I am concerned about the quality of my drinking water in my home or place of work. What can I do?

In the first instance you should contact Scottish Water and ask them to investigate.

Scottish Water
PO Box 8855
Edinburgh
EH10 6YQ

Tel 0845 601 8855

If, having discussed the matter with Scottish Water, you do not feel that the issue has been satisfactorily resolved, you should contact the Drinking Water Quality Regulator for Scotland. The DWQR can investigate on your behalf and take action if necessary. DWQR will inform you of the outcome of any investigation.

The DWQR may be contacted either by writing to:

Drinking Water Quality Regulator for Scotland
PO Box 23598
EDINBURGH
EH6 6WW

Or via our website: www.DWQR.org.uk

Or telephoning 0131 244 0224

When contacting DWQR, please provide as much information as possible, including the address of the property where the problem has occurred, the nature and duration of your concerns and details of any contact you have had with Scottish Water regarding the problem. Please note that the DWQR can only investigate concerns relating to the quality of public drinking water supplies in Scotland. For matters concerning private supplies in Scotland you should contact the Environmental Health Department of your local council.

For matters concerning services provided by Scottish Water other than the quality of the water supplied you should contact Scottish Public Services Ombudsman on 0800 377 7330

For matters concerning the quality of public supplies elsewhere in the UK you should contact the Drinking Water Inspectorate (DWI) for England or Wales or the Northern Ireland Drinking Water Inspectorate. The DWQR works closely with both of these organisations to ensure a consistent approach is taken towards ensuring the quality of drinking water across the UK. A Memorandum of Understanding between the three bodies can be found on the DWQR website: www.dwqr.org.uk

This document is also available on www.dwqr.org.uk

Further copies are available from
DWQR at www.DWQR.org.uk or 0131 244 0224

APS Group Scotland
DPPAS11791 (08/11)

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Drinking Water Quality in Scotland 2010 Annual Report by the Drinking Water Quality Regulator for Scotland

Drinking Water Quality in Scotland 2010

Annual Report by the Drinking Water Quality Regulator for Scotland

dwqr

The 10 Key Drinking Water Quality Standards in Scotland

Ten key drinking water quality standards have been identified from the Water Supply (Water Quality) (Scotland) Regulations 2001 which are of particular significance when considering the quality of drinking water in Scotland.

Parameter	Significance
Total Coliforms *PCV 0 per 100ml* Sampled at WTW, service reservoirs and at consumers' taps.	The coliform group of bacteria is present in large numbers in the gut of all warm-blooded animals and in the environment. Their presence in water supplies may indicate a breach in the integrity of the water supply system or a failure of the treatment process, and they are a useful indicator in monitoring the quality of water supplies. It is generally considered that coliforms themselves do not present a risk to health, and on their own they do not indicate that faecal pollution has occurred.
Faecal Coliforms *PCV 0 per 100ml* Sampled at WTW, service reservoirs and at consumers' taps.	Faecal coliforms are present in large numbers in the gut of all warm-blooded animals. Their presence in water supplies indicates a breach in the integrity of the water supply system and that faecal pollution may have occurred. The detection of faecal coliforms in a water supply is taken very seriously.
Colour *PCV 20 mg/L Pt/Co* Sampled at consumers' taps.	True colour in water comes from naturally occurring humic substances, particularly in acidic water sources derived from peaty moorland catchment areas with minimal treatment. High colour may be unacceptable to consumers on aesthetic grounds and the humic substances may form other compounds such as trihalomethanes when the water is disinfected.
Turbidity *PCV 4 NTU* Sampled at consumers' taps (1NTU standard applies at treatment works).	Turbidity is a measure of the "cloudiness" of the water. Naturally occurring turbidity is usually caused by the suspension of tiny particles of predominantly inorganic origin. Its presence could indicate poor control of the treatment process and could mean that the treatment process has not provided an effective barrier against organisms such as Cryptosporidium, or that disinfection has been compromised.
Hydrogen Ion (pH) *PCV 6.5 – 9.5* Sampled at consumers' taps.	pH is a measure of the hydrogen ion content of the water or degree of acidity. Most surface waters in Scotland have a low pH and would therefore be corrosive towards the materials used in water treatment systems and consumers' installations unless corrected during treatment. Extreme pH values may present a risk to the health of consumers.
Aluminium *PCV 200 µg/l* Sampled at consumers' taps.	Aluminium occurs in acidic waters derived from moorland catchments and is removed in water treatment by coagulation and filtration. Aluminium sulphate is used as a coagulant in water treatment. High concentrations are unacceptable to consumers on aesthetic grounds.
Iron *PCV 200 µg/l* Sampled at consumers' taps.	Iron is present naturally in many water sources and is removed by conventional water treatment processes. Iron in water supplies may also be derived from corrosion of iron water mains and poor control of water treatment processes. High iron concentrations are unacceptable to consumers on aesthetic grounds as they may cause discoloured supplies.
Manganese *PCV 50 µg/l* Sampled at consumers' taps.	Manganese occurs naturally in many water sources. It may be removed from water by using an appropriate treatment process. Where treatment processes do not remove manganese, it may accumulate in water mains and cause unacceptable discolouration of supplies.
Lead *PCV 25 µg/l* Sampled at consumers' taps (reduces to 10µg/l in 2013).	Elevated lead concentrations may be present at consumers' taps if lead pipes have been used in the internal household plumbing or service pipe. Many waters in Scotland have a tendency to dissolve lead from lead pipework, and phosphate compounds can often be dosed at the treatment works to reduce this tendency.
Trihalomethanes *PCV 100 µg/L* for total of four of the compounds. Sampled at consumers' taps.	Trihalomethanes (THMs), occur in drinking water principally as products of the reaction of chlorine with naturally occurring organic materials such as humic acids. Treatment processes can be adapted to minimise their formation or to remove the precursor compounds. THMs at high concentrations may present a health risk if consumed over a long period.

Drinking Water Quality in Scotland 2010

Annual Report by the
Drinking Water Quality Regulator for Scotland

Front cover shows a new membrane treatment works at Acharacle, Lochaber that treats water from Allt Beithe river to a high quality and replaces a more basic treatment works that previously supplied the area.

Published on behalf of the Drinking Water Quality Regulator for Scotland, August 2011
ISBN: 978-1-78045-329-3

Produced for the Drinking Water Quality Regulator by APS Group Scotland DPPAS11791 (08/11)

Further copies are available from
DWQR at www.DWQR.org.uk or 0131 244 0190.

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Contents

1. Foreword

This report provides Scottish Ministers with details of the quality of Scotland's drinking water supplies, both public and private, as well as the work of the Drinking Water Quality Regulator (DWQR) during 2010.

The quality of public drinking water supplies in Scotland continues to improve. In 2010, 99.83% of samples taken from consumers' taps met the regulatory standard, an increase of 0.05% on compliance in 2009 which was, itself, the best ever.

Compliance improved for most parameters, notably so for total trihalomethanes (THM), which are a by-product of the disinfection process. Following criticism last year from DWQR, Scottish Water made a concerted effort in 2010 to improve THM compliance through various means, and these have borne fruit. There is still further progress required and Scottish Water must strike a balance between ensuring water supplies are adequately disinfected, which is paramount, and minimising THM formation arising from inadequate treatment and high chlorine concentrations. Some water supplies still recorded unacceptable concentrations of THMs in 2010. While in most cases capital investment will result in upgraded treatment processes to prevent the problem, Scottish Water is challenged with optimising water quality to minimise THM formation in the meantime.

Much work is underway to cleanse and rehabilitate distribution pipework to ensure consumers do not experience the inconvenience of discoloured supplies due to iron and manganese sediment originating from Scottish Water's pipework. Compliance for iron has improved significantly, and many former hotspots for discoloured supplies are no longer an issue. Manganese compliance did not improve however, and this was largely due to the Muirdykes supply in Renfrewshire. An increase in manganese concentrations in this supply resulted in significant inconvenience for consumers in the area. Scottish Water has now given Scottish Ministers a legally binding undertaking to make the necessary improvements, but this case does serve to demonstrate the need for Scottish Water to be more proactive in anticipating and dealing with issues before they develop.

DWQR reviews water quality incidents that occur to ensure problems are addressed and lessons learned. During 2010, a significant number of these incidents were due to elevated concentrations of aluminium in water supplies. Aluminium salts are used by Scottish Water as part of the treatment process, so their addition to the water and subsequent removal should be completely within Scottish Water's control. While changes in source water quality can complicate the process, Scottish Water needs to ensure that it has the appropriate technology, monitoring instrumentation and professional expertise to manage this highly sensitive process effectively.

Water quality is about more than simple compliance figures. DWQR believes that consumers should be able to have confidence in their water supply and find it

aesthetically acceptable. Scottish Water has demonstrated a clear desire to improve the experience of consumers when they draw water from their taps so that they receive water that tastes, smells and looks appealing. It is pleasing to note that contacts to Scottish Water about quality issues fell by about 15% in 2010 from the previous year and DWQR hopes that this is a trend that will continue.

Not everyone in Scotland receives water from Scottish Water. About 3% of the population is on a private water supply (PWS), and the quality of these has long been a concern as treatment is often basic or non-existent. Scotland is leading the way in understanding and quantifying the risks these small supplies present, and efforts by both DWQR and local authorities have enabled us to better present water quality data with an increasing degree of confidence.

In 2010, over 46,000 samples were taken from PWS and 91.95% of tests complied with the regulatory standard. Microbiological safety has to be the primary concern from a health perspective and it is worrying that only around 64% of samples complied with the standard for coliforms, and just over 18% contained *E.coli,* which is a clear indicator of faecal contamination. The health risk from contaminated PWS was clearly demonstrated in 2010 when 14 visitors staying in holiday accommodation on a private water supply became infected with *E.coli* O157. This only serves to underline the risk from private water supplies, and how this can have an economic as well as a personal impact. Work to encourage owners and users to install treatment must continue, but it is becoming increasingly apparent that efforts to ensure treatment is operated and maintained correctly are also absolutely vital if the benefits of improvement work are to be sustained.

The supply of clean, wholesome water whether it be from a public or private supply requires the management of numerous risks. DWQR fully supports the use of the World Health Organisation's Water Safety Plan approach for assessing and managing risks at each stage of the water treatment and supply process. By late 2011, Scottish Water will have produced water safety plans for all of its water supplies. DWQR is working with local authorities and owners of PWS to develop a water safety plan approach that can be adapted for use on these supplies. Such plans are seen as key in driving further improvements in water quality and ensuring risks are proactively identified and effectively managed.

We are sad to report that 2010 saw the untimely death of Colin McLaren, the Drinking Water Quality Regulator, after a long and brave fight against cancer. Colin worked tirelessly to bring about great improvements in the quality of the drinking water supply in Scotland. His measured approach and charming, good-natured character are greatly missed by his team and many in the UK water industry and beyond.

The DWQR team is continuing Colin's work to drive improvements in Scotland's water supplies and safeguard public health. DWQR achieved accreditation to ISO 9001 in late 2010. The process to appoint a new Regulator is underway, and it is hoped that this will be completed by the end of 2011.

August 2011

2. Executive Summary

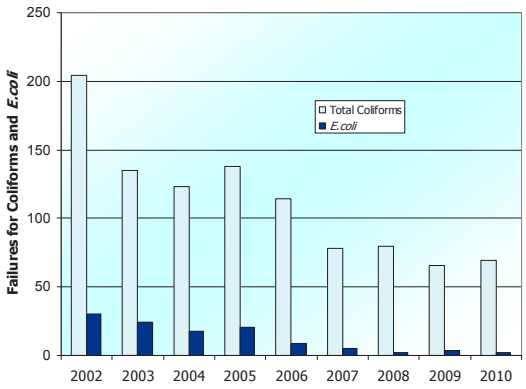
2. Executive Summary

This is the ninth annual report prepared for Scottish Ministers by the Drinking Water Quality Regulator for Scotland (DWQR). It presents and reviews the information provided by Scottish Water under the Water Supply (Water Quality) (Scotland) Regulations 2001 (the Regulations) and reflects the dealings that the DWQR had with Scottish Water between 1 January and 31 December 2010. The report also presents and reviews information on private water supplies provided by the local authorities. Section 3 of this report covers drinking water quality at a national level; Section 3A examines the water quality of the public supply at source, at the water treatment works, and through the distribution system to consumers' taps; 3B looks at private water supplies in Scotland. Section 4 breaks the national picture down into the five regions of Scotland represented by the Waterwatch Scotland panel areas, and Section 5 provides details of water quality in public and private water supplies by local authority area.

The drinking water quality results reported by Scottish Water for 2010 show that 323,998 tests for parameters with a numerical standard were carried out on samples taken from water treatment works, service reservoirs and consumers' taps. Of the 155,302 tests on samples taken from consumers' taps for which a numerical standard applies, 99.83% complied with requirements, the highest ever compliance figure. A total of 267 tests gave results which did not meet the standard set out in the 2001 Regulations. As in previous years, the largest number of failing samples was for the coliform bacteria and trihalomethane (THM) parameters, with coliform compliance slightly down on 2009 and THM compliance significantly improved.

Microbiological compliance at treatment works showed a decline on 2009, while compliance at storage points was slightly improved. There were 69 failures of the coliform bacteria standard at consumers' taps and two samples contained *E.coli*, compared with 66 and four respectively in 2009. *Figure 2.1* shows the trend in microbiological compliance at consumers' taps going back to 2002, when Scottish Water was formed.

Fig 2.1 Summary of Microbiological Tests on Tap Samples Since 2002



The *Cryptosporidium* (Scottish Water) Directions 2003 require Scottish Water to sample some raw and all final waters for *Cryptosporidium*. In 2010, 9,386 *Cryptosporidium* samples were taken from water treatment works final waters. Of these, 312 (3.32%) contained *Cryptosporidium* oocysts, a slight improvement on 2009.

DWQR receives details from Scottish Water of events which could affect drinking water quality. In 2010, 899 event notifications were received from Scottish Water. Of these, 62 were classified as incidents by DWQR and subject to further investigation.

In 2010 Scottish Water was contacted 20,495 times by consumers concerned about drinking water quality issues. This represented a reduction of over 15% on 2009. As in previous years, the largest category (70%) of contacts concerned discoloured supplies.

3. Drinking Water Quality across Scotland

3. Drinking Water Quality across Scotland

3A Public Water Supplies in Scotland

Table 3a: Key Facts - A Summary of Drinking Water Assets in Scotland

Raw Water Sources	***Source Type***			
	Lochs and Reservoirs	*Rivers and Burns*	*Springs and Boreholes*	**TOTAL**
Number of Sources	268	214	88	**570**
Treatment Works	***Volume of Water Distributed (Ml/d)***			
	<2	2 to 10	>10	**TOTAL**
Number of Treatment Works	187	50	36	**273**
Daily Supply (Ml/d)	60	239	1,716	**2,016**
Storage Points	***Capacity of Reservoir (Ml)***			
	<2	2 to 10	>10	**TOTAL**
Number of Storage Points	810	192	53	**1,055**
Capacity (Ml)*	311	855	1,386	**2,551**
Supply Zones	***Size of Zone (Population)***			
	< 5,000	5,000 to 20,000	> 20,000	**TOTAL**
Number of Zones	196	44	83	**323**
Population	148,100	466,184	4,368,284	**4,982,568**

Public water supplies in Scotland are the responsibility of Scottish Water. The majority are derived from surface water sources, although an increasing number of groundwater sources are being used. Water from all of these sources is treated at 273 treatment works before being distributed through 1,055 storage points and over 47,000km of mains. A maximum of 2,016 Mega litres (Ml) of potable water is supplied each day to about 97% of the resident population. The remainder of the population are served by private supplies, which are described in section 3B of this report.

