 2010.

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 2008, a total of 2,482 tests were carried out for copper across the region and all but one met the standard (2mg/l).

A copper level of 2.06mg/l was reported by Three Valleys Water in September in a consumer's tap collected from the Chorleywood and Gerrards Cross zone. The company was able to demonstrate that the failure was confined to the internal plumbing within the property because levels of copper were reduced by flushing of the tap. Advice was given to the householder.

Fluoride

Traces of fluoride occur naturally in many water sources, particularly in groundwaters. For example, fluoride is found in water abstracted by Three Valleys Water 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 2008, all 2,381 tests for fluoride taken across the region met the regulatory standard (1.5mg/l).

See the DWI website <http://www.dwi.gov.uk> for more information on fluoridation.

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.

All companies in the Thames region completed their long-term section 19 programmes of mains renovation work in 2002 and delivery of ongoing compliance with the standard for iron since then has been through companies' Distribution, Operation and Maintenance Strategies (DOMS). In 2008, there were 18 failures of the iron standard at consumers' taps, compared to 16 failures in 2007.

A failure in the Lingfield zone in March was responded to initially by Sutton and East Surrey Water by a sampling survey which found higher than expected levels of iron in the area. The company carried out a flushing exercise to increase flow into the area and remove historic mains deposits, however, elevated iron results close to the standard persisted. As a short-term measure, the company has put in place a regular (four monthly) flushing programme and scheduled to renovate the water main serving all properties in the road starting by March 2010.

In 2008, Thames Water reported 15 failures of the iron standard and 13 of these were determined to be isolated events caused by a localised disturbance of the main dealt with by flushing at the time and not indicative of a wider problem. A failure in Wycombe South, North and Central zone in Buckinghamshire in February, gave an unusually high result (966µg Fe/l). The company identified the presence of a cast iron

main, however, all samples from other neighbouring properties contained only traces of iron and there were no failures of other drinking water standards. A similar situation occurred when a failure was reported in a sample collected from a consumer's tap in the Petts Wood zone, near Orpington in Kent in July. The Inspectorate expects Thames Water to use information about failures and investigations to inform their DOMS prioritising work to renovate or replace sections of newly identified cast iron mains as part of the water safety plan approach to securing safe, clean, drinking water.

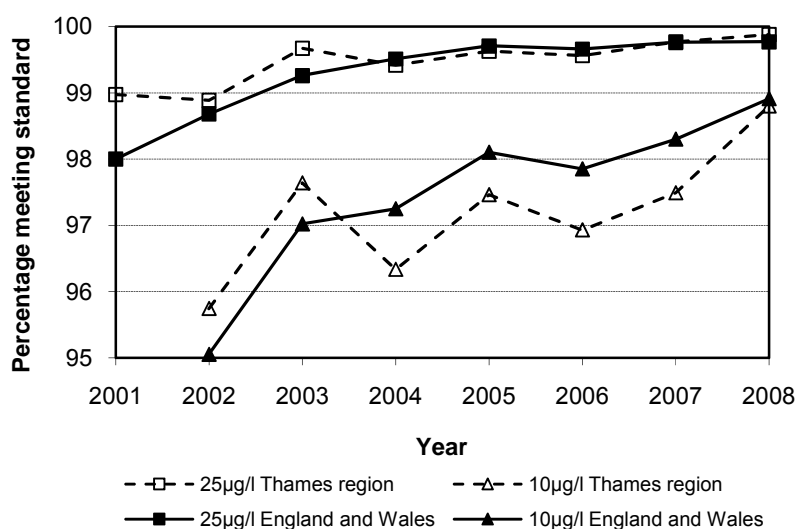
In 2008, Three Valleys Water reported two failures of the iron standard. One of these, in the Barkway and Therfield zone in August was an isolated event not indicative of a wider problem. In the other case, which occurred in the Luton East zone in March, the company identified the cause as a small diameter cast iron main, which dated back to 1959. This main was directly fed by a service reservoir which provided a bulk supply input from Anglian Water. The company installed a hydrant to facilitate flushing and carried out investigations in this low flow main which exhibited signs of internal corrosion. Evidence was obtained of elevated iron and turbidity levels also coming from the bulk supply. After a modelling exercise, the company decided to rezone the area (bringing in water from another source), however, this arrangement caused water quality at other properties elsewhere along the main to deteriorate. The permanent remedy was brought about when Three Valleys Water transferred the supply to these properties to an adjacent polyethylene main.

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 2008 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 7).

Figure 7: Percentage of tests meeting the current and future standard for lead between 2001 and 2008



Water companies notify both the consumer and the relevant local authority whenever a failure of the lead standard occurs. In 2008, the Inspectorate was notified of a total of three failures in the region of the current standard of 25µg/l (3 TMS) and 30 other samples exhibiting levels above the future standard of 10µg/l (27 TMS, 3 TVW). This represents an improvement over previous years, mostly because Thames Water has adjusted the frequency of testing for lead to bring it into line with the requirements of the regulations. Figure 7 shows that compliance with the future standard for lead in the Thames region is close to the industry average.

In 2008 there were three failures of the current standard for lead. In the Thames Water Whitechapel zone in December and the New Cross zone in January, further testing by the company demonstrated the presence of lead plumbing. The local authority was notified and the householders were given advice. The third failure in the Chiddingfold zone (TMS) was also associated with a failure of the nickel standard (discussed in more detail in the *Nickel* section).

Some companies within the Thames region have put forward proposals in their PR09 final business plans for an integrated package of measures to address the risk to consumers of exposure to lead from lead pipes. The measures include targeted lead communication pipe replacement in high risk areas, working with Health Protection teams and Primary Care Trusts to address risk to vulnerable consumers, educate consumers on the benefits of lead pipe replacement, opportunistic lead communication pipe replacement as part of pre-planned work on the distribution system, and lead communication pipe replacement on failure of the 25µg/l standard. Thames Water has included within its business plans five additional

phosphate dosing schemes at Dancers End, Hawridge, New Ground, Harpsden and Henley works.

In addition, during 2008 companies in the region have responded to 424 consumer requests to check the level of lead in drinking water in their properties.

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 2008, one company (TVW) reported two failures of the manganese standard of 10µg/l.

In April and September there were two failures of the manganese standard in samples collected from consumers' taps in the Epping and Ongar zone in Essex. The raw water source at Three Valleys Water's Roydon works is manganese rich and levels in the treated water entering the distribution system are typically at or around 10µg/l. After the second failure was reported in 2008, Three Valleys Water investigated the feasibility of a programme of mains cleaning work for areas of the network assessed as being susceptible to the build up of deposits. The company has identified the risk in its Regulation 28 report and has included work to install a manganese removal plant at Roydon works in its business plan (PR09). This programme of work will be completed before 2011.

Nickel

Nickel may be present in coatings on modern tap fittings. In 2008, a total of 2,481 tests were carried out for nickel and all but two met the standard (20µg/l). Nickel at a level of 854µg/l was detected in a sample from a consumer's tap in the Chiddingfold zone in February, the same sample also failed the lead standard. Thames Water collected and analysed stagnation samples (first draw of water from the tap after no water being drawn for at least half an hour) which again showed elevated levels of lead and nickel, confirming a plumbing or water fittings problem. The property was part of a private estate and the company worked with the estate owner to establish the extent of the problem by carrying out a sampling survey.

The results of this survey showed that samples taken at other properties within the estate all met the standards and all results were below 10µg/l. This confirmed that the issue was not widespread and was isolated to a single property.

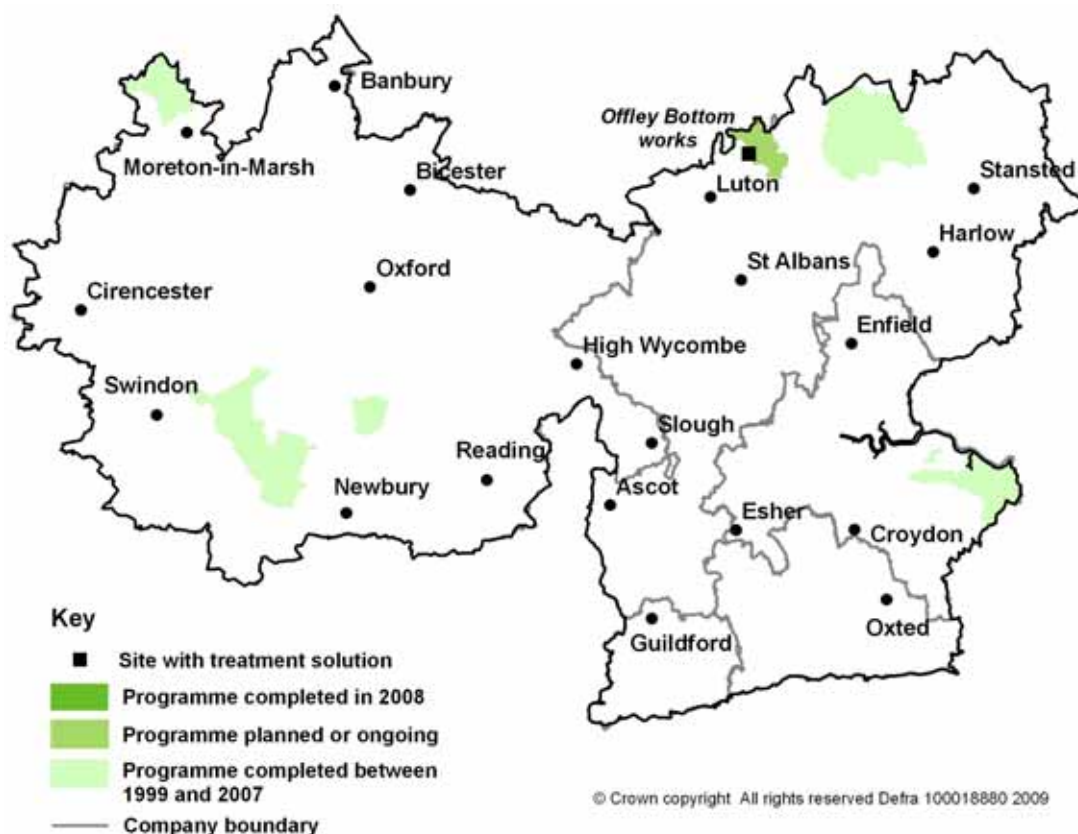
A level of 22µg/l nickel was reported in a consumer's tap sample from the Wimbledon zone in January. Thames Water carried out additional testing which showed that when the water was allowed to stand in the pipes in the property there was a build up of both nickel and copper. The company provided the householder with advice.

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 in to lakes, rivers and streams. Nitrate levels can be reduced by water treatment or by blending with another, low nitrate, water source. In 2008, all 7,810 tests for nitrate across the Thames region met the standard of 50mg/l.

In May 2008, Thames Water completed work at Wilmington works to install ion exchange treatment to reduce nitrate in the raw water which has been increasing year-on-year benefiting 19,000 consumers in the Dartford area of Kent. Three Valleys Water has also demonstrated a rising trend in raw water nitrate levels at Offley Bottom works near Hitchin in Hertfordshire and a legally binding programme of work to install an ion exchange plant is going ahead (due for completion in 2010) benefiting around 37,000 consumers.

Figure 8: The extent of nitrate improvement programmes



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 disinfection process. Chloramination is used throughout the area supplied by Sutton and East Surrey Water and by Thames Water in central London. Additionally, chlorine residual is in the form of chloramine in Three Valleys Water’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 2008, all 7,810 tests carried out across the region for nitrite met the standard.

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 2008, two (SES) tests in the region exceeded the standard for total pesticides from 1,503 tests. There was 100% compliance for the four pesticides with a standard of 0.03µg/l in a total of 2,384 tests. Out of a total of 42,102 tests for individual pesticides (with a standard of 0.1µg/l) just 10 exceeded the standard. The circumstances and substances involved are summarised below.

In March 2008, Three Valleys Water completed a legally binding programme of work to install granular activated carbon (GAC) treatment for pesticide removal at its groundwater works at Kensworth Lynch which serves the area of Kensworth and Caddington near Luton in Bedfordshire. This scheme was initiated following the company's monitoring of the catchment which identified the potential for the presence of pesticides. The completion of this scheme will benefit around 37,500 consumers.

Carbendazim

In April, Carbendazim was detected at a level of 0.14µg/l in a sample taken from Marlow treatment works in Buckinghamshire. Thames Water has monitored for this pesticide for several years and there have been no failures for any pesticide at this works for 10 years. A source to tap sampling survey did not verify the presence of Carbendazim and the company attributed this failure to contamination of the sample during analysis. The Inspectorate has noted issues with the integrity of analysis for pesticides at several water industry laboratories during 2008 and this will be taken into account during the programme of technical audits in 2009.

Glyphosate

Glyphosate is a non-selective herbicide for the control of annual and perennial weeds in non-crop situations. The standard is 0.1µg/l.

In August, a glyphosate level of 0.168µg/l was reported by Sutton and East Surrey Water in a sample of treated water at its Woodmansterne works supply point. Extensive sampling from source to tap did not reveal any ongoing presence of the pesticide. The company concluded that the failure was not representative of water in supply and most likely due to contamination within the laboratory. The Inspectorate has noted issues with the integrity of analysis for pesticides at several water industry laboratories during 2008 and this will be taken into account during the programme of technical audits in 2009.

Metaldehyde

During 2008, metaldehyde, the active ingredient of some slug pellets, has been identified by Sutton and East Surrey Water as a new pesticide hazard at its Bough Beech works which draws water from the River Eden catchment. The levels found range from 0.198µg/l to 0.433µg/l. The Health Protection Agency has advised that no adverse health effects are expected from these levels in drinking water.

In February 2008, Sutton and East Surrey Water identified the presence of metaldehyde following a revision of its pesticide monitoring strategy, consistent with changes in the regulations which introduced a requirement for companies to implement the water safety plan approach to risk assessment. In total, throughout the year, the company has reported methaldehyde at a level above the pesticide standard of 0.1µg/l in seven samples from Bough Beech works during 2008. The company has changed the carbon at the works to optimise pesticide removal generally.

The Inspectorate is working with the water industry, the regulator of pesticides (Health and Safety Executive) and the Environment Agency to address the metaldehyde risk to drinking water supplies generally. Legally binding agreements will be put in place to ensure that companies work with the Environment Agency, farmers and others to develop and implement specific control measures for those water sources where raw water monitoring and Regulation 27 risk assessments have identified the need.

Monuron

Monuron is an obsolete herbicide once used to control a wide range of annual and perennial broad-leaved weeds and grasses. It is not registered for use in the UK.

In January, Monuron was detected at a level of 0.117µg/l in a sample from Woods Farm works. Thames Water has monitored for this pesticide at this groundwater site since 2003. Monuron has been detected for brief periods since February 2007 relating to periods of heavy rainfall and its occurrence is believed to be related to groundwater levels. Control measures identified in the company's Regulation 28 risk assessment report include working with the Environment Agency and investigating the need for additional treatment to address rapid changes in the raw water caused by rainfall.

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.

In the Thames region, out of a total of 11,323 tests, the specification was exceeded on three occasions in 2008.

Thames Water reported pH out of specification in samples collected from consumers' taps in April, June and August from different water quality zones. In each case the company investigation found that a reverse osmosis or water softening treatment device had been connected to the incoming mains water supply inside the premises. The householders were given advice about the need to retain a tap connected directly to the mains for drinking and cooking.

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 consumers' 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 section titled *Microbiological quality*.

In 2008, a total of 11,324 samples from consumers' taps across the region were tested for turbidity and all but two met the standard of 4NTU.

In June, a sample taken in Finsbury Park zone in the Thames Water supply area showed a turbidity level in excess of the 4NTU standard and this was associated with a failure of the standard for iron. The company's investigation survey identified a discrete area of the network at risk of discolouration. The company has since used information gained from the investigation of this failure to inform its programme for mains replacement in the area.

In September, a sample taken by Thames Water in the Dartford North zone in Kent failed the 4NTU turbidity standard at a time when there was mains renovation work being carried out locally giving rise to disturbance of historic mains deposits.