The area served by the public water supply system is divided into water supply zones. In 2010 there were 323 public water supply zones in Scotland. The number of treatment works and supply zones in Scotland has been steadily decreasing as Scottish Water has developed larger regional treatment works to replace smaller supplies, improving efficiency and the quality of water supplied. In 2009 work began on constructing a new water treatment works, Glencorse. The new works is due to be completed in late summer 2011 and will rationalise and upgrade water treatment in the Edinburgh area.

Regulatory Background

The role of the Drinking Water Quality Regulator for Scotland (DWQR) is to ensure that drinking water in Scotland is safe to drink. This is done by ensuring that Scottish Water safeguards the quality of the public supply through a process of inspections and monitoring. DWQR enforces the requirements of the Water Supply (Water Quality)(Scotland) Regulations 2001 (the Regulations) and takes action where these requirements are not met. Additionally, DWQR has a role to ensure drinking water is not only safe, but pleasant to drink and has the trust of consumers. Working with Waterwatch Scotland, (to be superseded in 2011 by the Scottish Public Services Ombudsman), DWQR assists consumers who have a concern about the

quality of their water supply where they have contacted Scottish Water and feel the company has not adequately addressed these concerns.

Compliance Sampling

Scottish Water undertook over 330,000 tests on samples taken at water treatment works (WTW), storage points and consumers' taps in 2010 to demonstrate that the water supplied complied with the Regulations. These Regulations set a "Prescribed Concentration or Value" (PCV) or standard for 51 substances or parameters that may be present in the water. The Regulations also define the frequency at which samples are to be taken for each parameter. In order for a water supply to be classed as "wholesome" the result of each test must meet the PCV.

The 10 Key Parameters

Ten key drinking water quality standards have been identified from the 2001 Regulations that are of particular significance when considering the quality of drinking water in Scotland. Definitions of these *Ten Key Parameters* may be found on the fold-out flap at the back of this report.

A Scottish Water Laboratory

Failures of the PCV

The quality of drinking water in Scotland is very high but from time to time, samples do fail the PCV. The regulatory standards are set with a wide margin of safety, and some are concerned with the appearance or taste of the water. All failures must be investigated by Scottish Water and remedial action taken where necessary. Every failure is recorded as an 'Event' and the associated investigation is reported to DWQR, who will also investigate where appropriate. Each failure is also reported to local authority Environmental Health Officers and NHS Health Professionals who will take a judgement as to whether the failure has implications for public health and therefore require action to be taken to protect consumers.

The vast majority of failures that occur are minor and should not be taken as an indication that a water supply is unsafe to drink. When interpreting some contraventions of samples taken from a consumer's tap, especially those for lead and microbiological parameters, it is important to remember that the result may reflect the condition of the tap or plumbing in the property rather than the water in the public supply. The circumstances under which water is stored within a building can also greatly affect its quality.

Overall Compliance in 2010

Public drinking water supplies in Scotland continue to be of a very high quality. Overall compliance with the drinking water quality standards at consumers' taps in 2010 was 99.83%, which is the highest ever recorded in Scotland. This reflects the improvements delivered by the ongoing investment by Scottish Water in its assets, as well as a concerted effort by Scottish Water to improve operational practices.

3.1 Quality of Drinking Water Sources

Table 3.1a: Summary of Data from Sampling of Water Sources

Parameter name		No. test results	Min. test result	Max. test result	Ave. test result
Coliform Bacteria	**CFU per 100ml**	140	0.0	83.0	0.6
E. coli	**CFU per 100ml**	142	0.0	32.0	0.2
Enterococci	**CFU per 100ml**	131	0.0	4.0	0.0
Colour	**mg/l Pt/Co**	1,536	1.0	474.0	43.3
Hydrogen ion	**pH value**	1,536	5.0	10.2	7.2
Iron	**µg/l**	1,534	7.0	98,203.0	530.0
Manganese	**µg/l**	1,535	1.0	55,618.3	135.4
Ammonium	**mgNH4/l**	33	0.0	0.0	0.0
Nitrate	**mgNO3/l**	24	1.4	32.1	12.0
Turbidity	**NTU**	1,536	0.3	893.0	3.5
Pesticides - Total	**µg/l**	501	0.0	1.0	0.0

The 2001 Regulations do not require Scottish Water to routinely sample its water sources. However, in 2010, sampling continued to take place for operational reasons and to comply with an Information Letter issued by DWQR on 12 December 2007. This letter set out raw water monitoring requirements following the repeal of the European Directive 75/440/EEC on the quality required of surface water intended for the abstraction of drinking water. *Table 3.1a* shows a summary of results from tests carried out on samples taken during 2010 from water sources used for public drinking water supplies. The data is a combined summary of all the sources that were sampled. It provides an indication of the range of waters Scottish Water has to treat in order to comply with the standards set down in the 2001 Regulations.

Scottish Water is required to produce Drinking Water Safety Plans (DWSPs) for all of its water supplies, and these plans should take into account any risks presented by the quality of the source water and identify ways to mitigate them.

Water quality can vary considerably between sources but quality can also vary with time, especially during severe weather. Scottish Water must therefore ensure that its treatment works can reliably produce clean, safe drinking water regardless of the variability in raw water quality encountered at those works.

Some substances, such as manganese, are naturally occurring, while others, like nitrate and pesticides are present because of agricultural activity. It can be expensive to remove nitrate and pesticides from the water – fortunately these substances are not present in many Scottish supplies because most sources in Scotland are derived from upland catchments where agricultural activity is limited.

Many raw sources contain significant numbers of bacteria, which serves to demonstrate the importance of adequate treatment, especially disinfection, in order to make the water safe to drink.

It is also worth highlighting the very high amounts of both iron and manganese in some raw waters, which also demonstrates the importance of adequate treatment to bring concentrations of these metals down to acceptable levels.

Table 3.1b: Source Water Cryptosporidium

Treatment Works	Region	Number of Raw Source Samples	Number of Positive Raw Source Samples	Max. oocyst count per 10l	Ave. oocyst count per 10l
Craighead WTW	East	25	8	8.07	0.70
Auchneel WTW	South	12	3	3.55	0.33
Turriff WTW	East	52	25	4.08	0.28
Coulter WTW	South	12	2	2.59	0.25
Glenfarg WTW	East	26	5	2.43	0.19
Kettleton WTW	South	12	3	1.01	0.18
Westray WTW	East	12	1	1.89	0.16
Lochenkit WTW	South	12	4	0.82	0.16
Forehill WTW	East	52	9	3.71	0.15
Glendevon WTW	East	26	7	1.21	0.13
Scotland		1,893	242	0.55	0.05

The *Cryptosporidium* (Scottish Water) Directions 2003 require Scottish Water to sample all drinking water sources designated as high risk for *Cryptosporidium*. In 2010, 88 drinking water sources were sampled across Scotland. *Cryptosporidium* oocysts were detected at all but 22 of these sites. In 2010, 13% of raw water samples contained oocysts. The corresponding figure for 2009 was 25%, for 2008 was 33%, and for 2007 it was 27%; this suggests that this figure varies significantly from year to year, possibly due to changes in weather conditions. This year on year variability merits further study. The mean number of oocysts found in raw samples in 2010 was, at 0.05 per 10 litres, about the same as that found in 2009 when it was 0.06 per 10 litres, but it was significantly less in 2008 when it was only 0.02 per 10 litres.

Table 3.1b lists the ten sites with the highest average count of *Cryptosporidium* oocysts in source water samples. The average oocyst count per 10 litres of water is significantly higher at many sites in 2010 and 2009 than it was in 2008. There also appears to be a significant variability in the sites that appear in the table from year to year but Forehill has appeared consistently over the past five years and Glenfarg for the past four years.

Craighead, which supplies Huntly and the surrounding area in Aberdeenshire, contained the highest average oocyst count in raw water samples. However, Craighead has an effective treatment process which means that this does not represent the situation in the final water. An appropriate, well-optimised treatment process should minimise the risk of *Cryptosporidium* oocysts being present in the final water.

Ultimately, reducing the risk to the public from *Cryptosporidium* in drinking water is as much about reducing the occurrence in the catchment as it is about improving treatment. Improved liaison between Scottish Water and stakeholders such as SEPA, livestock farmers and landowners should result in a joined-up approach to the protection of drinking water sources in line with the Water Framework Directive. DWQR very much hopes that Drinking Water Safety Plans will provide the catalyst for this liaison to the benefit of all parties.

3.2 Drinking Water Quality at Treatment Works

Table 3.2a: Microbiological Tests on Samples taken at Water Treatment Works and Comparison with Previous Years

Coliform Bacteria Standard = 0 per 100ml	**2010**	***2009***	***2008***	***2007***	***2006***	***2005***
Number of tests	29,097	*30,997*	*31,488*	*32,534*	*32,935*	*33,623*
Number containing coliforms	44	*30*	*76*	*33*	*70*	*130*
Percentage containing coliforms	0.15	*0.10*	*0.24*	*0.10*	*0.21*	*0.38*
E.coli Standard = 0 per 100ml						
Number of tests	29,097	*30,997*	*31,487*	*32,534*	*32,935*	*33,623*
Number containing faecal coliforms	8	*6*	*10*	*10*	*24*	*51*
Percentage containing faecal coliforms	0.03	*0.02*	*0.03*	*0.03*	*0.07*	*0.15*

The Regulations require that samples are taken from treatment works and tested for a number of parameters. These include microbiological parameters, in order to confirm the effectiveness of the disinfection process, and turbidity and nitrite which demonstrate control of this and other treatment processes. *Table 3.2a* shows summary results for tests carried out for coliforms and *E.coli* on samples taken at treatment works in 2010. Forty-four (0.15%) of the samples taken at treatment works contained coliforms. In 2009 the percentage of samples failing reduced markedly, surpassing the pass rate achieved in 2007, but there has been some deterioration in the pass rate again for 2010.

In 2010, eight samples taken from treatment works contained *E.coli*, a failure rate of 0.03% which is very similar to the previous three years for *E.coli* failures at treatment works.

Although most of the coliform and *E.coli* fails were low level, some are noteworthy. Glendevon water treatment works, which lies between Kinross and Dunblane, experienced a high coliform count of 64 and an *E.coli* count of 64 on 18 July 2010. On the same day, Clatto water treatment works, which is just to the north of Dundee had a coliform count of 38 and an *E.coli* count of 38. Lintrathen water treatment works, which is to the west of Kirriemuir in Angus, had a coliform count of nine and an *E.coli* count of nine, again on the same day, 18 July 2010. Scottish Water's investigations into the causes of these failures were not conclusive, but a number of actions were identified to improve the process of sampling, transportation of samples, storage of samples and the subsequent analysis of samples to reduce the risks that any of these activities may have been the cause of the failures.

A high number of coliforms (60) were found at Picketlaw water treatment works, which lies to the west of East Kilbride, on 14 September 2010. Although it was not immediately obvious, the cause of this failure was due to blockages at the entrances of the inlet pipes in the raw water reservoir. This reduced the flow to the treatment works to about a third of the normal flow and the chemistry of the works was manually adjusted to deal with this. The blockages were eventually cleared, and the flow restored to normal. Water quality deteriorated for a short time and the coliform failure occurred despite the disinfection dose being increased to reduce the risk of a microbiological failure.

Table 3.2b: Summary of Nitrite Tests on Samples taken at Water Treatment Works

Nitrite Indicator Standard = 0.1mg/l at WTW	**2010**	***2009***	***2008***	***2007***	***2006***	***2005***
Number of tests	2,859	*2,993*	*3,028*	*3,182*	*3,375*	*3,434*
Number of tests exceeding standard	3	*4*	*2*	*3*	*9*	*9*
Percentage of tests exceeding standard	0.10	*0.13*	*0.07*	*0.09*	*0.27*	*0.26*
Number of treatment works not meeting regulatory requirements	2	*3*	*2*	*2*	*5*	*9*
% of treatment works not meeting regulatory requirements	0.74	*1.06*	*0.68*	*0.65*	*1.60*	*2.69*

Nitrite is a compound that can form when there is an excess of ammonia in a supply. It is an indicator parameter in treated water, and the standard was introduced in order to monitor the effectiveness of the disinfection process, where chloramination is used.

Table 3.2b shows that in 2010, three samples failed to meet the required standard of 0.1mg/l for nitrite at treatment works, representing a failure rate of 0.10%. This is a slight improvement on 2009 when four samples failed. Two of the failures in 2010 occurred at Turriff water treatment works in the north east of Scotland and the other one was at Ballygrant which is on the island of Islay, off the west coast of Scotland.

Table 3.2c: Summary of Turbidity Tests on Samples taken at Water Treatment Works

Turbidity Indicator Standard = 1 NTU at WTW	**2010**	***2009***	***2008***	***2007***	***2006***	***2005***
Number of tests	7,855	*8,123*	*8,250*	*8,514*	*8,812*	*8,970*
Number of tests exceeding standard	28	*26*	*33*	*71*	*78*	*112*
Percentage of tests exceeding standard	0.36	*0.32*	*0.4*	*0.83*	*0.89*	*1.25*
Number of treatment works not meeting regulatory requirements	2	*20*	*17*	*39*	*40*	*49*
% of treatment works not meeting regulatory requirements	8.49	*7.04*	*5.78*	*12.70*	*12.50*	*14.60*

Turbidity (cloudiness) of treated water is an important measurement because it can provide an indication of how well the treatment process is removing particulate matter (including *Cryptosporidium* oocysts). It can also give an indication of the likely effectiveness of the disinfection process because it is difficult to adequately disinfect turbid waters.

Table 3.2c shows that in 2010, 28 samples exceeded the turbidity standard at water treatment works, representing 0.36% of samples tested. This is about the same failure rate as in 2008 and 2009 which were both good years. Sample tap locations at the treatment works and the influence of lime, added during the treatment process to control the pH of the water, can be a factor in turbidity failures.

Scottish Water is taking action to ensure that its sample points are located sufficiently far downstream of any treatment process to ensure that the samples taken are representative of the water leaving the

treatment works and not impacted upon by the treatment process itself. However, care should be taken to ensure that these are on the site of the works and not so far downstream that they cease to be representative of the final water being supplied from the works.

Most of the 28 failing samples in 2010 were isolated failures at different water treatment works, but three of them were at Daer water treatment works which lies between Moffat and Sanquhar and supplies significant parts of South Lanarkshire. The investigation into the failures was not conclusive, but it is thought that they may have been due to sampling errors.