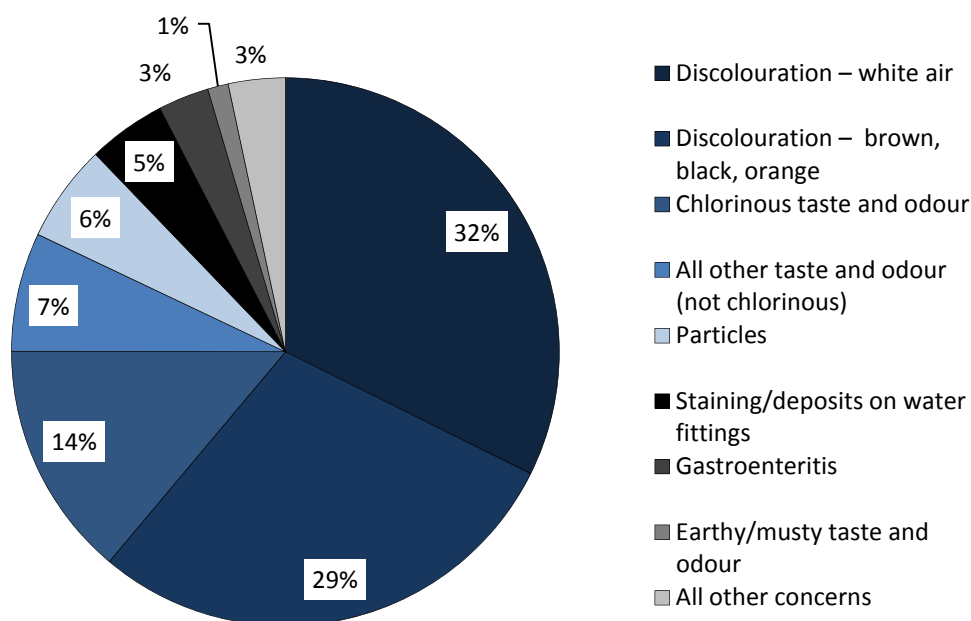
Consumer perceptions of drinking water quality

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. Table 9 shows the change in the rate of consumer contacts per 1,000 population for the three main categories (appearance, taste and odour, and illness) since 2006.

Table 9: Total contact rates of appearance, taste and odour, and illness

Company	Contacts per 1,000 population		
	2006	2007	2008
Sutton and East Surrey Water	1	1	1
Thames Water	1	1	1
Three Valleys Water	2	2	2
Region overall	1	1	1

In the Thames region, the most frequently reported consumer concerns during 2008 were discolouration – white due to air (32%), discolouration – brown, black, orange (29%), chlorinous taste and odour (14%), non-chlorine taste and odour (7%), and particles (6%). Together these constituted 88% of all consumer contacts about drinking water quality in 2008.

Figure 10: Consumer concerns in the Thames region in 2008

Over the last three years there has been a 8% increase in appearance, taste and odour or illness contacts across the Thames region from 14,704 in 2006 to 15,834 in 2008. Further detail on the changes is provided below.

Discoloured water

White water due to entrained air constitutes the largest category of consumer contacts in the Thames region (32%). The number of contacts stands at close to 5,000 contacts for 2008, a figure that has changed little since 2006. Aeration is a largely avoidable problem. The Inspectorate is disappointed to note that companies do not seem to be taking the necessary steps to improve their procedures for operating valves to minimise the impact on their customers.

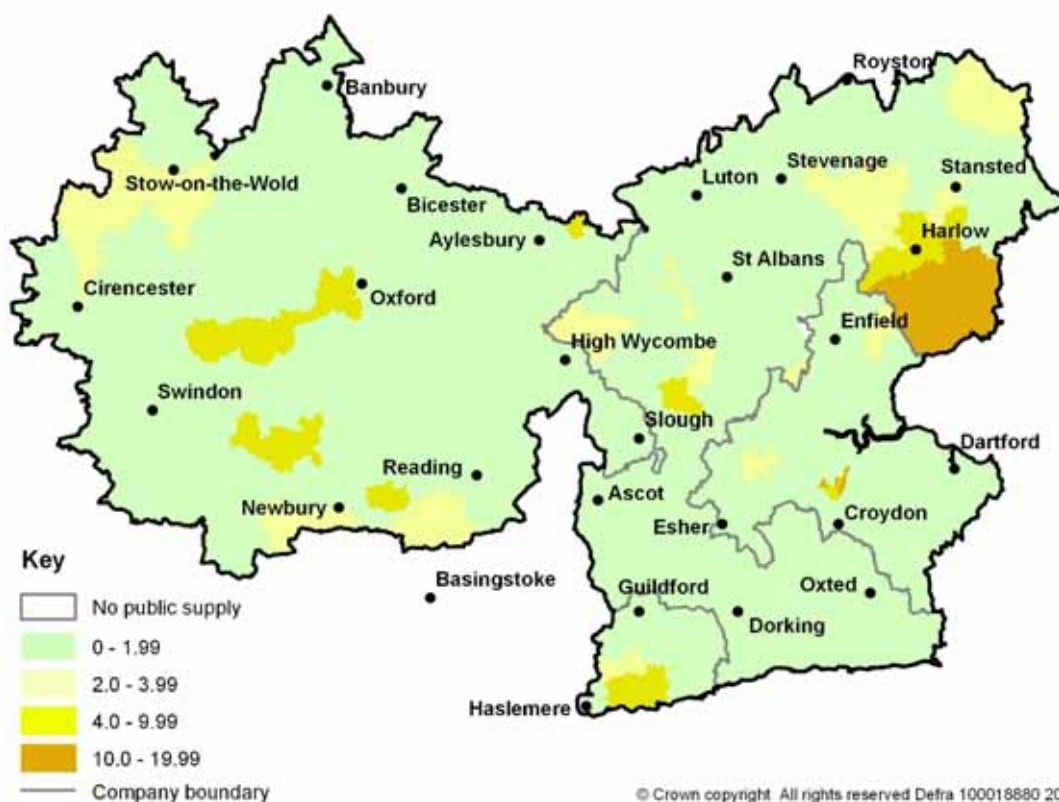
Although 'dirty' water reports by consumers are a less frequent concern for consumers in the Thames region compared to other regions, reports of discolouration (brown, black or orange) still account for almost a third of contacts from concerned consumers. Companies in the region completed their long-term section 19 mains renovation programmes in 2002, however, since then there has been an 11% upturn in this category of contact, mainly from customers of Three Valley's Water, where the company has received 36% more contacts since 2006.

Table 11: Consumer contacts for brown, black or orange water 2006-08

Company	Number of consumer contacts reporting brown black or orange water		
	2006	2007	2008
Sutton and East Surrey Water	176	137	135
Thames Water	1,865	1,526	1,629
Three Valleys Water	2,054	2,293	2,794
Total	4,095	3,956	4,558

Figure 12 illustrates consumer contact rates for zones in the Thames region and highlights an area around Harlow where the contact rates are the highest in the region. Three Valleys Water is planning improvements to the Roydon treatment works to improve this situation. Additionally, work is planned at the Blackford works which will address the zones north east of Slough which are also experiencing elevated numbers of consumer contacts. However, the Inspectorate expects the company to implement short-term remedies within their Distribution, Operation and Management Strategies (DOMS) to reduce the impact for customers in the interim.

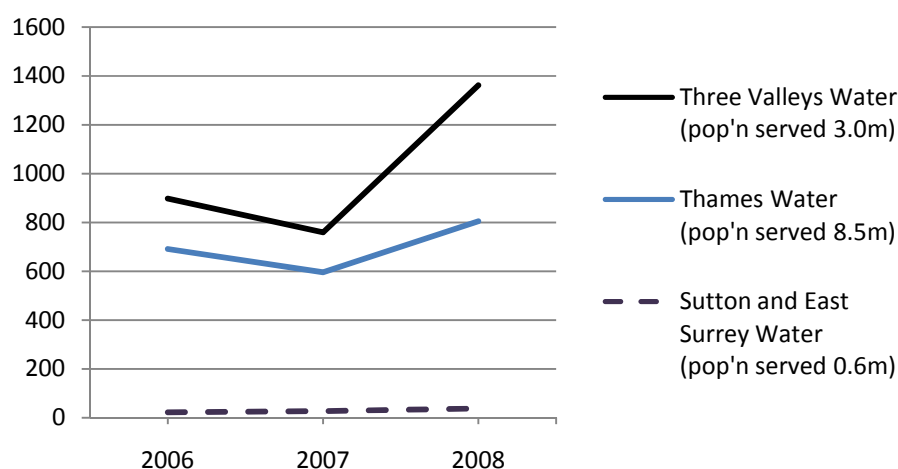
Figure 12: Consumer contact rates per 1,000 population for brown, black or orange water



Chlorine taste and odour

Over the past three years the proportion of contacts attributable to chlorinous taste and odour across the industry has risen from 8% to nearly 13% of all consumer concerns (from over 12,000 to nearly 18,000 contacts). The reasons for this trend are twofold: investment by the companies is effectively tackling the causes of discolouration therefore, generally, dirty water complaints are declining in number as water mains are renewed or renovated; and water quality is improved at source through enhanced water treatment resulting in a more stable chlorine residual which is carried further through the network of pipes. These are the positive benefits of water company investment, however, it also means some consumers will be experiencing fresh tap water with a trace of chlorine for the first time. Figure 13 illustrates the rising trend for companies in the Thames region. The Inspectorate expects Thames Water and Three Valleys Water to address the contacts about chlorine by developing effective chlorine residual management strategies to minimise the impact on consumers.

Figure 13: Consumer contacts for chlorinous taste and odour 2006-2008



When the response of a company fails to provide the necessary reassurance or remedy, the consumer may turn to the Inspectorate for advice. As can be seen from Table 14, in 2008 there were 12 consumers living in the region who complained directly to the Inspectorate, slightly more than the nine complaints received in 2007. All but one of these complaints were made by customers of Thames Water. The following case supports the Inspectorate's view that companies generally do not have sufficient regard for the adverse impact that aeration has on public confidence in drinking water quality.

Table 14: Contacts from consumers received by the Drinking Water Inspectorate

Category	Number of contacts
Appearance	8
Taste and odour	3
Report of illness	0
Water quality concern	1
Number of contacts to DWI from consumers by company. TMS (11), TVW (1)	
Categories are as defined in Information Letter 1/2006	

In March, a customer of Thames Water living in Sydenham, London contacted the Inspectorate to report that his tap water was undrinkable (white water) for several weeks and he was concerned about its safety. He was aware that others in his community were experiencing similar problems. After intervention by the Inspectorate, Thames Water carried out several actions which quickly resolved the issue for most consumers. However, the problem was not fully analysed and resolved for several weeks. A pumping station in Brixton was correctly identified as the source of the problem. It was necessary for the company to refurbish the pumps and introduce a new pumping arrangement. This case illustrates the need to maintain good and continuing communications with consumers when it is likely to take time to achieve a permanent remedy.

Incidents in 2008

Companies in the Thames region notified the Inspectorate of events during 2008. The Inspectorate classified 13 as 'incidents' requiring a comprehensive report from the company and a full investigation by the Inspectorate, this compares to 14 in the region in 2007.

Table 15: Water quality events in the region in 2008

Water company	Number of events notified	Number classed as incidents
Sutton and East Surrey Water	4	1
Thames Water	65	8
Three Valleys Water	14	4
Region overall	83	13

A summary of the nature, cause and duration of each incident, along with details of the Inspectorate's findings are set out in *Annex 3*. Most incidents were of relatively short duration and the company took action to inform stakeholders and safeguard consumers as appropriate.

Wider learning points from incident investigations in the region in 2008 are highlighted by the following cases:

Disinfection failure at Farmoor works, Oxford

- The disinfection system at Thames Water's Farmoor works near Oxford failed in September due to a fault with the chlorine gas drum automatic changeover system. Alarms generated at the time went unnoticed until the operator returned to the control room after carrying out site checks. The failsafe system was set incorrectly so high lift pumps continued to operate and water which had not been adequately disinfected entered the supply. The root cause of the incident was a lack of planned maintenance for secondary chlorination equipment and no procedures for its use. The company has since acted to prevent a recurrence. The Inspectorate was also critical of the delay in escalation of this incident to senior management and a lack of timely sampling in response to consumer contacts. Companies are reminded that Regulation 26 requires that all aspects of the design, operation and maintenance of treatment, including disinfection, must be adequate at all times.

Detection of *Cryptosporidium* oocysts at Cleeve works

- Flooding events adversely affected two of Thames Water's treatment works at in 2008. At Cleeve works, the company failed to act appropriately following an unusual turbidity alarm. The site should have been risk assessed as being vulnerable to flooding and *Cryptosporidium* at a time of heavy rainfall and high river levels. The Inspectorate was also critical of the time taken to isolate particular boreholes and delays in sending *Cryptosporidium* samples for fast track analysis by the laboratory. *Cryptosporidium* oocysts were detected in a sample of the final water leaving the site. The company has been required to improve its procedures to prevent a recurrence.

Loss of coagulation at Chingford South works

- In February 2008, Chingford South works was restarted and returned to supply without an operational coagulation process due to an error by the operators whereby critical dosing pumps were not reset. The Inspectorate was critical that it was possible for the works to be started and returned to supply without coagulation in operation. The company modified the control systems at Chingford South works and revised site procedures. The Inspectorate concluded the company had not taken sufficient action to prevent a recurrence and recommended that operational details, such as low coagulant flows, be clearly displayed on SCADA screens (supervisory control and data acquisition system) and that the screens and online trends be

routinely monitored and records of equipment history and status improved. Further recommendations were made in respect of staff training and the keeping of comprehensive plant logs.

Cross connection to a private supply

- Following a complaint from a consumer living in Woodside, Hatfield analysis of samples revealed that the composition of the tap water was not representative of the public water supply. Three Valleys Water made site visits which revealed a cross connection between the mains supply and a local private water supply. Do not drink warning notices were issued while checks were made and a non-return valve fitted. This was a complex event requiring ongoing and effective communications. The Inspectorate was pleased to note that the company has since worked in partnership with local authorities to identify properties that have both private and public supplies where the potential for similar cross-contamination risks may be present.

No offences are currently under consideration by the Inspectorate in connection with any of the incidents that occurred in the region in 2008.

Technical audit activity in the region

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, incident 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 2008 in the Thames region is set out in Table 16.

Table 16: Summary of the Inspectorate's technical audits in the region

Site name	Audit topic	Main findings from audit
Thames Water		
Chingford South works	Coagulation incident.	Generally satisfactory in relation to maintenance. Recommendations were made relating to the monitoring of water quality trends and the training of operators.
Hampton works	Training, operational risks, Regulation 26.	Generally satisfactory. Recommendations were made in relation to staff training, Regulation 31 procedures, the operation of ozone and filters and staff training and procedures.
N/A	Audit of risk assessments for planned work on the distribution system.	Generally satisfactory. Recommendations were made relating to training in assessment of risks, the exchange of information with contractors and the checking of valves prior to commencement of jobs.

Local authority engagement

Public water supplies – risk assessments

Section 77 of the Water Act 1991 places a duty on local authorities to keep themselves informed about the quality of drinking water supplies to premises in their area. Until now, local authorities' routine involvement with public water supplies has mainly related to working level contacts with water companies about consumer complaints and the results of testing at consumers' taps. The amendment of the drinking water regulations in December 2007, which introduced a requirement for comprehensive risk assessments for each water supply system, introduced a new mechanism for local authority engagement with water companies about the safety and security of public water supplies in their area. By 1 October 2008, water companies were required to complete Regulation 27 risk assessments using water safety plan methodology for each water supply system. The output of this work was a Regulation 28 report to the Inspectorate and a plan for communicating the content of each risk assessment to relevant local authorities and local health protection professionals in the Health Protection Agency.

A total of 796 Regulation 27 risk assessments are now in place across England and Wales. In *Annex 6* of this report we have listed, for each of the 84 local authorities in the Thames region, the number of risk assessments that cover all or part of their area. The Inspectorate encourages local authorities to check that companies have contacted them about each relevant risk assessment.

During 2009, the Inspectorate will be assessing each water company risk assessment. The Inspectorate has the power to issue notices to require improvements to be made and copies of any such notices will be sent directly to the relevant local authorities.

Private water supplies

Local authorities have direct responsibility for ensuring the wholesomeness and safety of private water supplies in the region and can call on the Inspectorate for technical advice when required. In the Thames region, local authorities hold information regarding 1,393 private water supplies. Table 17 provides information on the numbers of supplies grouped by volume of water supplied per day.