Table 3.2d: Summary of 2010 Sample Data for Cryptosporidium in Final Water

Cryptosporidium	**2010**	***2009***	***2008***	***2007***	***2006***
Number of tests	9,386	*10,386*	*11,002*	*11,393*	*10,602*
Number of samples containing *Cryptosporidium* oocysts	312	*409*	*471*	*927*	*667*
% of samples containing *Cryptosporidium* oocysts	3.32	*3.94*	*4.28*	*8.14*	*6.29*
Number of treatment works sampled for *Cryptosporidium*	270	*281*	*292*	*300*	*304*
Number of treatment works with one or more samples containing oocysts	88	*93*	*87*	*138*	*178*
% of treatment works with one or more samples containing oocysts	32.59	*33.10*	*29.79*	*46.00*	*58.55*

Cryptosporidium is a microscopic protozoan parasite that can live in the gut of humans and warm blooded animals. There are a number of species of *Cryptosporidium*, and not all are thought to be infectious to humans. All species form bodies known as oocysts in which they can survive in the environment for long periods. Once ingested, *Cryptosporidium* multiplies rapidly in the gut and oocysts are excreted in very large numbers, completing the life-cycle of the organism. In humans, infection can cause stomach cramps and diarrhoea and, in extreme cases, can be fatal to the immuno-compromised or to the very young or old.

Cryptosporidium oocysts can enter a water supply if faecal material is washed into the source (raw) water and the treatment process does not remove them. Standard chlorine disinfection is not generally effective against oocysts, so removal using a filter barrier is the best option. The *Cryptosporidium* (Scottish Water) Directions 2003 set out the measures Scottish Water is expected to take to monitor and operate assets to prevent oocysts from contaminating drinking water supplies. Under the requirements of the *Cryptosporidium* (Scottish Water) Directions 2003, all Scottish Water's treatment works should have at least 12 final water samples taken and tested for *Cryptosporidium* during the year. The exact sample frequency is determined by the risk assessment process defined in the *Cryptosporidium* Directions.

Table 3.2d shows that in 2010, Scottish Water took 9,386 final water samples. Of these, 312 contained *Cryptosporidium* oocysts, meaning 3.32% of final water samples were positive, a decrease on 2009 and 2008, which saw a significant decrease on the year before. For

the third year running about a third of all Scottish Water's treatment works recorded at least one positive sample.

It was reported two years ago that a number of Scottish Water's treatment works did not have an adequate barrier to prevent *Cryptosporidium* entering the water supply and that DWQR had been working closely with Scottish Water to identify investment requirements for the period 2010 to 2015. As a result of that work, 45 priority sites were indentified for inclusion in Scottish Water's investment programme to have appropriate treatment installed. It may take until March 2015 to build all 45 of these works and get them fully operational, so DWQR expects Scottish Water to do all that it can to minimise the risk from *Cryptosporidium* in the meantime.

3.3 Drinking Water Quality in Distribution Systems

The network of water mains, service reservoirs and water towers that carries drinking water from the treatment works to the consumer is known as the distribution system. Regardless of how thoroughly drinking water has been treated, the condition of the distribution system can have a significant effect on the quality of the water passing through it. Cast iron mains can corrode and add particles of iron to the water. Deposits of iron, manganese or aluminium can accumulate in the system, perhaps from inefficient treatment processes, long since replaced. These deposits can be disturbed by changes in flow, causing discoloured supplies. If the integrity of the distribution system is breached, or re-growth of microbiological organisms occurs, bacterial contamination can be a problem. In practice, such problems are rare, but careful management of the distribution system is required in order to ensure that the quality of the treated drinking water is not allowed to deteriorate on its way to consumers.

Service reservoirs and water towers are constructed at points in the distribution system to form storage points, both for hydraulic reasons and to even out the demand for water through the day. Service reservoirs that are not maintained in good structural condition can be prone to inward leakage from contaminated surface water and this needs to be controlled through inspection and maintenance.

Secondary disinfection is installed at some service reservoirs, but this should only be used where chlorine residuals diminish because of long distribution networks. In such cases there may be a need to boost disinfection levels to achieve a disinfection residual at the end of the network. It is important that secondary disinfection does not disguise a more fundamental problem with a service reservoir such as compromised structural integrity. Scottish Water adopts a risk-based approach to cleaning and refurbishing service reservoirs. The DWQR inspects a selection of structures each year in order to ensure that they are being maintained and operated in a manner that minimises any risk to water quality.

Table 3.3a: Summary of Microbiological Tests on Samples taken from Storage Points and Comparison with Previous Years

Coliform Bacteria Standard = 0 per 100ml in at least 95% of samples from each site	**2010**	***2009***	***2008***	***2007***	***2006***	***2005***	***2004***
Number of tests	49,894	*53,001*	*55,104*	*56,277*	*56,175*	*56,410*	*56,340*
Number containing coliforms	107	*137*	*137*	*127*	*123*	*224*	*328*
% containing coliforms	0.21	*0.26*	*0.25*	*0.23*	*0.22*	*0.39*	*0.58*
E.coli Standard = 0 per 100ml							
Number of tests	49,894	*53,001*	*55,102*	*56,277*	*56,175*	*56,410*	*56,340*
No. containing faecal coliforms	9	*12*	*11*	*16*	*32*	*35*	*72*
% containing faecal coliforms	0.02	*0.02*	*0.02*	*0.03*	*0.06*	*0.06*	*0.13*

Summary results for storage points in 2010 are shown in *Table 3.3a* and are compared to those in previous years. It shows that 0.21% of samples contained coliforms – an improvement on 2009 and the best microbiological result since the Regulations came into force. Scottish Water has worked hard to ensure adequate chlorine residuals are maintained at storage points, and has improved the process by which it prioritises the cleaning of these assets.

Six sites recorded more than one sample containing coliforms. Scottish Water investigates each detection and takes action where necessary. All detections, and the action taken, are reported to DWQR, local authorities and Health Boards via an event reporting system.

One storage point, at Kirkton of Durris in Aberdeenshire, failed to meet the regulatory requirement that 95% of samples shall not contain coliforms. This compares with 3 sites not meeting the 95% requirement in 2009. Several other sites came close to failing the 95% standard suggesting that although 2010's results are good there is no room for complacency.

The presence of *E.coli* (faecal coliforms) indicate that contamination by faecal material has occurred. The standard for *E.coli* is zero per 100 millilitres of water. All detections of *E.coli* must be taken very seriously, and Scottish Water will investigate any failure thoroughly before taking remedial action where this is necessary to protect public health. In 2010, nine failures occurred at storage points, compared with 12 in 2009.

It is reassuring to see the improving trend continue for microbiology at storage points, and this undoubtedly reflects considerable effort by Scottish Water. The challenge is to ensure this is maintained and that progress is reviewed regularly. Scotland has a large number of storage points, and Scottish Water has a duty to maintain its assets so that they do not introduce a risk to water quality. Where assets are oversized or no longer required, they should be modified or safely disconnected from the water supply network. The balance between security of supply and water quality is undoubtedly a difficult one, but Scottish Water has the necessary expertise and must rise to the challenge.

An example of a storage point in Northern Scotland

Table 3.3b: Distribution Maintenance Index (DMI) in Scotland 2010

Rank	Site Name	No. Samples Failed for Iron	No. Samples Failed for Manganese	No. Samples Failed for Turbidity	DMI
1	Elgol Skye Zone	1	0	0	83.33%
2	Invergarry Zone	1	0	0	91.67%
2	Tarbert Western Isles Zone	1	0	0	91.67%
4	Roberton Zone	1	3	0	94.44%
5	Lochinvar Zone	1	2	0	95.83%
6	Amlaird Zone	2	2	0	96.30%
7	Muirdykes Zone	0	8	0	96.49%
8	Mannofield East Zone	4	1	0	96.79%
9	Rawburn Zone	2	0	0	97.10%
10	Afton Zone	0	3	0	97.22%
10	Corsehouse Zone	0	1	0	97.22%
10	Kirbister Orkney Zone	1	1	0	97.22%
10	Penwhapple Zone	0	1	0	97.22%
10	Penwhirn Zone	2	0	0	97.22%
10	Whitehillocks Zone	1	0	1	97.22%
16	Camphill Zone	1	1	0	98.15%
16	Spynie Zone	2	0	0	98.15%
18	Loch Eck Zone	0	1	0	98.61%
18	Turret/Balmore/Carron Valley Zone	0	1	0	98.61%
20	Marchbank B Zone	2	0	0	98.67%
21	Bradan B Zone	1	1	0	98.72%
22	Carron Valley B Zone	2	0	0	98.81%
23	Castle Moffat Zone	1	0	0	99.07%
23	Turret A Zone	0	1	0	99.07%
25	Balmore D Zone	1	0	0	99.10%
26	Bradan A Zone	1	1	0	99.12%
26	Lintrathen Zone	1	1	0	99.12%
28	Balmore F Zone	1	0	0	99.35%
29	Glendevon B Zone	1	0	0	99.36%
29	Mannofield South Zone	1	0	0	99.36%
29	Turret C Zone	0	1	0	99.36%
32	Carron Valley A Zone	0	1	0	99.56%
			Mean Distribution Maintenance Index Scotland		99.72%

Table 3.3b shows the Distribution Maintenance Index, or DMI, (formerly known as OPI (TIM)). This is a measure used by all the UK drinking water quality regulators to monitor the performance of distribution systems. DMI looks at regulatory sample data for turbidity, iron and manganese at consumer taps. These are the 3 parameters that best reflect the performance of the distribution system and its tendency to cause discoloured water incidents.

Turbidity is a measure of the cloudiness of the water, and iron and manganese are the two substances most commonly associated with discoloured supplies. Whilst iron in water supplies is commonly associated with the corrosion of cast iron water mains, it may also originate from a water treatment works which is failing to adequately remove naturally occurring iron from the raw water. Manganese is a naturally occurring substance found in raw waters in some parts of Scotland. If treatment processes are insufficient to remove it, it passes into the distribution system. Both iron and manganese may be deposited in pipes where low flows enable them to settle out and accumulate. Such deposits may later be disturbed by changing flow patterns causing discoloured supplies. DMI is a measure of the extent to which these substances are accumulating in the

distribution system and the effectiveness of the techniques used by Scottish Water to keep the distribution system clean. A full description of DMI, which is derived from the Mean Zonal Compliance for the three parameters, can be found in **Annex G**.

Table 3.3b shows the overall DMI for Scotland, together with a list of water supply zones where DMI was less than 100% in 2010. Scotland's mean DMI was 99.72%, another marked improvement on the index for the previous year. In 2010 there were 64 failures of the standards that comprise the index, with a fairly even split between iron and manganese. Only 32 supply zones appear in the table because they had a failure of an index parameter, which compares favourably with 42 in 2009.

Work to rehabilitate old cast iron water mains and install treatment for manganese is continuing, following detailed studies to identify the areas experiencing the worst problems. It is hoped that Scottish Water will eventually be in the position of being able to rehabilitate underground pipework before its condition deteriorates to the extent that it has an impact on consumers.

As in previous years, many of the worst performing supply zones have small populations, meaning that only a small number of samples require to be taken throughout the year. One failure within a small dataset can therefore have a large impact upon DMI.

Having said this, there are some larger zones quite high up in the table. Of particular note is Muirdykes water supply zone, covering parts of Paisley and Renfrewshire, where 8 failures of the manganese standard were recorded and consumers experienced discoloured supplies. DWQR is in the process of finalising a legally binding Undertaking with Scottish Water to make the necessary improvements, although the scale of the work required means that this may take some time. Although the problem seems to have worsened significantly in recent years, DWQR believes that Scottish Water should have anticipated the issue and commenced work to resolve it.

It is reassuring to note that Penwhirn supply zone, a former "hotspot" for discolouration in Dumfries and Galloway, only recorded two iron failures in 2010 and DWQR looks forward to this area not being represented in the table at all in future years once all work is complete.

3.4 Drinking Water Quality at Consumer Taps

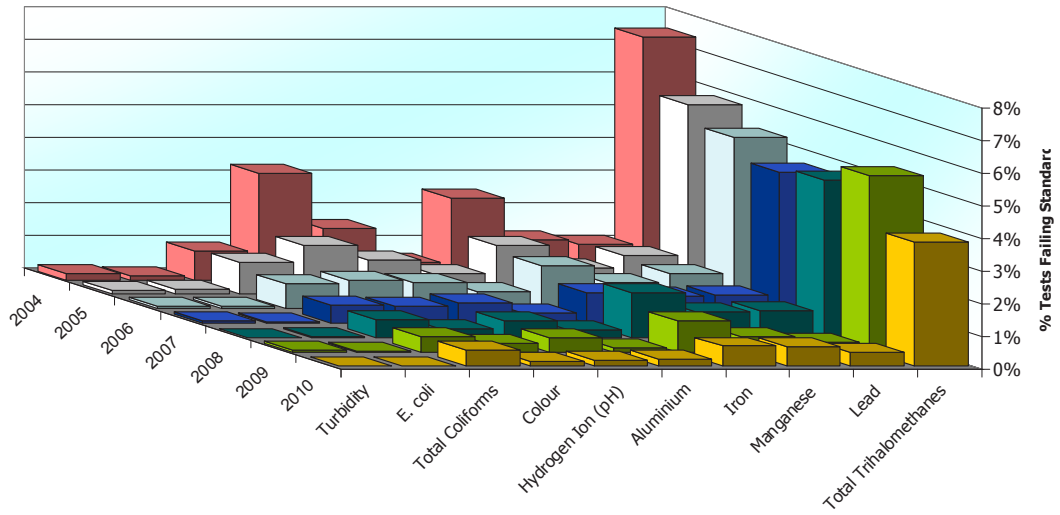
Table 3.4a: Summary of Microbiological Tests on Samples taken at Consumers' Taps with Comparison for Previous Years

Coliforms Standard = 0 per 100ml	**2010**	***2009***	***2008***	***2007***	***2006***	***2005***	***2004***
Number of tests	14,304	*14,386*	*14,473*	*14,555*	*14,710*	*14,263*	*13,988*
Number containing coliforms	69	*66*	*80*	*78*	*114*	*138*	*123*
Percentage containing coliforms	0.48	*0.46*	*0.55*	*0.54*	*0.77*	*0.97*	*0.88*
E.coli Standard = 0 per 100ml							
Number of tests	14,304	*14,386*	*14,473*	*14,554*	*14,702*	*14,263*	*13,988*
Number containing faecal coliforms	2	*4*	*2*	*5*	*9*	*21*	*18*
Percentage containing faecal coliforms	0.01	*0.03*	*0.01*	*0.03*	*0.06*	*0.15*	*0.13*

Table 3.4a shows microbiological data from samples taken at consumers' taps. Sample locations are selected randomly within a supply zone. The number of samples to be taken in each year in a supply zone is set out in the Regulations and is dependent on the population of the zone.

In 2010, compliance with the coliform standard was 99.52%, a slight decrease on last year's best ever figure. Two samples contained *E.coli*, which equals 2008's result, and represents a significant improvement in compliance from five years ago. Scottish Water is expected to investigate all failures of microbiological standards at consumers' taps and take action where necessary to protect public health. In many cases, the failure is due to the poor condition of the tap from which the sample was taken, and advice on tap hygiene is given to the affected consumer.

Figure 3.4a: Year on year Comparison of the Percentage of Tests from Consumer Taps Failing the PCV



Although samples are tested for 51 parameters, ten of these have particular significance for drinking water quality. *Figure 3.4a* shows the comparative failure rate for the ten parameters. Most of these show a stable or improving trend. Compliance for hydrogen ion (pH), colour, iron and THMs all improved significantly, the latter following much effort from Scottish Water and dialogue between DWQR and Scottish Water regarding 2009's poor result. Out of 62 failures, 32 were in the Northwest, reflecting the large number of raw waters containing high concentrations of organic material and sometimes limited capability of treatment processes for removing it. Scottish Water has site-specific action plans in place to tackle the THM issue and is making progress in this respect, via a range of measures including control of water residence times and chlorine concentrations. Further capital investment should also bring significant improvements in future years.