Table 17: Number of private water supplies supplying given volumes of water per day

	Number of private water supplies supplying volume indicated			
	<10m ³ per day	10m ³ – 99m ³ per day	100m ³ – 399m ³ per day	400m ³ – 1,000m ³ per day
England				
Central region	6,341	421	12	11
Eastern region	2,118	215	23	13
Northern region	5,496	352	19	15
Southern region	454	56	129	6
Thames region	1,056	206	126	5
Western region	8,414	550	27	5
Total for England	23,879	1,800	336	55
Wales	3,562	355	4	30
Total for England and Wales	27,441	2,155	340	85

Following a review of the Private Water Supplies Regulations 1991, the Department for the Environment, Food and Rural Affairs (Defra), issued a consultation document on proposed new regulations (the Private Water Supplies (England) Regulations 2009)². The consultation period ran from 11 August to 3 November 2008. The purpose of the change is to transpose the requirements of the 1998 EU Drinking Water Directive into law and to protect the health of consumers who rely on private water supplies for drinking and food preparation. The consultation recognised that existing arrangements for the safety and security of private water supplies were not adequate. Similar changes are proposed for Wales and the Welsh Assembly Government. The closing date for the consultation was 8 June 2009³.

Defra published the 105 responses received during the consultation period⁴. The key points made by respondents are set out below:

- The maximum fees proposed were considered insufficient to cover local authority costs in carrying out risk assessments and monitoring.
- There is a need for guidance on the definition of private distribution system.
- The proposed timescale of six months for data collection by local authorities is too short.
- The 30 year retention period for data is too long and not consistent with other data collection requirements.
- Small shared domestic supplies was a category that posed a higher risk and the monitoring proposals for these were considered insufficient.

In parallel to the above activities, the Inspectorate has been working closely throughout the year with local authorities to develop the technical guidance that needs to be in place to enable implementation of the new private water supply regulations. A national stakeholder group was formed to identify and understand the issues which emerged during the consultation and to take forward the work of developing and disseminating

² Consultation for England available at

<http://www.defra.gov.uk/corporate/consult/private-watersupplies/index.htm>

³ Consultation for Wales available at

<http://wales.gov.uk/consultations/environmentandcountryside/privatewater/?lang=en>

⁴ Summary Document available at

<http://www.defra.gov.uk/corporate/consult/private-watersupplies/summary-responses.pdf>

best practice. Two key areas of work have been identified by the Inspectorate: developing with local authorities and software houses effective systems and methods for data capture and reporting, and national training tools and programs. Local authorities have requested web-based information and the Inspectorate is working with the Chartered Institute of Environmental Health and the Local Authorities Coordinators of Regulatory Services on putting this in place.

Through its role in the management of Defra's Water Quality and Health Research Programme the Inspectorate has identified, and will be commissioning appropriate research to improve the evidence base on risks relating to private water supplies.

For further information on the Water Supply (Water Quality) Regulations 2000 (amendment) Regulations 2007, or the microbiological and chemical parameters covered by the regulations please refer to the DWI website: <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: 020 7270 3370.

Annex 1

Further sources of information

The publication *Drinking water 2008* 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 monitoring data from 2008 under the following headings:

- Introduction to the report for the region
- Summary of the Drinking Water Inspectorate's conclusions about drinking water quality in the region
- Water supply arrangements
- Drinking water quality testing
- Drinking water quality results
- Consumer perceptions of drinking water
- Incidents in 2008
- Technical audit activity in the region
- Local authority engagement.

Each report begins with a short summary of the Inspectorate's conclusions about drinking water quality in the region in 2008.

The reports and other content are published on the DWI website at <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 2008. They provide information on:

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

Incidents in England and Wales 2008

To promote shared learning, the Inspectorate has compiled a list of all incidents that occurred in 2008 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.

List of risk assessments by local authority

This is a reference list for local authorities letting them know how many risk assessments have been carried out by each water company supplying drinking water in their area.

Annex 2

Glossary and description of standards

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

1,2-Dichloroethane	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.
Acrylamide	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.
Aggressive	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.
Aesthetic	associated with the senses of taste, smell and sight.
Alkali	a solution containing an excess of free hydroxyl ions, with a pH greater than seven.
Aluminium	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.
Ammonium	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.
Analytical quality control (AQC)	the method used to ensure that laboratory analysis methods are performing correctly.

Antimony	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.
Aquifer	water-containing underground strata.
Arsenic	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.
Authorised departure	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.
Benzene	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.
Benzo(a)pyrene (BaP)	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.
Boron	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.
Bromate	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.
Bulk supply	water supplied in bulk, usually in treated form, from one water company to another.

Cadmium	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.
Chloramine	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.
Chloramination	the process of generating a chloramine disinfectant residual in water leaving a treatment works.
Chloride	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.
Chlorine residual	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.
Chromium	is not present in drinking water. A European health-based standard of 50µg/l applies.
<i>Clostridium perfringens</i>	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.
Coagulation	a process employed during drinking water treatment to assist with the removal of particulate matter.
Coliform bacteria	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.
Colony counts	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'.

Colour	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.
Communication pipe	the connection from the water main to the consumer's property boundary.
Compliance assessment	a comparison made by the Inspectorate of data gathered by water companies against standards and other regulatory requirements.
Compound	a compound consists of two or more elements in chemical combination.
Concessionary supplies	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.
Conductivity	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 μ S/cm.
Contact tank	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.
Contravention	a breach of a regulatory requirement.
Copper	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.
<i>Cryptosporidium</i>	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.

Cyanide	is not present in drinking water. A European health-based standard of 50µg/l applies.
Dead leg	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.
Distribution systems	a water company's network of mains, pipes, pumping stations and service reservoirs through which treated water is conveyed to consumers.
Drinking water standards	the prescribed concentrations or values listed in regulations.
EC Drinking Water Directive	Council Directive 98/83/EC December 1998 – setting out drinking water standards to be applied in member states.
Enforcement action	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.
Enterococci	see <i>Escherichia coli</i> .
Environment Agency	the Environment Agency is responsible for maintaining or improving the quality of fresh, marine, surface and underground water in England and Wales.
Epichlorhydrin	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.
Epidemiology	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.
<i>Escherichia coli</i> and Enterococci	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.
Filtration	the separation of suspended particulate matter from a fluid.

Fluoride	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.
Geosmin	a substance produced by the growth of algae, normally in surface waters which gives rise to a characteristic 'earthy' or 'musty' taste or odour.
Granular activated carbon	an adsorbent filtration media used to remove trace organic compounds from water.
Groundwater	water from aquifers or other underground sources.
Hydrogen Ion (pH)	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.
Improvement programmes	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.
Incident	an event affecting or threatening to affect drinking water quality.
Indicator parameter	something that is measured to check that control measures, such as water treatment, are working effectively.
Indicator organism	an organism which indicates the presence of contamination and hence the possible presence of pathogens.
Information Letter	formal guidance to water companies given by the Inspectorate and published on the Inspectorate's website at www.dwi.gov.uk
Inspectorate	The Drinking Water Inspectorate.

Iron	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.
Lead	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.
Manganese	is present naturally in many sources and is usually removed during treatment. A national standard of 50µg/l applies.
Mean zonal compliance percentage	a measure of compliance with drinking water standards introduced by the Inspectorate in 2004.
Mercury	is not found in sources of drinking water. A European health-based standard of 1µg/l applies.
Microbiological	associated with the study of microbes.
m³/d	cubic metre per day.
mg/l	milligram per litre (one thousandth of a gram per litre).
MI/d	megalitre per day (one MI/d is equivalent to 1,000 m ³ /d, or to 220,000 gallon/d).
µg/l	microgram per litre (one millionth of a gram per litre).
New regulations	the Water Supply (Water Quality) Regulations 2000 Amended 2007 in England; the Water Supply (Water Quality) Regulations 2001 Amended 2007 in Wales.

Nickel	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.
Nitrate	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.
Nitrite	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.
Odour	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.
Ofwat	the water industry's economic regulator.
Oocyst	the resistant form in which <i>Cryptosporidium</i> occurs in the environment, and which is capable of causing infection.
Organoleptic	characteristics of a substance as detected by our senses, for example taste, odour or colour.
Outbreak Control Team (OCT)	a team set up to investigate possible waterborne outbreaks of cryptosporidiosis, comprising members of the medical profession, as well as representatives of relevant local authorities and water companies.
Ozone process (ozonation)	the application of ozone gas in drinking water treatment.
Parameters	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.