The trend in compliance for aluminium, lead and manganese was less satisfactory. The manganese result was especially disappointing given work undertaken by Scottish Water at a number of locations, however the figure is heavily influenced by the emerging issue at Muirdykes in Renfrewshire which resulted in eight failures of the standard.

Table 3.4b overleaf, summarises the results of analysis on all samples taken from consumers' taps in 2010.

Substances outside the ten key parameters with notable numbers of failures include ammonium and nitrite, with 13 and ten exceedences respectively. Both of these results show an improvement on 2009, but are still above the 2008 values. An improvement in performance is required, especially as these parameters are primarily related to control of disinfection where chloramination is used. An excess of nitrogen containing compounds, poor management of treatment processes and distribution systems lead to such failures. Six of the ammonium failures occurred in the Inverness supply over a short space of time, due to an incorrect ratio of ammonia to chlorine being applied.

Compliance with the individual and total pesticide standards, which are set at very low levels, improved in 2010 with a single exceedence of the individual standard. 2009 saw five failures of the individual standard and two of the total pesticides standard. This is to be welcomed, although DWQR is of the opinion that work to ensure lasting compliance is still required at Forehill WTW which serves Peterhead, and terms of an undertaking to this effect have been agreed with Scottish Water.

Table 3.4b: Summary of all Tests on Consumer Tap Samples During 2010

Parameter	Total No. of Samples	No. of Failed Samples	% of Failed Samples	No. of Zones with failures	Mean Zonal Compliance
Key Parameters					
Coliform Bacteria	14,304	69	0.48%	48	99.52%
E. coli	14,304	2	0.01%	2	99.92%
Colour	5,246	7	0.13%	7	99.38%
Turbidity	5,244	1	0.02%	1	99.99%
Hydrogen ion (pH)	5,244	9	0.17%	9	99.25%
Aluminium	5,197	12	0.23%	9	99.83%
Iron	5,197	32	0.62%	23	99.45%
Manganese	5,197	31	0.60%	18	99.72%
Lead	1,625	7	0.43%	7	99.11%
Total Trihalomethanes	1,636	62	3.79%	39	94.78%
Other Parameters					
1,2 Dichloroethane	1,636	0	0.00%	0	100.00%
Aldrin	1,629	0	0.00%	0	100.00%
Ammonium	5,247	13	0.25%	7	99.68%
Antimony	1,625	0	0.00%	0	100.00%
Arsenic	1,627	0	0.00%	0	100.00%
Benzene	1,636	0	0.00%	0	100.00%
Benzo 3,4 Pyrene	1,637	0	0.00%	0	100.00%
Boron	1,626	0	0.00%	0	100.00%
Bromate	1,623	0	0.00%	0	100.00%
Cadmium	1,625	0	0.00%	0	100.00%
Chloride	1,635	0	0.00%	0	100.00%
Chromium	1,625	0	0.00%	0	100.00%
Clostridium perfringens	5,201	4	0.08%	4	99.90%
Conductivity	5,245	0	0.00%	0	100.00%
Copper	1,625	1	0.06%	1	99.92%
Cyanide	1,624	0	0.00%	0	100.00%
Dieldrin	1,629	1	0.06%	1	99.96%
Enterococci	1,626	1	0.06%	1	99.92%
Fluoride	1,624	0	0.00%	0	100.00%
Heptachlor	1,629	0	0.00%	0	100.00%
Heptachlor epoxide	1,629	0	0.00%	0	100.00%
Mercury	1,626	0	0.00%	0	100.00%
Nickel	1,626	0	0.00%	0	100.00%
Nitrate	2,434	0	0.00%	0	100.00%
Nitrite	2,435	10	0.41%	7	99.84%
Nitrite/Nitrate formula	2,434	0	0.00%	0	100.00%
Odour	5,248	2	0.04%	2	99.98%
PAH - Sum of 4 Substances	1,637	0	0.00%	0	100.00%
Pesticides - Total Substances	2,910	0	0.00%	0	100.00%
All Other Individual Pesticides	13,362	1	0.01%	1	99.99%
Selenium	1,625	0	0.00%	0	100.00%
Sodium	1,626	0	0.00%	0	100.00%
Sulphate	1,623	0	0.00%	0	100.00%
Taste	5,247	2	0.04%	2	99.98%
Tetrachloroethene/Trichloroethene - Sum of 2 Substances	1,636	0	0.00%	0	100.00%
Tetrachloromethane	1,636	0	0.00%	0	100.00%
Total for All Parameters	**155,302**	**267**	**0.17%**	**123**	**99.77%**

Only parameters in Schedule 1 of the Regulations (shaded) are used in the calculation of Overall Compliance.

3.5 Summary of Drinking Water Quality Events and Incidents

Occasionally things do go wrong, so Scottish Water must inform DWQR of any event at a water treatment works or in the distribution system that could adversely affect water quality, cause concern to consumers or attract media attention. Each event is assessed by the DWQR and may be classified as an incident, if it was sufficiently serious or had the potential to be serious. Usually, DWQR will request a full report from Scottish Water on the causes and impact of any incident, including details of the remedial action taken by Scottish Water to prevent a recurrence. Where appropriate, DWQR will investigate further. All events where a boil notice or alternative supplies are issued are classified as an incident regardless of whether a report is requested by DWQR. *Table 3.5a* summarises the drinking water quality incidents that occurred during 2010. It is now DWQR policy to declare any event an incident where Scottish Water is unable to demonstrate that water quality has been restored within two months. This is in order to drive a swift and decisive resolution of water quality issues.

Table 3.5a: Summary of Drinking Water Quality Incidents in 2010

Location	Incident Date	Type of Incident
CRATHIE	02-Jan-10	WTW shutdown leading to inadequately treated water being supplied
CARRON VALLEY	06-Jan-10	Loss of control within Coagulation process
WINDYFIELD	08-Jan-10	Compliance not restored within two months
KILLIN	11-Jan-10	Serious or recurring parameter exceedence
FETLAR	06-Jan-10	Compliance not restored within two months
SOUTHDEAN	16-Jan-10	Serious or recurring parameter exceedence
TURRET	16-Jan-10	Loss of control within Disinfection process
WEST LEWIS	18-Jan-10	Serious or recurring parameter exceedence
BRADAN	17-Jan-10	Power or process failure with potential for loss of supply
BRADAN	16-Jan-10	Power or process failure with potential for loss of supply
WHITEHILLOCKS ZONE	22-Jan-10	Compliance not restored within two months
TURRET	01-Feb-10	Serious or recurring parameter exceedence
ROBERTON	22-Feb-10	Near miss
MANNOFIELD SOUTH	05-Apr-10	Compliance not restored within two months
INVERCANNIE	07-Apr-10	Compliance not restored within two months
FAIRBURN SERVICE RESERVOIR	19-Apr-10	Compliance not restored within two months
FETLAR	13-Apr-10	Compliance not restored within two months
KIRBISTER	20-Apr-10	Compliance not restored within two months
LINTRATHEN	25-Apr-10	Failure to respond adequately to Telemetry alarms
BOARDHOUSE	11-May-10	Compliance not restored within two months
KIRBISTER	13-May-10	Compliance not restored within two months
BALLYGRANT	25-May-10	Serious or recurring parameter exceedence
BALLATER	07-Jun-10	Serious or recurring parameter exceedence
NEWMORE	09-Jun-10	Loss of control within Coagulation process
MUIRDYKES	18-Jun-10	Compliance not restored within two months
GLENLATTERACH	28-Jun-10	Serious or recurring parameter exceedence
INVERCANNIE	09-Jul-10	Power or process failure with potential for loss of supply
GLENDEVON	18-Jul-10	Serious or recurring parameter exceedence
LINTRATHEN	18-Jul-10	Serious or recurring parameter exceedence
CLATTO	18-Jul-10	Serious or recurring parameter exceedence
WHITEHILLOCKS	20-Jul-10	Loss of control within Coagulation process
WHITEHILLOCKS ZONE	26-Jul-10	Compliance not restored within two months
BLAIRNAMARROW	28-Jul-10	Loss of control within Disinfection process
MUIRDYKES ZONE	30-Jul-10	Compliance not restored within two months
ASSYNT	16-Aug-10	Power or process failure with potential for loss of supply
DAER	23-Aug-10	Power or process failure with potential for loss of supply
BALLATER	27-Aug-10	Loss of control within Coagulation process
GLENDEVON	26-Aug-10	Failure to respond adequately to Telemetry alarms

Table 3.5a (continued)

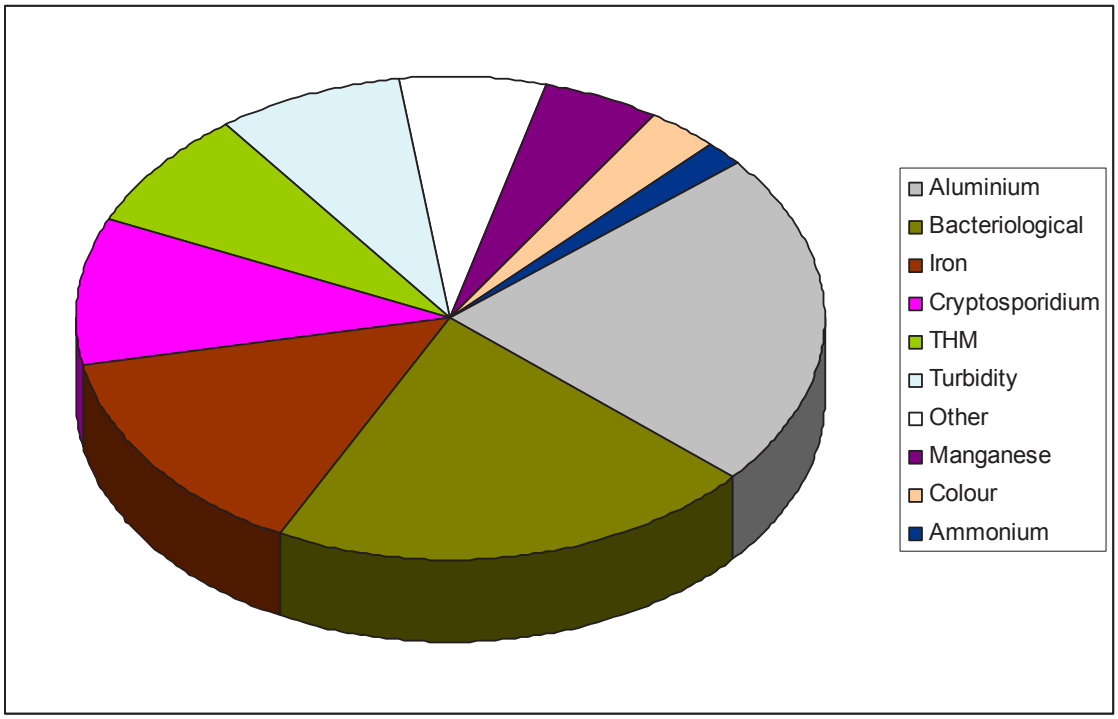
Location	Incident Date	Type of Incident
AMLAIRD ZONE	26-Aug-10	Compliance not restored within two months
GREENTOFT SERVICE RESERVOIR	01-Sep-10	Bottled water or boil notice to more than one property
ELPHIN	01-Sep-10	Compliance not restored within two months
SPYNIE SERVICE RESERVOIR	01-Sep-10	Compliance not restored within two months
PICKETLAW	14-Sep-10	Loss of control within Disinfection process
SHIELDAIG	14-Sep-10	Compliance not restored within two months
PAPA STOUR	15-Sep-10	Compliance not restored within two months
FOULA	17-Sep-10	Compliance not restored within two months
GLENLATTERACH	21-Sep-10	Serious or recurring parameter exceedence
GAIRLOCH	30-Sep-10	Loss of control within Disinfection process
INVERMORISTON	23-Sep-10	Serious or recurring parameter exceedence
AMLAIRD	02-Oct-10	Compliance not restored within two months
FOREHILL	27-Sep-10	Compliance not restored within two months
CRATHIE	08-Oct-10	WTW shutdown leading to inadequately treated water being supplied
UNST	29-Sep-10	Compliance not restored within two months
NEWMORE	17-Oct-10	Loss of control within Coagulation process
FOULA	13-Oct-10	Compliance not restored within two months
SCOURIE	23-Oct-10	Loss of control within Disinfection process
CRAIGNURE	29-Oct-10	Compliance not restored within two months
GORTHLECK	27-Oct-10	Serious or recurring parameter exceedence
GLENLATTERACH	13-Nov-10	Loss of control within Coagulation process
GLENLATTERACH	20-Nov-10	Loss of control within Disinfection process
LINTRATHEN ZONE	11-Dec-10	Multiple bacteriological failures following mains repairs
WHITEHILLOCKS ZONE	09-Dec-10	Failure of Management processes
SANDAY	17-Dec-10	Loss of control within Coagulation process
TURRET	22-Dec-10	Failure of Management processes
BLACK ESK	24-Dec-10	Loss of control within Coagulation process
GLENLATTERACH	25-Dec-10	Loss of control within Coagulation process

In 2010, 899 event notifications were received from Scottish Water. Of these, 62 were classified as incidents by DWQR, and 40 of these incidents occurred in Scottish Water's East region, which stretches from Shetland to Fife.

Some locations recorded more than one incident in 2010, notably Glenlatterach WTW in Moray with five, and Turret WTW in Perthshire and Whitehillocks Supply Zone in Angus with three each. In 2010, DWQR used incidents as a trigger for a site visit to discuss the incident with Scottish Water staff. In many cases a technical audit was also undertaken. This has provided the opportunity to explore the causes of incidents in greater detail.

Figure 3.5a shows the causes of drinking water incidents. Issues with aluminium made up the largest category of incident. These tend to be associated with loss of control of the treatment process, often due to difficulties in maintaining the optimum pH for coagulation. Incidents involving an actual detection of bacteriological parameters, or an increased risk of failure due to problems with the disinfection process accounted for the second largest proportion of incidents.

Figure 3.5a: Causes of Drinking Water Quality Incidents in 2010



3.6 Consumer Contacts About Quality to Scottish Water in 2010

When a consumer calls Scottish Water regarding the quality of their water supply, the contact is recorded and classified according to the categories listed in **Annex F**. *Table 3.6a* shows the number of contacts, by type, that Scottish Water received during 2010.

Table 3.6a: Contacts received by Scottish Water in 2010, compared with 2009.