Pathogen	an organism which can infect humans and cause disease.
PCV	see 'Prescribed concentration or value'.
Periodic review	the economic regulator's process of setting water prices.
Pesticides	any fungicide, herbicide, insecticide or related product (excluding medicines) used for the control of pests or diseases.
Pesticides – organochlorine compounds (aldrin, dieldrin, heptachlor, heptachlor epoxide)	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.
Pesticides – other than organochlorine compounds	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 pesticide 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.
Phosphate dosing	treatment of water that results in a protective film building up on the inside of pipes minimizing the likelihood of lead being present in drinking water supplied through lead pipes.
Plumbosolvency	the tendency for lead to dissolve in water.
Polycyclic aromatic hydrocarbons (PAHs)	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.
Powdered activated carbon (PAC)	powdered activated carbon is employed in treatment processes to remove pollutants.
Pre- and post- renovation assessment (PPRA)	a programme of assessment before and after mains renovation to demonstrate justification for the work, and the improvements achieved by the renovation.

Prescribed concentration or value (PCV)	the numerical value assigned to drinking water standards defining the maximal or minimal legal concentration or value of a parameter.
PR09	the periodic review process for setting water prices for 2010-2015.
Private supplies	water taken from private sources or supplied by non-licensed suppliers; supplies of water provided otherwise than by a statutorily appointed water undertaker.
Protozoan parasites	a single cell organism that can only survive by infecting a host.
Public Register	drinking water quality information made available to the public by water companies as required by regulations.
Public supplies	water supplied by a company licensed for that purpose.
Raw water	water prior to receiving treatment for the purpose of drinking.
Regulations	The Water Supply (Water Quality) Regulations 2000 Amended 2007 (England), 2001 Amended 2007 (Wales).
Remedial action	action taken to improve a situation.
Residual disinfectant	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.
Secretary of State	Secretary of State for Environment, Food and Rural Affairs.
Selenium	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.
Service connection	connection between the water company's main to a consumer's property.

Service pipe	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.
Service reservoir	a water tower, tank or other reservoir used for the storage of treated water within the distribution system.
Sodium	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.
Springs	groundwater appearing at the surface at the outcrop of the junction of a permeable stratum with an impermeable stratum.
Statement of intent	formal written acknowledgement from a water company about action it plans to take to address an actual or potential regulatory breach.
Sulphate	occurs naturally in all waters and is difficult to remove by treatment. An indicator parameter with a guide value of 250mg/l.
Supply pipe	pipe connecting between the boundary of a consumer's property to the inside stop tap.
Supply point	a point other than a consumer's tap authorised for the taking of samples for compliance with the regulations.
Surface water	untreated water from rivers, impounding reservoirs or other surface water source.
Taste	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.
Technical audit	the means of checking that water companies are complying with their statutory obligations.

Tetrachloroethane and Trichloroethene	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.
Tetrachloromethane	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.
Time of supply	the moment when water passes from the water company's pipework into a consumer's pipework.
Total indicative dose	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.
Total organic carbon	represents the total amount of organic matter present in water. An indicator parameter with a guide value of 'no abnormal change'.
Toxicology	the study of the health effects of substances.
Treated water	water treated for use for domestic purposes as defined in the regulations.
Trihalomethanes	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.
Tritium	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.
Turbidity	is a measure of the cloudiness of water. 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. 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.

Vinyl chloride	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.
Water supply zone	a pre-defined area of supply for establishing sampling frequencies, compliance with standards and information to be made publicly available.
WHO	World Health Organisation.
Wholesome/wholesomeness	a legal concept of water quality which is defined by reference to standards and other requirements set out in the regulations.

Annex 3

Incidents in the Thames region in 2008

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
18 Jan 2008 For 3 weeks (TMS)	Cleeve works, large area in Berkshire – Abingdon, Blewbury and Chilton, Cookley Green, Compton, Culham, East Oxford, Nettlebed, Thame, Wallingford, Didcot and Wantage East.	295,728	<i>Cryptosporidium</i> in treated water	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Isolated boreholes • Sampled affected area • Retrained staff • Reviewed all boreholes at risk of flooding and implement any relevant mitigation/protection measures • Reviewed turbidity alarms <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Company did not act on an uncharacteristic raw water turbidity alarm, site that should have been risk assessed as being vulnerable to flooding and <i>Cryptosporidium</i> at a time of heavy rainfall and high river levels • Required company to inform Inspectorate of when staff training took place and of the refresher intervals proposed • Recommended review of event response procedure at this, and similar sites at risk of <i>Cryptosporidium</i> and flooding, to instigate a more rapid and appropriate response • Recommended that the BECC guidance for responding to alarms be revised • Required company to provide details of the flood mitigation plans

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
03 Feb 2008 For 4 days (TMS)	Chingford South works serving Bush Hill, Enfield Town, Goffs Oak, Lee Valley, Picketts Lock, Upshire, Hertfordshire	235,119	<i>Cryptosporidium</i> in treated water	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Shut down treatment works • Modified control systems to prevent restart without critical processes • Start up procedure revised and new on-site checks incorporated • Refresher training organised <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended that SCADA screens display appropriate information and that this is routinely monitored • Recommended that regular on-site checks of the processes are made • Recommended proper completion of records is checked and verified • Recommended training of all operatives is reviewed and refreshed and that more complete Log Book entries are maintained • Recommended more comprehensive sampling in response to similar events

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
07 Feb 2008 For 5 days (TVW)	Wildhill, near Hatfield, Herts	148	Cross connection with private (untreated) water supplies	<p>Three Valleys Water action:</p> <ul style="list-style-type: none"> • Flushed mains • Issued a do not drink notice • Provided bottled water on request • Review of procedures • Sampled affected area • Successfully prosecuted the owner of private supply under Water Supply (Water Fittings) Regulations <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Thorough and satisfactory response and remedial actions
28 Feb 2008 For 3 weeks (SES)	Bough Beech works Bough Beech Supply zone	85,201	Pesticide (metaldehyde) detection	<p>Sutton and East Surrey Water action:</p> <ul style="list-style-type: none"> • Decreased works output • Funded research into the treatment processes for metaldehyde • Replaced granular activated carbon media at the works with a new, more effective media type • Over-abstracted water from the River Eden to dilute metaldehyde concentrations in the reservoir • Liaised with the Environment Agency • Wrote to farmers in the catchment and undertook a small stream survey • Construction of new granular activated carbon absorbers at the works <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Initiated enforcement action, enabling the company to take action to control risk through catchment management

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
07 Apr 2008 For 3 days (TMS)	West End Lane, London NW6	118	Ground contamination with hydrocarbons	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Replaced main <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Critical of the company for regarding petrochemical odours simply as being 'usual', company did not adhere to the criteria specified in its Best Operating Practices (BOP) and did not keep appropriate records of commissioning of new main, results of samples were ambiguous • Recommended company informs the Inspectorate of how it intends to ensure that procedures within its BOP will be followed • Recommended that all petrol-type odours are escalated and, at a very minimum, the company take a number of soil samples, either during its site surveys or in response to strong odours being detected in excavations during the laying of unprotected HPPE (or similar) mains • Advice given about sampling/analysis errors

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
26 Apr 2008 For 9 weeks (TMS)	Sunbury East, Syon Park, Teddington, Whitton Middlesex including the West Middlesex Hospital	180,575	Loss of supplies due to burst main	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Rezoned area (brought in water from different source) • Repaired main • Provided bottled water on request • Provided an alternative supply by tanker/bowser • Sampled affected area <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Critical of risk assessment as inadequate for an extended shut of a leaking 33 inch main, risk assessment was not documented – recommended investigation into why company procedures not followed and action to ensure that risk assessment and decisions made by third party contractors are documented in future

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
22 Jun 2008 For 7 days (TVW)	West Horsley near Guildford, Surrey	30,000	Media interest in burst main	<p>Three Valleys Water action:</p> <ul style="list-style-type: none"> • Repaired main • Sampled affected area • Removed service reservoir from supply • Rezoned area (brought in water from different source) • Increased chlorine residuals in the distribution system <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Inadequate contingency planning, risk assessment did not fully take into account the higher pressures operating within the affected area, critical of not deploying mobile disinfection unit to raise chlorine residuals in depressurised area • Recommended that in future all risk assessments should take the pressures within the various DMA's fully into account prior to opening boundary valves between DMA's • Recommended when there have been multiple bursts on the system linked with positive microbiological samples from a service reservoir then booster disinfection should be installed to ensure that the distribution system is fully disinfected