Contact Category	Number of Contacts		% Change on 2009	Contact rate per 10,000 population	
Appearance	**2010**	*2009*		**2010**	*2009*
Discoloured Water	14,349	*16,783*	-14.5	28.8	*33.6*
Aerated (Milky) Water	2,466	*2,303*	7.1	4.9	*4.6*
Particles in Water	742	*871*	-14.8	1.5	*1.8*
Organisms in Water	55	*49*	12.2	0.1	*0.1*
Taste and Odour					
Chlorine	1,261	*1,752*	-28.0	2.5	*3.5*
Metallic	418	*532*	-21.4	0.8	*1.1*
Solvent/Fuel Taste/Smell	43	*59*	-27.1	0.1	*0.1*
Musty/Earthy	618	*1,048*	-41.0	1.2	*2.1*
TCP/Chemical Taste/Smell	247	*350*	-29.4	0.5	*0.7*
Other contact about Water Quality					
Illness due to Water	242	*274*	-11.7	0.5	*0.6*
Other Contact	54	*147*	-63.3	0.1	*0.3*
Total contacts about Water Quality	20,495	*24,168*	-15.2	41.1	*48.5*

In 2010, Scottish Water received 20,495 consumer contacts relating to water quality. This is an overall call reduction of just over 15%, when compared to the number of calls taken during 2009. The large reduction in calls from 2009 to 2010, continuing the trend of the last few years, is welcomed by DWQR.

There was a reduction in calls across all categories, apart from the appearance categories relating to aerated water and organisms in water. The small increases in these two categories seem to be spread across the country, with no one zone accounting for the rise in calls. However, 219 calls relating to aerated water were received during the 18-20th May 2010 for Balmore F zone (serving parts of Livingston, Armadale, Broxburn and Kirkliston). Upon investigation, DWQR could not find any event or incident that could account for these calls. It appears that this was an isolated occurrence, possibly air entering the system due to a burst main, as the calls did reduce for the rest of the year.

DWQR also welcomes the year on year reduction in the number of chlorine contacts relating to taste and odours which now amounts to some 31% since 2008. It is important however that Scottish Water continues to review chlorine residuals in water supply systems to ensure these are appropriate and to identify opportunities to reduce the amount of chlorine being added whilst not compromising microbiological safety.

The significant reduction in musty or earthy complaints is more a reflection of a particular problem in 2009, with the 618 contacts this year being similar to the 2008 level.

3.7 Consumer Contacts to DWQR in 2010

Table 3.7a: Contacts received by DWQR in 2010, compared with previous years.

Contact Category	Number of Contacts		
Appearance	**2010**	*2009*	*2008*
Discoloured Water	21	*11*	*15*
Aerated (Milky) Water	6	*3*	*4*
Particles in Water	4	*3*	*5*
Organisms in Water	4	*0*	*0*
Taste and Odour			
Chlorine	5	*19*	*22*
Metallic	1	*2*	*0*
Solvent/Fuel Taste/Smell	0	*0*	*0*
Musty/Earthy	3	*5*	*1*
TCP/Chemical Taste/Smell	6	*1*	*0*
Other contact about Water Quality			
Illness due to Water	6	*3*	*-*
Other Contact	3	*21*	*21*
Request for Information	91	*75*	*58*
Total contacts about Water Quality	**150**	*143*	*126*

During 2010, DWQR received 150 contacts which is a slight increase on 2009 levels. As with previous years, the largest category relates to consumers asking for additional information about their water supplies. Water hardness levels and additional water sample data requests make up the majority of these types of contacts, often from consumers wishing to adjust settings on a new kitchen appliance. A recent modification to the mapping application on the DWQR website has added a water hardness data tab to the summary data presented for each water regulation zone. This will hopefully make this information more readily accessible to consumers.

Scottish Water has a responsibility to investigate water quality complaints and supply issues and DWQR guides consumers to report any concerns to Scottish Water in the first instance to enable their resolution.

Where consumers are dissatisfied with Scottish Water's response, DWQR carries out an investigation into the issues.

On a case by case basis, there are examples where Scottish Water has clearly pursued the root cause of complaints and gone the extra mile to resolve matters. There are however others which have variously highlighted issues around:

- responsiveness to the consumer issue
- quality of investigation into complaints and underlying issues
- data quality and transfer of information
- internal communications.

DWQR believes Scottish Water must be more consistently attentive to gaining a clear understanding of consumer complaints and to maintaining a focus throughout the company to resolving their problems.

3B Private Water Supplies across Scotland

Introduction

Private water supplies (PWS) in Scotland are those drinking water supplies which are not provided by Scottish Water, and are the responsibility of the owners and users of the supplies.

PWS are classified as either Type A or Type B supplies. Type A supplies are those which supply 50 or more people, supply ten or more cubic meters of water per day or supply any kind of public or commercial activity. Type B supplies are all other PWS.

In 2010, there were 19,177 registered PWS in Scotland supplying approximately 150,000 people. 2,209 were Type A supplies and 16,968 were Type B supplies.

Table 3B.1: PWS per local authority area

Local Authority Area	Number of Type A supplies	Number of Type B supplies
Aberdeen City	12	98
Aberdeenshire	237	7,342
Angus	37	364
Argyll and Bute	368	1,335
City of Edinburgh	1	12
Clackmannanshire	5	22
Comhairle Nan Eilean Siar	19	34
Dumfries and Galloway	72	1,194
Dundee City	0	1
East Ayrshire	13	192
East Dunbartonshire	0	20
East Lothian	12	45
East Renfrewshire	15	7
Falkirk	1	8
Fife	33	300
Glasgow	0	0
Highland	691	1,543
Inverclyde	8	50
Midlothian	3	66
Moray	95	669
North Ayrshire	22	259
North Lanarkshire	0	15
Orkney	30	191
Perth and Kinross	262	1,151
Renfrewshire	6	9
Scottish Borders	125	1,310
Shetland	1	71
South Ayrshire	30	223
South Lanarkshire	28	20
Stirling	67	363
West Dunbartonshire	7	13
West Lothian	9	41
Total	**2,209**	**16,968**

Risk Assessments

The legislation for regulating PWS is The Private Water Supplies (Scotland) Regulations 2006 ("the 2006 Regulations"). The 2006 Regulations are enforced by Environmental Health teams in local authorities, and the DWQR has a statutory role in supervising local authorities' enforcement role.

The 2006 Regulations set out different legislative requirements for Type A and Type B supplies. All Type A supplies must have risk assessments carried out on them (or have existing risk assessments reviewed) and be sampled in accordance with the 2006 Regulations at least once a year by local authorities. *Table 3B.2* shows the number of risk assessments completed by local authorities in 2010.

Table 3B.2: Type A risk assessments per local authority area

Local Authority Area	Number of Type A supplies	Risk Assessments or Reviews completed in 2010	% Risk Assessments or Reviews completed in 2010
Aberdeen City	12	9	75
Aberdeenshire	237	218	92
Angus	37	37	100
Argyll and Bute	368	329	89
City of Edinburgh	1	1	100
Clackmannanshire	5	5	100
Dumfries and Galloway	72	72	100
Dundee City	0	0	-
East Ayrshire	13	13	100
East Dunbartonshire	0	0	-
East Lothian	12	3	25
East Renfrewshire	15	15	100
Eilan Siar	19	14	74
Falkirk	1	1	100
Fife	33	32	97
Highland	691	676	98
Inverclyde	8	8	100
Midlothian	3	3	100
Moray	95	93	98
North Ayrshire	22	1	5
North Lanarkshire	0	0	-
Orkney	30	23	77
Perth and Kinross	262	254	97
Renfrewshire	6	5	83
Scottish Borders	125	121	97
Shetland	1	1	100
South Ayrshire	30	28	93
South Lanarkshire	28	28	100
Stirling	67	61	91
West Dunbartonshire	7	7	100
West Lothian	9	8	89
Total	**2,209**	**2,066**	**94**

In 2010, from a total of 2,209 Type A supplies, 2,066 risk assessments (94%) were carried out.

Local authorities are obliged to sample Type B supplies and to assist with risk assessments on request from owners and users of the supplies. Any owners or users of Type B supplies should contact their local authority if they require assistance with risk assessments or sampling of their supply. It should be noted that local authorities may charge for this service. In 2010, local authorities completed 1,778 risk assessments on Type B supplies. DWQR recognises the amount of work involved in carrying out assessments on these supplies.

Water Quality of PWS

In 2010, 46,460 tests were carried out on statutory samples taken for the purposes of the 2006 Regulations; this figure includes tests from the statutory Type A samples and the initial sample taken from Type B supplies.

There was a significant improvement in the quality of data provided by local authorities, which has allowed Type A and Type B supplies to be reported separately for the first time. Additionally, following meetings and discussions with individual local authorities, data from 2009 has been cleansed by DWQR so that statutory Type A sampling and Type B samples can be reported and compared with 2010 data. This data cleansing will mean that there may be variations in 2009 water quality results in this report when compared to the DWQR's 2009 annual report.

It is recognised that PWS data reporting from local authorities to the DWQR can be time consuming and complex. Through working in partnership with the Society of Chief Officers of Environmental Health in Scotland there has been a significant amount of work carried out by local authorities to improve the quality of the PWS data.

Table 3B.3 shows the overall quality of PWS sampled in 2010, which includes the statutory Type A samples and samples from Type B

Table 3B.3: Water Quality of PWS (Type A and B supplies)

Parameter	Total Number of Tests	Total Number of Fails	Overall Compliance (%)
Coliform Bacteria	2,870	1,029	64.15
E. coli	2,866	526	81.65
Colour	1,773	329	81.44
Turbidity	2,597	81	96.88
Hydrogen ion (pH)	2,806	551	80.36
Aluminium	461	15	96.75
Iron	1,462	196	86.59
Manganese	1,289	121	90.61
Lead (25)	1,815	108	94.05
Total Trihalomethanes	72	5	93.06
Other Parameters	28,449	781	97.25
All Parameters	**46,460**	**3,742**	**91.95**

supplies. Of continuing concern is the microbiological quality of PWS. Compliance with the *E. coli* standard was poor, with 18.35% of samples failing the standard. *E. coli* shows that there has been faecal contamination of a water supply, and its presence can indicate risk from other waterborne pathogens of faecal origin such as *Campylobacter* and *Cryptosporidium*. Compliance with the Coliform bacteria standard was also poor, with more than a third (35.85%) of samples failing the standard. Coliform bacteria are ubiquitous in the environment and do not necessarily indicate faecal contamination.

They do, however, indicate that there may be no disinfection on the supply, that any disinfection process has been ineffective or that there has been post treatment contamination.

Water treatment at a PWS

Table 3B.4: Water Quality of Type A PWS

Parameter	Number of Type A Tests	Number of Type A Fails	Compliance (%)
Coliform Bacteria	1,701	489	71.25
E. coli	1,702	254	85.08
Colour	1,492	289	80.63
Turbidity	1,558	37	97.63
Hydrogen ion (pH)	1,656	256	84.54
Aluminium	381	8	97.90
Iron	796	119	85.05
Manganese	681	57	91.63
Lead (25)	845	45	94.67
Total Trihalomethanes	55	4	92.73
Other Parameters	21,406	435	97.97
All Parameters	**32,273**	**1,993**	**93.82**

Table 3B.5: Water Quality of Type B PWS

Parameter	Number of Type B Tests	Number of Type B Fails	Compliance (%)
Coliform Bacteria	1,169	540	53.81
E. coli	1,164	272	76.63
Colour	281	40	85.77
Turbidity	1,039	44	95.77
Hydrogen ion (pH)	1,150	295	74.35
Aluminium	80	7	91.25
Iron	666	77	88.44
Manganese	608	64	89.47
Lead (25)	970	63	93.51
Total Trihalomethanes	17	1	94.12
Other Parameters	7,043	346	95.09
All Parameters	**14,187**	**1,749**	**87.67**

Raw water storage tanks at a PWS

Local authorities have a statutory duty to sample all Type A supplies at least annually. In 2010, compliance with the *E. coli* standard was poor, with 14.92% of samples taken from Type A supplies failing the standard. Additionally, 28.74% of samples taken for coliform bacteria failed the standard. Type B supplies are generally sampled by local authorities only on request from the owners and users of the supplies. Microbiological quality of Type B supplies sampled in 2010 was also poor, with 23.37% failing the *E. coli* standard and 46.19% of samples failing the coliform bacteria standard testing for *Enterococci*, another faecal indicator confirmed the poor microbiological quality of many PWS, with 10.52% of Type A and 19.22% of Type B supplies failing the standard.

When compared to 2009 data, Type A compliance with the *E. coli* standard in 2010 improved by 5.67%, and Type B supplies improved by 2.10%, although these are likely to be a different set of supplies to those sampled in 2009. PWS compliance with water quality standards in the 2006 Regulations needs to be monitored over a number of years to determine whether water quality is actually improving. Most Type A supplies will only be sampled once a year, and for some of these supplies, different properties served by that supply will be sampled, some of which may have point of use treatment and some of which may not. Type B supplies are most likely to be sampled on request, and it may be that the owners and users of these supplies only request samples when they have concerns about their supply, distorting the dataset. Once a water quality problem has been dealt with, it is unlikely that further sampling will be carried out in subsequent years, so improvements in water quality may not be observed.

If there is disinfection on a PWS that has been correctly designed, installed, operated and maintained, it should result in no coliform bacteria or *E. coli* in drinking water at consumers' taps when sampled. In 2010 there were a significant number of PWS which had no disinfection, as can be seen from *Table 3B.7*.

Table 3B.6: E coli compliance comparison 2009 – 2010

	2010		2009	
	Type A	Type B	Type A	Type B
Number of Tests	1,680	1,164	1,477	1,115
% Complying with *E. coli* standard	84.88	76.63	79.21	74.53

Table 3B.7: PWS with Disinfection

	Number of Supplies	Number of supplies with disinfection	% Supplies with disinfection
Type A	2,209	1,310	59
Type B	16,968	1,207	7

Table 3B.8: Microbiological failures on PWS with disinfection

Parameter Name	Number of Type A Fails	% of Fails with Disinfection	Number of Type B fails	% of Fail with Disinfection
Coliform Bacteria	488	55.33	540	21.48
E. coli	254	53.15	272	20.96

In 2010, out of a total of 2,209 Type A supplies across Scotland, 41% had no disinfection, and 93% of Type B supplies had no disinfection.

It is of great concern that of 254 *E. coli* failures on Type A supplies in 2010, more than half (53%), had disinfection systems, suggesting that disinfection systems are either incorrectly installed or operated, or are not adequately maintained. The issue does not seem to be so pronounced with Type B supplies, although 21% of disinfection systems are not adequately disinfecting supplies.

In 2010, there was an outbreak of *E. coli* O157 in the west of Scotland which was linked to a PWS, where 14 individuals were infected. *E. coli* O157 was detected in the PWS and the outbreak was thought to be caused by the failure of the disinfection system through inadequate maintenance and poor management of the supply.

DWQR will be investigating the issue of ineffective treatment and maintenance with local authorities in 2011 to determine the best strategy for assisting owners and users of PWS in the correct use of water treatment systems.

It is recommended that appropriate water treatment should be installed at PWS where risk assessments or water quality monitoring show that there is a risk of faecal contamination of supplies. Where water treatment processes have been installed, it is critical that:

- **they are appropriate for the supply and have been installed, operated and maintained in accordance with manufacturers' instructions; and**
- **users have an understanding of their supply and treatment systems and how to maintain their effectiveness.**

19.37% of Type A supplies and 14.23% of Type B supplies failed the colour standard. Colour in drinking water can be caused by naturally occurring organic water in catchments, and can also be caused by high iron and manganese from catchments as well as iron from rusting pipework. High colour levels can make drinking water supplies aesthetically unappealing, and can adversely affect the operation of ultraviolet (UV) systems, which are commonly used to disinfect PWS. Furthermore, the addition of chlorine to water with high levels of organic matter can lead to the formation of trihalomethanes; 7.27% of Type A supplies and 5.88% Type B supplies sampled for trihalomethanes failed the standard.

Compliance with the pH standard was low, with 15.46% of Type A and over a quarter (25.65%) of Type B samples failing pH standards. Breaches of the pH standards can be the cause of elevated levels of metals used in plumbing materials such as copper and lead. In 2010, 7.89% of Type A samples taken for copper failed the copper standard, of which 35.00% also failed pH standards. 11.96% of Type B samples taken for copper

failed the standard, with 40.91% of these failures also failing the pH standard.

Lead continues to be detected in PWS, with 5.33% of Type A and 6.49% of Type B supplies breaching the standard. The standard for lead will be changing from 25µg/l to 10µg/l at the end of 2013 in line with the requirements of the European Drinking Water Directive; failures in 2010 against the 10µg/l standard would be 9.94% for Type A supplies and 12.68% for Type B supplies.

Iron and manganese are metals which can occur naturally in the environment, and can commonly be found together. Iron can also be derived from rusting iron pipe work. In 2010, 14.95% of Type A samples taken for iron failed the standard, and 8.37% failed the manganese standard. Elevated levels of both metals can lead to discoloured supplies and can cause staining of laundry and tap fittings.

2.10% of Type A and 8.75% of Type B samples taken in 2010 failed the aluminium standard. Concentrations of naturally occurring aluminium can vary significantly, depending on the mineral content of the catchment and the water quality of the drinking water supply.

Nitrates in drinking water are generally caused by inorganic fertilisers used on the land surrounding water supplies. In 2010, 3.54% of Type A and 6.11% of Type B supplies exceeded the regulatory standard for nitrates. Failures of the nitrate standard are of particular concern when supplies are used for making up feed for bottle-fed babies.

In 2010, 3,376 samples were taken for pesticides in PWS, and compliance with standards was generally high, with only 0.27% of Type A and 0.25% of Type B samples failing standards.

Protection of PWS Against Pollution

The quality of drinking water supplied from PWS can clearly be affected by activities in their catchments. Legislation to protect and improve the water environment, and the sources of drinking water includes The Water Environment (Controlled Activities) (Scotland) Regulations, 2005 ("the CAR Regulations").

The CAR Regulations enable the Scottish Environment Protection Agency (SEPA) to control activities, including diffuse agricultural pollution, which may have an adverse impact on the water environment, including sources of drinking water. This is achieved through a risk based framework of controls such as general binding rules, registration and licenses.

If there are any concerns over the pollution of PWS, SEPA may be able to help or advise.

The PWS Grants System

When the 2006 Regulations were introduced, a grants system to help improve PWS was introduced at the same time. Local authorities administer the grants on behalf of the Scottish Government, and non-means tested grants of up to £800 per property can be awarded. If local authorities determine that there would be financial hardship incurred in improving a PWS, a grant in excess of £800 can be awarded. Expenditure on grants made to owners and users of PWS across Scotland for the financial year ending 31st March 2011 totalled £1.4m.

It is recommended that local authorities continue to promote PWS Grants and that owners and users of PWS make use of this grant to make improvements to their supplies to bring them up to modern standards and minimise the risk of possible illness.

Water Safety Plans

For complex supplies, supplies which feed larger numbers of people, or those which are of particular concern, it is recommended that a Water Safety Plan (WSP) is developed. WSP are risk assessment and risk management tools which can be invaluable in identifying and managing risks, and for highlighting routine maintenance tasks. WSP are promoted as best practice by the World Health Organisation (WHO), and are recognised worldwide as the most effective means of managing water supplies from source, through the treatment process, to consumers' taps. DWQR promotes the WSP approach to improving drinking water quality. Local authorities already carry out risk assessments on all Type A supplies, and WSP are a natural extension of risk assessments.

In May 2010 the DWQR was represented at the 2nd All Africa Environmental Health Congress in Malawi, and co-hosted a session on the use of WSP in small community supplies with representatives from Malawi and Uganda.

Greater understanding was gained of the needs of remote communities, and this has been incorporated into templates and training for WSP for small community or private supplies in Scotland.

The WHO's Small Community Supply Management Network was promoted at the Congress, and DWQR continues to remain an active member of this Network.

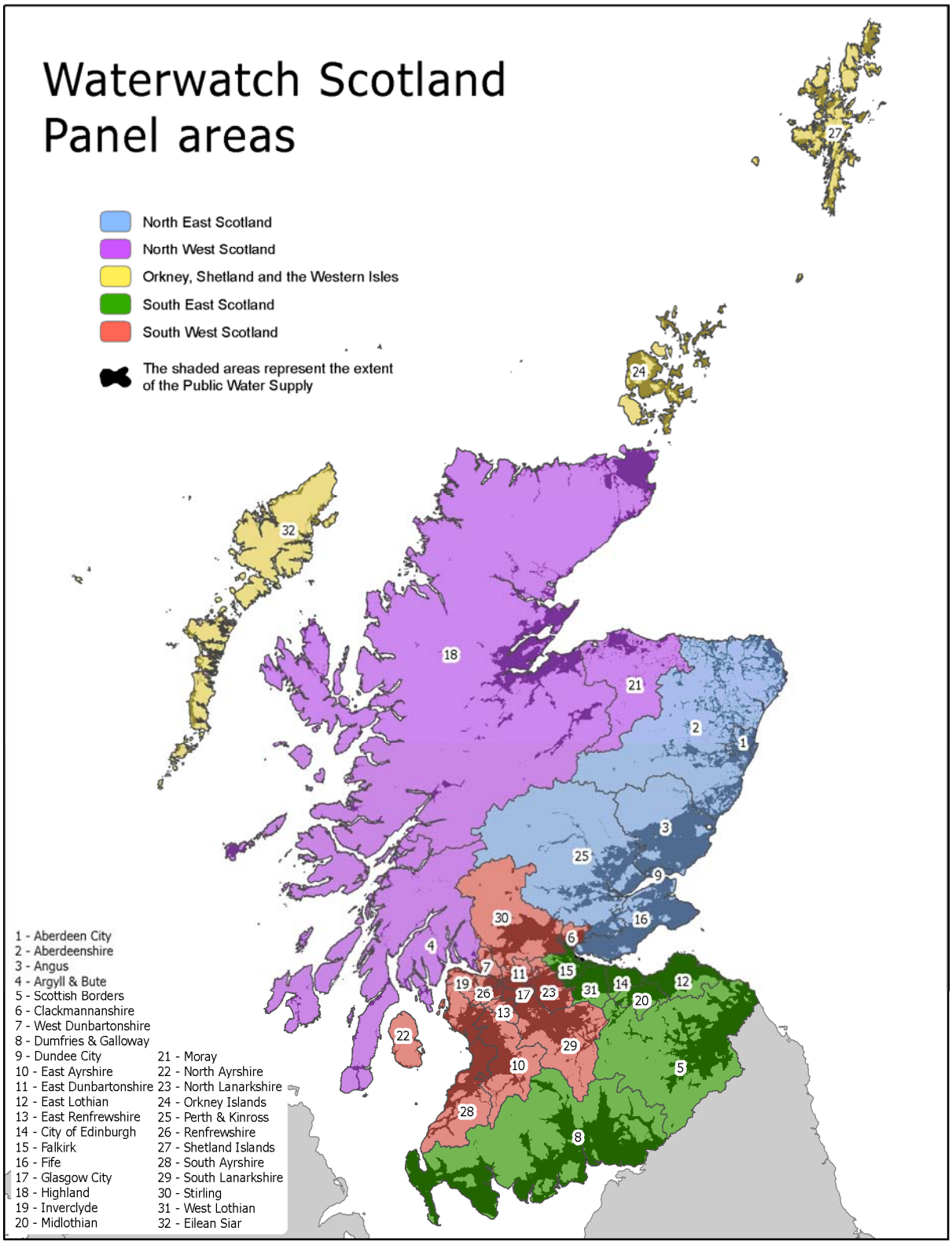
A community drinking water supply in Malawi

The DWQR is working with a number of local authorities to develop WSP for specific supplies. It is envisaged that these case studies could be used as templates to help users of Type A supplies effectively manage their own supplies and treatment systems.

4. Drinking Water Quality by Region

4. Drinking Water Quality by Region

This section looks at drinking water quality in the five Waterwatch Scotland panel areas, with a particular emphasis on consumer issues.



Map 4: Waterwatch Scotland Panel Regions and Local Authorities

4.1 Drinking Water Quality in the South West Waterwatch Panel Area

Water Quality Data

Table 4.1a: Samples Taken from Water Treatment Works Supplying the South West

Parameter	Number of tests	Number exceeding standard	% exceeding standard	No. WTW not meeting regulatory requirements	% WTW not meeting regulatory requirements
Coliform Bacteria	9,196	9	0.10%	8	20.00%
E.Coli	9,196	1	0.01%	1	2.50%
Nitrite	388	0	0%	0	0%
Turbidity	3,921	13	0.33%	10	32.50%

Table 4.1b: Summary of Samples taken from Service Reservoirs in the South West

Parameter	Number of tests	No. containing coliforms or *E.coli*	% exceeding standard	No. service reservoirs not meeting regulatory requirements*	% service reservoirs not meeting regulatory requirements
Coliform Bacteria	11,282	19	0.17%	19	0%
E.Coli	11,282	0	0%	0	0%

*95% samples shall not contain coliforms; 100% shall not contain *E.coli*

Table 4.1c: Summary of Samples taken from Consumers' Taps in the South West

Parameter	Number of Tests	Number exceeding standards	% of fails	No. of Zones not meeting regulatory requirements	Compliance (%)
Coliform Bacteria	6,920	29	0.42%	18	99.69%
E. coli	6,920	1	0.01%	1	99.99%
Colour	2,478	0	0%	0	100%
Turbidity	2,477	0	0%	0	100%
Hydrogen ion (pH)	2,477	4	0.16%	4	99.76%
Aluminium	2,475	6	0.24%	4	99.87%
Iron	2,475	9	0.36%	7	99.73%
Manganese	2,475	21	0.85%	11	99.27%
Lead	532	1	0.19%	1	99.83%
Total Trihalomethanes	533	14	2.63%	9	97.60%
Other Parameters	28,665	4	1.00%	2	100%
All Parameters	**58,427**	**89**	**15.00%**	**34**	**99.90%**

Table 4.1d: Distribution Maintenance Index – Zones in the South West not Scoring 100%

Water Supply Zone Name	MZC Iron	MZC Manganese	MZC Turbidity	DMI
Amlaird Zone	94.44%	94.44%	100%	**96.30%**
Muirdykes Zone	100%	89.47%	100%	**96.49%**
Afton Zone	100%	91.67%	100%	**97.22%**
Corsehouse Zone	100%	91.67%	100%	**97.22%**
Penwhapple Zone	100%	91.67%	100%	**97.22%**
Camphill Zone	97.22%	97.22%	100%	**98.15%**
Bradan B Zone	98.08%	98.08%	100%	**98.72%**
Carron Valley B Zone	96.43%	100%	100%	**98.81%**
Turret A Zone	100%	97.22%	100%	**99.07%**
Balmore D Zone	97.30%	100%	100%	**99.10%**
Bradan A Zone	98.68%	98.68%	100%	**99.12%**
Balmore F Zone	98.04%	100%	100%	**99.35%**
Turret C Zone	100%	98.08%	100%	**99.36%**
Carron Valley A Zone	100%	98.68%	100%	**99.56%**
South West Region Mean DMI	**99.73%**	**99.27%**	**100%**	**99.67%**

Microbiological compliance deteriorated in the South West in 2010. All three stages of monitoring – treatment, service reservoirs and consumer taps showed a poorer performance than 2009 but service reservoirs showed an especially marked change at nearly twice the number of detections of coliforms recorded in 2009.

Overall compliance at consumers' taps was marginally poorer than in 2009 and this is driven by microbiological performance and manganese failures. Whilst iron compliance has improved in the year, perhaps reflecting the work carried out to improve treatment processes and clean distribution pipework, manganese remains a more stubborn concern. The improving situation is reflected in *Table 4.1d* which lists a number of hotspots scoring badly in the South West. The number of zones featured has reduced by a third over the year.

The number of exceedences for THMs was greater than in 2009 but fewer zones were affected.

Scottish Water received 8,940 contacts from consumers regarding water quality. Over 80% of the contacts concerned discoloured water and there were five zones where this was a notable issue. The Muirdykes zone had the largest proportion of contacts, affecting the Johnstone area and parts of Paisley. Recognising the ongoing water quality concerns in this area, DWQR has requested a legally binding Undertaking from Scottish Water in relation to improvements at Muirdykes WTW and in the distribution system.

Milky or cloudy water was the next most significant issue accounting for just over 9% of contacts. Together with discolouration problems, it can point towards deficiencies in the configuration of distribution networks and valves and control of activity on the networks.

4.2 Drinking Water Quality in the North West Waterwatch Panel Area

Water Quality Data

Table 4.2a: Samples Taken from Water Treatment Works Supplying the North West

Parameter	Number of tests	Number exceeding standard	% exceeding standard	No. WTW not meeting regulatory requirements	% WTW not meeting regulatory requirements
Coliform Bacteria	9,590	13	0.14%	11	8.53%
E.Coli	9,590	4	0.04%	4	3.10%
Nitrite	988	3	0.30%	2	1.55%
Turbidity	1,462	9	0.62%	8	6.20%

Table 4.2b: Summary of Samples taken from Service Reservoirs in the North West

Parameter	Number of tests	No. containing coliforms or *E.coli*	% exceeding standard	No. service reservoirs not meeting regulatory requirements*	% service reservoirs not meeting regulatory requirements
Coliform Bacteria	14,883	30	0.20%	1	0.32%
E.Coli	14,883	2	0.01%	2	0.67%

*95% samples shall not contain coliforms; 100% shall not contain *E.coli*

Table 4.2c: Summary of Samples taken from Consumers' Taps in the North West

Parameter	Number of Tests	Number exceeding standards	% of fails	No. of Zones not meeting regulatory requirements	Compliance (%)
Coliform Bacteria	2,150	8	0.37%	6	99.69%
E. coli	2,150	0	0%	0	100%
Colour	826	5	0.61%	5	98.66%
Turbidity	826	0	0%	0	100%
Hydrogen ion (pH)	826	3	0.36%	3	99.05%
Aluminium	807	2	0.25%	2	99.75%
Iron	807	4	0.50%	3	99.39%
Manganese	807	1	0.12%	1	99.97%
Lead	492	2	0.41%	2	99.05%
Total Trihalomethanes	493	36	7.30%	22	90.74%
Other Parameters	19,635	13	0.07%	7	99.97%
All Parameters	**29,819**	**74**	**0.25%**	**41**	**99.67%**

Table 4.2d: Distribution Maintenance Index – Zones in the North West not Scoring 100%

Water Supply Zone Name	MZC Iron	MZC Manganese	MZC Turbidity	DMI
Elgol Skye Zone	50.00%	100%	100%	**83.33%**
Invergarry Zone	75.00%	100%	100%	**91.67%**
Spynie Zone	94.44%	100%	100%	**98.15%**
Loch Eck Zone	100%	95.83%	100%	**98.61%**
North West Region Mean DMI	**99.39%**	**99.97%**	**100%**	**99.78%**

Compliance for all parameters at treatment works deteriorated in the North West in 2010. In particular, the number of samples containing *E.coli* increased from one to four. Compliance at storage points was fairly similar to 2009, with 30 samples containing coliforms and two containing *E.coli*.