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
14 Jul 2008 For 5 weeks (TMS)	Finmere, Oxfordshire (Anglian bulk supply)	1,026	Pesticide (metaldehyde) in a bulk supply	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Work with other stakeholders about reducing metaldehyde in the catchment of the bulk supply <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended that the company submits a Regulation 28 report on its Regulation 27 risk assessment specifying the measures it has undertaken, or intends to undertake, to mitigate the risk of a metaldehyde recurrence • Recommended the appropriate Environmental Health Officers are notified of future events
05 Sep 2008 For 2 hours (TMS)	Farmoor works, Oxford, Oxfordshire	2,500	Disinfection failure	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Flushed mains • Sampled affected area • Review of procedures • Chlorination procedure contained within the Site Operating Manual (SOM) has been reviewed and updated • To ensure the contact tank inlet valve is operational, monthly testing will commence in April 2009, initiated by the company's electronic maintenance system, where a low chlorine concentration is simulated in order to trigger the failsafe system. This activity will result in the shutdown of the highlift pumps in addition to the closure of the contact tank inlet valve. • An annual maintenance programme for the chlorination system has been implemented

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
05 Sep 2008 For 2 hours (TMS) (continued)	Farmoor works, Oxford, Oxfordshire (continued)	2,500 (continued)	Disinfection failure (continued)	<p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Critical that investigations by the company identified no maintenance schedule for disinfection failsafe equipment • Inadequate communication caused delay in response • Inadequate training/competence of staff • Recommend that the company review the operational procedures for chlorination, ensure that the failsafe shutdown system is functional and set up routine maintenance and testing • Recommended that the contact tank valves are clearly shown and highlighted on the telemetry system when left in manual mode • Recommended that a maintenance schedule be set up for chlorination equipment and that procedures are written for its use and operational staff trained on the use of this system plan • Recommended that sampling of customer contacts during incidents should be prioritised • Recommended that the company completes an audit programme for all sites and carries out refresher training for all operational staff across the business in light of this incident, focusing on the operating procedures for disinfection, failsafe systems and plant shutdown/restart procedures • Recommended that a maintenance schedule be set up for failsafe and disinfection equipment and that procedures are written for its use

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
17 Oct 2008 For 4 weeks (TMS)	Hampton works Greater London. Grimbury WTW, Milton Oxfordshire. Chingford South WTW, Greater London	3,000,000	Pesticide (metaldehyde) detection	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Review of procedures <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Investigation ongoing
05 Nov 2008 For 1 day (TMS)	Playhatch works Emmer Green area, Reading, Berkshire	20,300	<i>Cryptosporidium</i> in treated water	<p>Thames Water action:</p> <ul style="list-style-type: none"> • Shut down treatment works <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Inadequate treatment process – filtration • <i>Cryptosporidium</i> identified in boreholes • Recommended that the two boreholes and wellheads are fully investigated including CCTV survey to determine if there has been any significant deterioration of the lining etc since the last survey

Date and duration (Company)	Area	Estimate of population affected	Nature and cause of the incident	Main actions and findings from the Inspectorate investigation
13 Nov 2008 For 2 days (TVW)	Iver works and Egham works	750,000	Pesticide (metaldehyde) detection	<p>Three Valleys Water action:</p> <ul style="list-style-type: none"> • Sampled affected area • Regulation 27 risk assessment to be updated and Regulation 28 report submitted • Monthly sampling of raw and final waters instigated in 2009. DWI reminded company of the amendments to regulations which allow sampling in raw waters and supply points <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended close liaison with the local Environment Agency officers to assist in a catchment management approach to controlling metaldehyde • Initiated enforcement action, enabling the company to take action to control risk through catchment management
30 Dec 2008 For 36 hours (TVW)	Iver works, Wraysbury, West Drayton, Hayes, Greenford, Northolt, Yiewsley, Uxbridge, Ickenham, Pinner, Ruislip, Northwood and Watford	400,000	Air in water (white)	<p>Three Valleys Water action:</p> <ul style="list-style-type: none"> • Provided recorded message for consumers on incoming telephone system • Control bobbin on surge vessel jammed, leading to the air compressor running continuously. Alarm added to compressor system to identify when the compressor has been running for excessive periods of time • Repaired heaters to the surge vessels, which may have been associated with the control bobbin jamming • Further maintenance checks added to the scheme for the surge vessels <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Inspectorate content with company actions and no further recommendations were made

Note: A complete table of incidents in England and Wales in 2008 can be found on the CD in the folder.

It is named **Incidents in England and Wales 2008.pdf**. It is also available on the DWI website at <http://www.dwi.gov.uk>

Annex 4

Improvement programmes in the region

Company	Parameter or hazard	Site	Status	Construction due for completion
Thames Water	Bromate	Hornsey	Ongoing	31-Jan-09
Thames Water	Nitrate	Wilmington	Completed 30-May-08	
Three Valleys Water	Bromate	Hatfield	Completed 27-Jun-08	
Three Valleys Water	Bromate	North Mymms	Ongoing	31-Mar-10
Three Valleys Water	Nitrate	Offley Bottom	Ongoing	31-Mar-10
Three Valleys Water	Pesticides	Kensworth Lynch	Completed 31-Mar-08	

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 2008

Name	Licensed supplier	Original supplier*	Status
Buxted Chicken, Flixton	Anglian Water	Essex and Suffolk Water, Eastern region	Supplying water
Fairfield Park and Lower Wilbury Farm, Arlesey	Three Valleys Water	Anglian Water, Eastern region	Supplying water
Northern Foods (Bowyers), Trowbridge	Wessex Water	Wessex Water, Western region	Supplying water
Shotton Paper Works, Shotton	Albion Water	Dŵr Cymru Welsh Water, Wales	Supplying water
Tidworth near Andover	Thames Water	Wessex Water, Western region	Supplying water
Wynyard Business Park, near Wolveston	Hartlepool Water	Northumbrian Water, Northern region	Supplying water
Old Sarum, The Portway	SSE Water	Wessex Water, Western region	Supplying water
Longcroft 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

New inset appointments in place for 2009

Name	Potential Licensed supplier	Original supplier*	Status
Tidworth near Andover	Veolia Water	Wessex Water, Western region	Appointment granted
Media City, Manchester	Peel Utilities	United Utilities, Northern region	Appointment granted
Valleywood near Llanilid	SSE Water	Dŵr Cymru Welsh Water, Wales	Appointment granted
Hale Village, Tottenham	SSE Water	Thames Water, Thames region	Appointment pending
Great Billing Way, Northampton	Independent Water Networks Ltd	Anglian Water, Eastern region	Appointment granted

*Original supplier at time of privatisation in 1989

Water supply license applications to date

Name of company	License type	Date license granted by Ofwat	Status
Aquavitae	Combined	1 December 05	Not yet operating
Watercall Ltd	Combined	1 December 05	Not yet operating
Severn Trent Water Select Ltd	Combined	1 December 05	Not yet operating
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	3 January 07	Not yet operating

Annex 6

Regulation 27 risk assessments by local authority

Local authority	Company	Number of Regulation 27 risk assessments
Aylesbury Vale District Council	Thames Water	2
Basingstoke and Deane Borough Council	Thames Water	1
Bracknell Forest Borough Council	Three Valleys Water	1
Brentwood Borough Council	Three Valleys Water	1
Broxbourne Borough Council	Thames Water	2
Central Bedfordshire Council	Three Valleys Water	13
Cherwell District Council	Thames Water	6
Chiltern District Council	Thames Water Three Valleys Water	2 10
City of London	Thames Water	2
Cotswold District Council	Thames Water	4
Crawley Borough Council	Sutton and East Surrey Water	1
Dacorum Borough Council	Thames Water Three Valleys Water	2 14
Dartford Borough Council	Thames Water	6
East Hertfordshire District Council	Thames Water Three Valleys Water	1 22
Elmbridge Borough Council	Sutton and East Surrey Water Thames Water Three Valleys Water	1 3 1
Epping Forest District Council	Thames Water Three Valleys Water	3 4
Epsom and Ewell Borough Council	Sutton and East Surrey Water Thames Water	3 2
Guildford Borough Council	Sutton and East Surrey Water Thames Water Three Valleys Water	1 2 3
Harlow District Council	Three Valleys Water	4
Hertsmere Borough Council	Three Valleys Water	4
Horsham District Council	Sutton and East Surrey Water Thames Water	1 1
London Borough of Barnet	Thames Water Three Valleys Water	3 4
London Borough of Bexley	Thames Water	6
London Borough of Brent	Thames Water Three Valleys Water	4 2
London Borough of Bromley	Thames Water	8
London Borough of Camden	Thames Water	7
London Borough of Croydon	Sutton and East Surrey Water Thames Water	2 7
London Borough of Ealing	Thames Water Three Valleys Water	4 2