The overall picture at consumer's taps was improved on 2009 – a total of 74 failures were recorded across all parameters against 95 the previous year. In particular, compliance for THMs and hydrogen ion (pH) improved significantly. *Table 4.2d* shows those supply zones where iron, manganese or turbidity failures occurred. Elgol, on Skye, featured in last year's table as well and iron failures here are largely due to the inability of the treatment works to remove naturally occurring iron. Work is underway to improve compliance with iron and manganese in Spynie zone near Elgin and Lock Eck zone covering Dunoon.

803 consumer contacts from the North West area were received by Scottish Water in 2010 with almost half relating to discoloured water. Assynt water supply zone, which serves Dingwall and the area to the North of Inverness recorded a relatively large number of contacts about discoloured water, as did Gairloch and the area around Onich to the South of Fort William.

The replacement of the Onich WTW with a supply from the Fort William system and mains rehabilitation works has improved quality in the Onich area.

Tullich supply zone covering the area around Oban generated 16 contacts about an earthy taste to the water, something that is sometimes associated with algal blooms in the source water supply, although there was no report of such a bloom in 2010.

4.3 Drinking Water Quality in the Islands Waterwatch Panel Area

Water Quality Data

Table 4.3a: Samples Taken from Water Treatment Works Supplying the Islands

Parameter	Number of tests	Number exceeding standard	% exceeding standard	No. WTW not meeting regulatory requirements	% WTW not meeting regulatory requirements
Coliforms	2,174	0	0%	0	0%
E.Coli	2,174	0	0%	0	0%
Nitrite	232	0	0%	0	0%
Turbidity	299	0	0%	0	0%

Table 4.3b: Summary of Samples taken from Service Reservoirs in the Islands

Parameter	Number of tests	No. containing coliforms or *E.coli*	% exceeding standard	No. service reservoirs not meeting regulatory requirements*	% service reservoirs not meeting regulatory requirements
Coliform Bacteria	3,882	8	0.21%	0	0%
E.Coli	3,882	1	0.03%	1	1.27%

*95% samples shall not contain coliforms; 100% shall not contain *E.coli*

Table 4.3c: Summary of Samples taken from Consumers' Taps in the Islands

Parameter	Number of Tests	Number exceeding standards	% of fails	No. of Zones not meeting regulatory requirements	Compliance (%)
Coliform Bacteria	482	6	1.24%	3	99.01%
E. coli	482	1	0%	1	99%
Colour	204	1	0.49%	1	99.44%
Turbidity	203	0	0%	0	100%
Hydrogen ion (pH)	203	0	0%	0	100%
Aluminium	203	0	0%	0	100%
Iron	203	2	0.99%	2	99.35%
Manganese	203	1	0.49%	1	99.91%
Lead	147	0	0%	0	100%
Total Trihalomethanes	148	10	6.76%	6	93.89%
Other Parameters	5,572	0	0%	0	100%
All Parameters	**8,050**	**21**	**0.26%**	**7**	**99.80%**

Table 4.3d: Distribution Maintenance Index – Zones in the Islands not Scoring 100%

Water Supply Zone Name	MZC Iron	MZC Manganese	MZC Turbidity	DMI
Tarbert Western Isles Zone	75.00%	100%	100%	**91.67%**
Kirbister Orkney Zone	95.83%	95.83%	100%	**97.22%**
Islands Region Mean DMI	**99.35%**	**99.91%**	**100%**	**99.75%**

There were no failures of microbiological standards at water treatment works in the islands in 2010 and whilst there was a significant improvement in the compliance of samples taken from service reservoirs, this was offset by a poorer performance at consumers' taps.

In contrast, there was a marked improvement in compliance with the various standards for chemical parameters. 14 failures were recorded in 2010 against 38 last year. The improving situation is reflected in *Table 4.3d* which lists just two zones scoring badly in the Islands. These are different zones to the six recorded in 2009, emphasising the improvements made - principally on the Western Isles.

Ten of the chemical failures were against the standard for THMs with these occurring evenly across the three island groups. This is a better performance than last year but still reflects the ongoing challenges faced by Scottish Water to adequately remove organic materials from the raw water supplies. The investment in new treatment processes and equipment will hopefully lead to a more marked improvement in 2011.

The 586 consumer contacts from the islands in 2010 represented a 33% decrease on the 2009 figure. This level of complaint is similar to the situation in 2008 and discolouration contacts continued to account for two thirds of the total number. The main hotspots were Kirbister supply zone in Orkney and the Ness and Stornoway water supply zones in the Western Isles.

Within all the island supply zones, Kirbister presented the greatest number of consumer issues for Scottish Water and this bears out its presence within the DMI index.

The other main reason consumers contacted Scottish Water in 2010 was chlorine taste and odour with around half of the 73 contacts arising in three zones – Stornoway, West Lewis and Lerwick.

4.4 Drinking Water Quality in the North East Waterwatch Panel Area

Water Quality Data

Table 4.4a: Samples Taken from Water Treatment Works Supplying the North East

Parameter	Number of tests	Number exceeding standard	% exceeding standard	No. WTW not meeting regulatory requirements	% WTW not meeting regulatory requirements
Coliform Bacteria	4,820	9	0.19%	7	26.92%
E.Coli	4,820	3	0.06%	3	11.54%
Nitrite	587	2	0.34%	1	3.85%
Turbidity	1,918	5	0.26%	5	19.23%

Table 4.4b: Summary of Samples taken from Service Reservoirs in the North East

Parameter	Number of tests	No. containing coliforms or *E.coli*	% exceeding standard	No. service reservoirs not meeting regulatory requirements*	% service reservoirs not meeting regulatory requirements
Coliform Bacteria	11,639	25	0.21%	2	0.80%
E.Coli	11,639	3	0.03%	3	1.20%

*95% samples shall not contain coliforms; 100% shall not contain *E.coli*

Table 4.4c: Summary of Samples taken from Consumers' Taps in the North East

Parameter	Number of Tests	Number exceeding standards	% of fails	No. of Zones not meeting regulatory requirements	Compliance (%)
Coliform Bacteria	2,907	23	0.79%	16	99.37%
E. coli	2,907	0	0%	0	100%
Colour	1,021	1	0.10%	1	99.96%
Turbidity	1,020	1	0.10%	1	99.87%
Hydrogen ion (pH)	1,020	1	0.10%	1	98.39%
Aluminium	1,021	0	0%	0	100%
Iron	1,021	8	0.78%	5	99.45%
Manganese	1,021	3	0.29%	3	99.83%
Lead	213	2	0.94%	2	98.79%
Total Trihalomethanes	213	1	0.47%	1	99.60%
Other Parameters	12,758	7	0.05%	5	99.96%
All Parameters	**25,122**	**47**	**0.19%**	**23**	**99.86%**

Table 4.4d: Distribution Maintenance Index – Zones in the North East not Scoring 100%

Water Supply Zone Name	MZC Iron	MZC Manganese	MZC Turbidity	DMI
Mannofield East Zone	92.31%	98.08%	100%	**96.79%**
Whitehillocks Zone	95.83%	100%	95.83%	**97.22%**
Lintrathen Zone	98.68%	98.68%	100%	**99.12%**
Glendevon B Zone	98.08%	100%	100%	**99.36%**
Mannofield South Zone	98.08%	100%	100%	**99.36%**
Turret C Zone	100%	98.08%	100%	**99.36%**
North East Region - Mean DMI	**99.45%**	**99.83%**	**99.87%**	**99.72%**

Whilst overall microbiological compliance across the North East remained similar to 2009, performance at each stage of monitoring varied. At treatment works, 12 tests failed to meet the standards compared to six last year and these occurred at an increased number of WTWs. At service reservoirs, a significant reduction in the number of failing tests – 65 in 2009 against 28 this year, is perhaps in part, reflective of the number of reservoirs taken out of service during the year, meaning that the total number of samples required was reduced. Within the supply zone itself, a slightly better performance was achieved at consumer's taps.

For the chemical parameters, iron was responsible for the largest number of non-compliant samples. In 2010 there was a marked improvement in compliance with the various standards for chemical parameters when compared with 2009. 24 failures were recorded in 2010 against 65 last year. The improving situation is reflected in *Table 4.4d* which lists six zones. This was a reduction from nine last year and most of those featuring again in the list have an improved score.

During 2010 there were a total of 4,428 consumer contacts about water quality in the North East. This was an increase of around 12% on last years levels. Of those contacts, discoloured water was by far the biggest cause for concern, accounting for almost two thirds of all contacts.

Particular hotspots for discolouration were the Laurencekirk and Brechin areas supplied from Whitehillocks WTW, the Peterhead area supplied from Forehill WTW and the Dunfermline and Cowdenbeath areas supplied from Glendevon WTW. Scottish Water has commenced an extensive programme of mains rehabilitation in the Whitehillocks supply zone to address quality issues there. The complaints from Forehill mostly arose from a specific issue at the treatment works that has now been resolved.

Milky or cloudy water was the next most significant issue accounting for over 12% of contacts. Together with discolouration problems, it can point towards deficiencies in the configuration of distribution networks and valves and control of activity on the networks.

4.5 Drinking Water Quality in the South East Waterwatch Panel Area

Water Quality Data

Table 4.5a: Samples Taken from Water Treatment Works Supplying the South East

Parameter	Number of tests	Number exceeding standard	% exceeding standard	No. WTW not meeting regulatory requirements	% WTW not meeting regulatory requirements
Coliform Bacteria	10,087	18	0.18%	12	21.43%
E. coli	10,087	3	0.03%	3	5.36%
Nitrite	1,022	0	0%	0	0%
Turbidity	3,843	12	0.31%	10	17.86%

Table 4.5b: Summary of Samples taken from Service Reservoirs in the South East

Parameter	Number of tests	No. containing coliforms or *E.coli*	% exceeding standard	No. service reservoirs not meeting regulatory requirements*	% service reservoirs not meeting regulatory requirements
Coliform Bacteria	15,024	29	0.19%	0	0.00%
E. coli	15,024	3	0.02%	3	0.93%

*95% samples shall not contain coliforms; 100% shall not contain *E.coli*

Table 4.5c: Summary of Samples taken from Consumers' Taps in the South East

Parameter	Number of Tests	Number exceeding standards	% of fails	No. of Zones not meeting regulatory requirements	Compliance (%)
Coliform Bacteria	5,387	23	0.43%	19	99.40%
E. coli	5,387	0	0%	0	100%
Colour	1,968	0	0%	0	100%
Turbidity	1,968	0	0%	0	100%
Hydrogen ion (pH)	1,968	3	0.15%	3	99.24%
Aluminium	1,938	7	0.36%	5	99.75%
Iron	1,938	14	0.72%	10	99.43%
Manganese	1,938	13	0.67%	8	99.44%
Lead	468	3	0.64%	3	98.26%
Total Trihalomethanes	477	3	0.63%	2	99.48%
Other Parameters	25,651	14	0.05%	10	99.97%
All Parameters	**49,088**	**80**	**0.16%**	**38**	**99.87%**

Table 4.5d: Distribution Maintenance Index – Zones in the South East not Scoring 100%

Water Supply Zone Name	MZC Iron	MZC Manganese	MZC Turbidity	DMI
Roberton Zone	95.83%	87.50%	100%	**94.44%**
Lochinvar Zone	95.83%	91.67%	100%	**95.83%**
Rawburn Zone	91.30%	100%	100%	**97.10%**
Afton Zone	100%	91.67%	100%	**97.22%**
Penwhirn Zone	91.67%	100%	100%	**97.22%**
Turret/Balmore/Carron Valley Zone	100%	95.83%	100%	**98.61%**
Marchbank B Zone	96.00%	100%	100%	**98.67%**
Carron Valley B Zone	96.43%	100%	100%	**98.81%**
Castle Moffat Zone	97.22%	100%	100%	**99.07%**
Turret A Zone	100%	97.22%	100%	**99.07%**
Lintrathen Zone	98.68%	98.68%	100%	**99.12%**
Balmore F Zone	98.04%	100%	100%	**99.35%**
Glendevon B Zone	98.08%	100%	100%	**99.36%**
Turret C Zone	100%	98.08%	100%	**99.36%**
Carron Valley A Zone	100%	98.68%	100%	**99.56%**
South East Region - Mean DMI	**99.43%**	**99.44%**	**100%**	**99.62%**

Compliance at water treatment works in the South East remained similar to 2009, with the exception of turbidity where 12 failures of the treatment standard were recorded in 2010 compared with four the previous year. As these failures occurred at ten different works it is hard to pinpoint a common cause. Performance at storage points deteriorated slightly, with three samples containing *E.coli* at three different reservoirs.

At consumers' taps, compliance with a number of standards deteriorated; notably coliforms, aluminium, iron and manganese. There was a significant improvement in THM compliance with only three failures following efforts by Scottish Water in this respect. *Table 4.5d* details compliance for the main standards that cause discolouration. Overall this has improved in the South East. Scottish Water attributed the poor compliance for manganese in Roberton Zone in the Borders as being due to unusually cold conditions at the start and end of the year that led to the source being frozen for lengthy periods, increasing the amount of soluble manganese passing through the treatment process.

4,846 consumer contacts relating to water quality in the South East area were received by Scottish Water in 2010. 60% of these related to discoloured water. Some of the water supply zones served by Daer and Camps WTWs in Lanarkshire recorded the most significant number of contacts regarding discolouration. Work is underway to rehabilitate iron water mains in these areas. Marchbank A Supply Zone in the Livingston area recorded 58 contacts about the taste of chlorine. Black Esk supply zone to the East of Dumfries generated 28 contacts about an earthy taste.