Local authority	Company	Number of Regulation 27 risk assessments
London Borough of Enfield	Thames Water	5
	Three Valleys Water	2
London Borough of Greenwich	Thames Water	7
London Borough of Hackney	Thames Water	4
London Borough of Hammersmith and Fulham	Thames Water	5
London Borough of Haringey	Thames Water	6
	Three Valleys Water	1
London Borough of Harrow	Three Valleys Water	2
London Borough of Hillingdon	Three Valleys Water	8
London Borough of Hounslow	Thames Water	5
	Three Valleys Water	1
London Borough of Islington	Thames Water	3
London Borough of Lambeth	Thames Water	5
London Borough of Lewisham	Thames Water	7
London Borough of Merton	Sutton and East Surrey Water	1
	Thames Water	5
London Borough of Newham	Thames Water	2
London Borough of Redbridge	Thames Water	3
London Borough of Richmond Upon Thames	Thames Water	6
London Borough of Southwark	Thames Water	7
London Borough of Sutton	Sutton and East Surrey Water	5
	Thames Water	4
London Borough of Tower Hamlets	Thames Water	3
London Borough of Waltham Forest	Thames Water	4
London Borough of Wandsworth	Thames Water	4
Luton Borough Council	Three Valleys Water	5
Mid Sussex District Council	Sutton and East Surrey Water	1
Mole Valley District Council	Sutton and East Surrey Water	3
	Thames Water	1
North Hertfordshire District Council	Three Valleys Water	20
Oxford City Council	Thames Water	2
Reading Borough Council	Thames Water	2
Reigate And Banstead Borough Council	Sutton and East Surrey Water	5
Royal Borough of Kensington and Chelsea	Thames Water	3
Royal Borough of Kingston On Thames	Thames Water	4
Royal Borough of Windsor And Maidenhead	Thames Water	2
	Three Valleys Water	1
Runnymede Borough Council	Three Valleys Water	3
Sevenoaks District Council	Sutton and East Surrey Water	2
	Thames Water	6
Slough Borough Council	Thames Water	1
	Three Valleys Water	1

Local authority	Company	Number of Regulation 27 risk assessments
South Buckinghamshire District Council	Thames Water Three Valleys Water	1 8
South Oxfordshire District Council	Thames Water	9
Spelthorne Borough Council	Thames Water Three Valleys Water	3 3
St Albans District Council	Three Valleys Water	15
Stevenage Borough Council	Three Valleys Water	1
Stratford-Upon-Avon District Council	Thames Water	1
Surrey Heath Borough Council	Three Valleys Water	3
Swindon Borough Council	Thames Water	4
Tandridge District Council	Sutton and East Surrey Water Thames Water	4 2
Tewkesbury District Council	Thames Water	1
Three Rivers District Council	Three Valleys Water	9
Uttlesford District Council	Three Valleys Water	13
Vale of White Horse District Council	Thames Water	6
Watford Borough Council	Three Valleys Water	2
Waverley Borough Council	Thames Water	3
Welwyn Hatfield District Council	Three Valleys Water	8
West Berkshire Council	Thames Water	8
West Oxfordshire District Council	Thames Water	6
Westminster City Council	Thames Water	4
Wiltshire Council	Thames Water	7
Woking Borough Council	Three Valleys Water	5
Wokingham District Council	Thames Water	2
Wycombe District Council	Thames Water Three Valleys Water	7 6

Annex 7

Water company data summary tables

Sutton and East Surrey Water plc

Water supply arrangements

Company assets		Water supplied	
Number of treatment works	8	Water supplied (MI/day)	151
Number of service reservoirs	32	Percentage from surface sources	16
Number of water supply zones	20	Percentage from ground sources	84
Length of mains pipe (km)	3,435	Percentage from mixed sources	0
Population served		Area of supply	
Population supplied	644,650	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
	2006	2007	2008	2008
Overall drinking water quality*	99.95%	99.99%	99.89%	99.96%
Water treatment				
Process Control Index	99.84%	100%	100%	99.98%
Disinfection Index	100%	99.99%	99.98%	99.93%
Distribution systems				
Distribution Maintenance Index	99.81%	99.92%	99.86%	99.85%
Reservoir Integrity Index	99.94%	99.97%	100%	99.96%
Building water systems				
Parameters influenced by domestic water systems	99.98%	100%	99.96%	99.88%

Consumer contacts

	Company figure			Industry average
	2006	2007	2008	2008
Informing consumers				
Total number	57	67	97	N/A
Rate per 1,000 population	0.09	0.10	0.15	1.22
Acceptability of water to consumers				
Total number	576	415	499	N/A
Rate per 1,000 population	0.90	0.64	0.77	2.55
Complaints to the Drinking Water Inspectorate				
No consumers of Sutton and East Surrey Water plc directly contacted DWI in 2008.				

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

* 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)	2,900
Number of service reservoirs	380	Percentage from surface sources	75
Number of water supply zones	238	Percentage from ground sources	25
Length of mains pipe (km)	31,411	Percentage from mixed sources	<1
Population served		Area of supply	
Population supplied	8,643,000	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	64		

Drinking water quality summary data

	Company figure			Industry average
	2006	2007	2008	2008
Overall drinking water quality*	99.97%	99.98%	99.99%	99.96%
Water treatment				
Process Control Index	99.99%	99.97%	>99.99%	99.98%
Disinfection Index	99.96%	99.98%	99.97%	99.93%
Distribution systems				
Distribution Maintenance Index	99.91%	99.95%	99.94%	99.85%
Reservoir Integrity Index	99.93%	99.94%	99.97%	99.96%
Building water systems				
Parameters influenced by domestic water systems	99.82%	99.87%	99.93%	99.88%

Consumer contacts

	Company figure			Industry average
	2006	2007	2008	2008
Informing consumers				
Total number	11,064	26,423	40,877	N/A
Rate per 1,000 population	1.34	3.17	4.73	1.22
Acceptability of water to consumers				
Total number	8,610	7,904	8,753	N/A
Rate per 1,000 population	1.04	0.95	1.01	2.55

Complaints to the Drinking Water Inspectorate

A total of 11 consumers of Thames Water Utilities Ltd directly contacted DWI in 2008.

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

* Overall drinking water quality as represented by mean zonal compliance for 39 parameters.

Three Valleys Water PLC

Water supply arrangements

Company assets		Water supplied	
Number of treatment works	83	Water supplied (MI/day)	850
Number of service reservoirs	132	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
	2006	2007	2008	2008
Overall drinking water quality*	99.98%	99.98%	99.98%	99.96%
Water treatment				
Process Control Index	>99.99%	99.97%	99.99%	99.98%
Disinfection Index	99.96%	99.95%	99.95%	99.93%
Distribution systems				
Distribution Maintenance Index	99.95%	99.91%	99.92%	99.85%
Reservoir Integrity Index	99.97%	99.90%	99.95%	99.96%
Building water systems				
Parameters influenced by domestic water systems	99.90%	99.94%	99.94%	99.88%

Consumer contacts

	Company figure			Industry average
	2006	2007	2008	2008
Informing consumers				
Total number	1,923	1,786	1,818	N/A
Rate per 1,000 population	0.65	0.60	0.61	1.22
Acceptability of water to consumers				
Total number	5,526	5,556	6,590	N/A
Rate per 1,000 population	1.87	1.87	2.21	2.55
Complaints to the Drinking Water Inspectorate				
A total of 1 consumer of Three Valleys Water PLC directly contacted DWI in 2008				

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

* Overall drinking water quality as represented by mean zonal compliance for 39 parameters.



guardians of drinking water quality

Drinking Water Inspectorate | 55, Whitehall | London | SW1A 2EY | Tel: 020 7270 3370

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