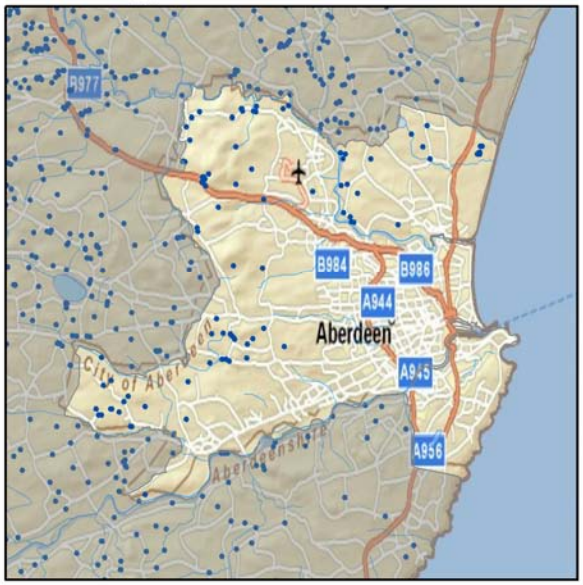
5. Drinking Water Quality by Local Authority

Key to Local Authority maps:

Aberdeen City Council

Public Supplies

Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	792	8	1.01	4	99.19
E. coli	792	0	0	0	100
Colour	275	0	0	0	100
Turbidity	275	0	0	0	100
Hydrogen ion (pH)	275	0	0	0	100
Aluminium	276	0	0	0	100
Iron	276	5	1.81	2	98.63
Manganese	276	1	0.36	1	99.73
Lead	56	0	0	0	100
Total Trihalomethanes	56	0	0	0	100
Other Parameters	3,878	4	0.10	3	99.94
All Parameters	**7,227**	**18**	**0.25**	**7**	**99.90**

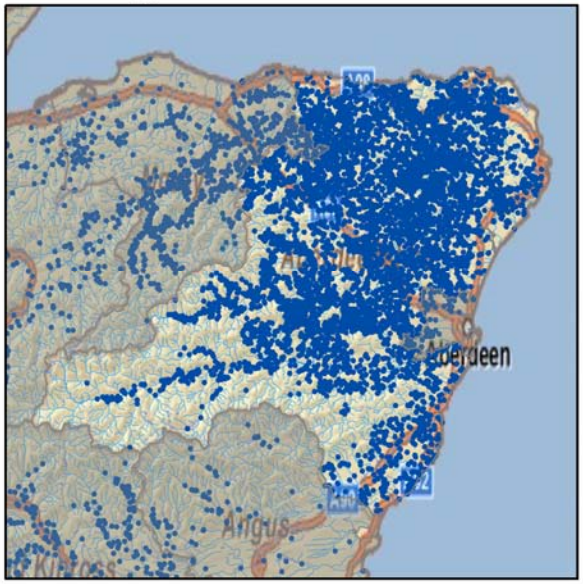
Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	9	11.11	88.89	1	100	0
E. coli	9	0	100	1	0	100
Colour	9	0	100	1	0	100
Turbidity	9	0	100	1	0	100
Hydrogen ion (pH)	9	55.56	44.44	1	0	100
Aluminium	-	-	-	-	-	-
Iron	9	0	100	1	0	100
Manganese	9	0	100	1	0	100
Lead (25)	9	0	100	1	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	81	11.11	88.89	9	11.11	88.89
All Parameters	**153**	**9.80**	**90.20**	**17**	**11.76**	**88.24**

Aberdeenshire Council

Public Supplies

Private Supplies



Quality of the Public Water Supply

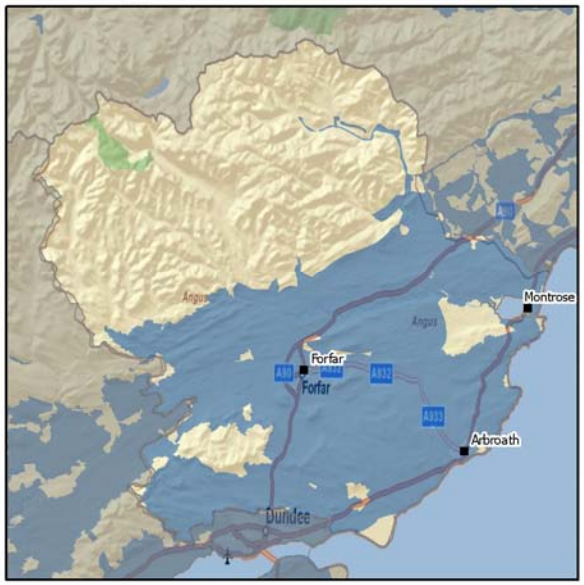
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,395	13	0.93	7	99.51
E. coli	1,395	0	0.00	0	100.00
Colour	497	0	0.00	0	100.00
Turbidity	496	1	0.20	1	99.79
Hydrogen ion (pH)	496	1	0.20	1	97.50
Aluminium	498	0	0.00	0	100.00
Iron	498	7	1.41	4	99.25
Manganese	498	2	0.40	2	99.84
Lead	129	1	0.78	1	98.75
Total Trihalomethanes	129	1	0.78	1	99.38
Other Parameters	7,390	7	0.09	5	99.94
All Parameters	**13,421**	**33**	**0.25**	**14**	**99.82**

Quality of Private Water Supplies

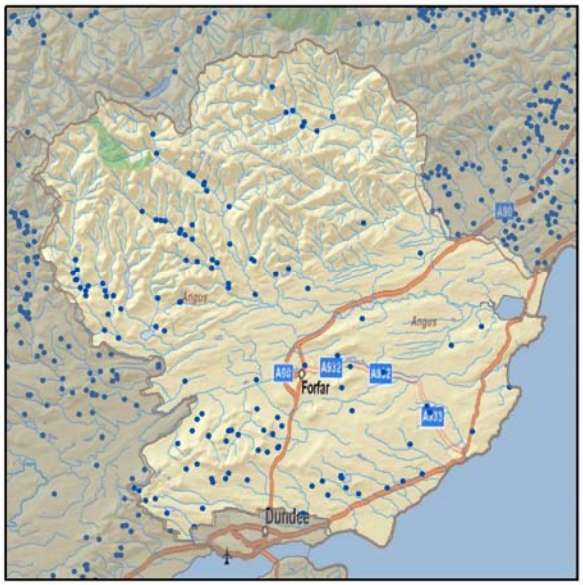
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	205	27.32	72.68	429	44.29	55.71
E. coli	204	11.27	88.73	424	16.51	83.49
Colour	170	7.65	92.35	6	0	100
Turbidity	194	3.61	96.39	385	4.94	95.06
Hydrogen ion (pH)	202	30.20	69.80	463	38.44	61.56
Aluminium	3	33.33	66.67	-	-	-
Iron	194	7.22	92.78	386	8.29	91.71
Manganese	193	7.25	92.75	385	8.05	91.95
Lead (25)	194	3.61	96.39	393	3.82	96.18
Total Trihalomethanes	2	0	100	-	-	-
Other Parameters	4,866	1.34	98.66	1,388	8.07	91.93
All Parameters	**6,427**	**4.06**	**95.94**	**4,259**	**15.19**	**84.81**

Angus Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	720	4	0.56	3	99.55
E. coli	720	0	0	0	100
Colour	252	1	0.40	1	99.67
Turbidity	252	1	0.40	1	98.96
Hydrogen ion (pH)	252	0	0	0	100
Aluminium	252	0	0	0	100
Iron	252	2	0.79	2	98.63
Manganese	252	1	0.40	1	99.67
Lead	32	0	0	0	100
Total Trihalomethanes	32	0	0	0	100
Other Parameters	2,319	0	0	0	100
All Parameters	**5,335**	**9**	**0.17**	**4**	**99.92**

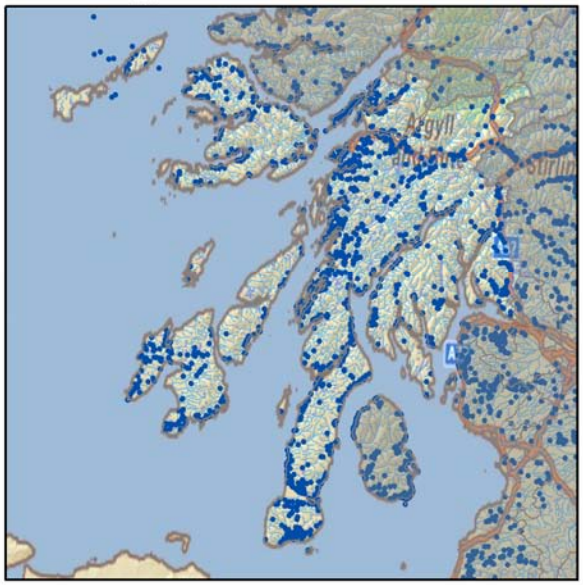
Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	11	100	0	6	100	0
E. coli	11	0	100	6	33.33	66.67
Colour	8	0	100	3	33.33	66.67
Turbidity	7	0	100	5	0	100
Hydrogen ion (pH)	8	0	100	6	0	100
Aluminium	-	-	-	-	-	-
Iron	3	0	100	2	0	100
Manganese	2	0	100	1	0	100
Lead (25)	4	0	100	5	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	154	4.55	95.45	80	3.75	96.25
All Parameters	**208**	**8.65**	**91.35**	**114**	**10.53**	**89.47**

Argyll and Bute Council

Public Supplies

Private Supplies



Quality of the Public Water Supply

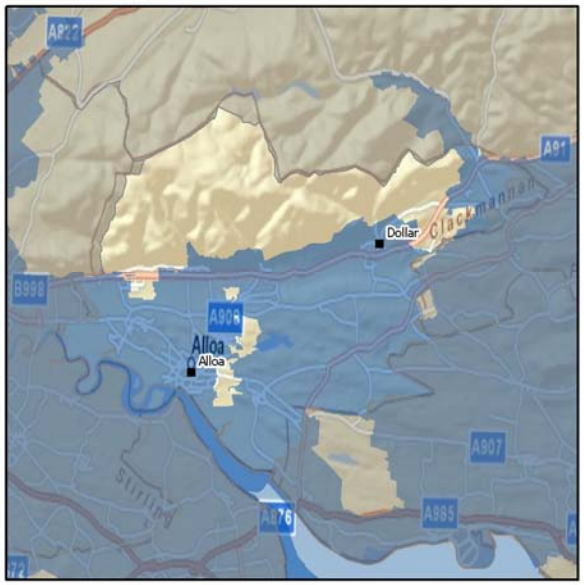
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	611	1	0.16	1	99.89
E. coli	611	0	0	0	100
Colour	249	0	0	0	100
Turbidity	250	0	0	0	100
Hydrogen ion (pH)	250	1	0.40	1	99.32
Aluminium	247	1	0.40	1	99.32
Iron	247	0	0	0	100
Manganese	247	1	0.40	1	99.89
Lead	152	1	0.66	1	99.32
Total Trihalomethanes	154	10	6.49	5	94.93
Other Parameters	5,882	1	0.02	1	99.98
All Parameters	**8,900**	**16**	**0.17**	**10**	**99.82**

Quality of Private Water Supplies

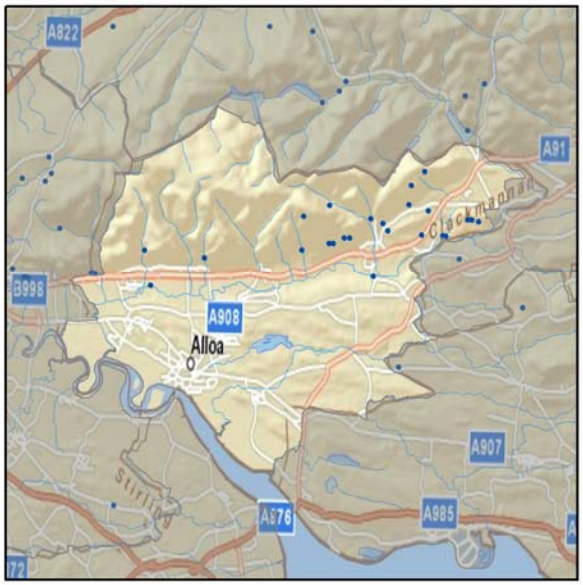
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	198	37.88	62.12	103	40.78	59.22
E. coli	200	28.50	71.50	102	22.55	77.45
Colour	169	28.99	71.01	16	18.75	81.25
Turbidity	187	6.42	93.58	90	3.33	96.67
Hydrogen ion (pH)	238	14.29	85.71	101	19.80	80.20
Aluminium	148	3.38	96.62	19	15.79	84.21
Iron	156	29.49	70.51	62	16.13	83.87
Manganese	155	9.68	90.32	61	16.39	83.61
Lead (25)	174	8.05	91.95	95	6.32	93.68
Total Trihalomethanes	7	28.57	71.43	2	50.00	50.00
Other Parameters	3,006	2.83	97.17	658	5.17	94.83
All Parameters	**4,638**	**8.50**	**91.50**	**1,309**	**11.84**	**88.16**

Clackmannanshire Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	492	2	0.41	2	99.64
E. coli	492	0	0	0	100
Colour	164	0	0	0	100
Turbidity	164	0	0	0	100
Hydrogen ion (pH)	164	0	0	0	100
Aluminium	164	0	0	0	100
Iron	164	0	0	0	100
Manganese	164	2	1.22	2	98.43
Lead	24	0	0	0	100
Total Trihalomethanes	24	0	0	0	100
Other Parameters	1,574	1	0.06	1	99.97
All Parameters	**3,590**	**5**	**0.16**	**3**	**99.94**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	26	3.85	96.15	3	33.33	66.67
E. coli	26	0	100	3	33.33	66.67
Colour	26	15.38	84.62	-	-	-
Turbidity	18	6	94.44	3	0	100
Hydrogen ion (pH)	27	0	100	3	0	100
Aluminium	2	0	100	-	-	-
Iron	11	36.36	63.64	-	-	-
Manganese	5	40.00	60.00	-	-	-
Lead (25)	-	-	-	-	-	-
Total Trihalomethanes	7	14	85.71	-	-	-
Other Parameters	299	3.34	96.66	45	2.22	97.78
All Parameters	**447**	**5.15**	**94.85**	**57**	**5.26**	**94.74**

Dumfries and Galloway Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

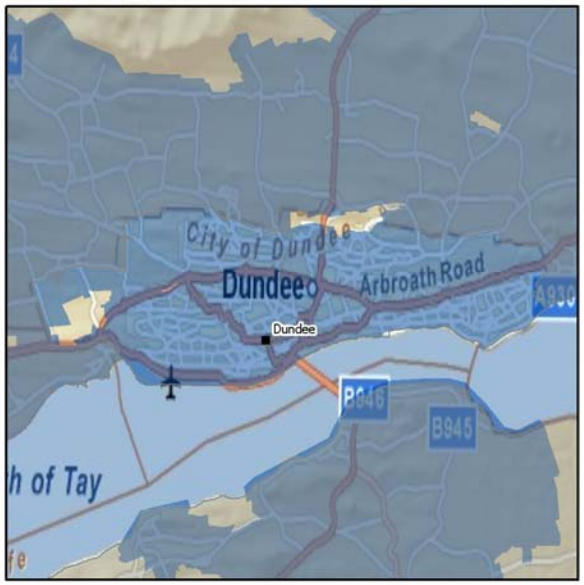
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	760	8	1.05	6	98.52
E. coli	760	0	0	0	100
Colour	290	0	0	0	100
Turbidity	290	0	0	0	100
Hydrogen ion (pH)	290	0	0	0	100
Aluminium	290	2	0.69	1	99.54
Iron	290	3	1.03	2	99.31
Manganese	290	5	1.72	2	99.07
Lead	105	1	0.95	1	94.44
Total Trihalomethanes	105	3	2.86	2	97.92
Other Parameters	4,645	2	0.04	2	99.97
All Parameters	**8,115**	**24**	**0.30**	**10**	**99.73**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	69	26.09	73.91	90	43.33	56.67
E. coli	69	14.49	85.51	90	26.67	73.33
Colour	57	7.02	92.98	75	10.67	89.33
Turbidity	62	3.23	96.77	75	1.33	98.67
Hydrogen ion (pH)	62	12.90	87.10	73	23.29	76.71
Aluminium	12	0	100	14	21.43	78.57
Iron	24	20.83	79.17	32	9.38	90.63
Manganese	18	11.11	88.89	22	9.09	90.91
Lead (25)	39	5.13	94.87	57	7.02	92.98
Total Trihalomethanes	2	0	100	2	0	100
Other Parameters	692	1.45	98.55	878	2.39	97.61
All Parameters	**1,106**	**5.52**	**94.48**	**1,408**	**8.66**	**91.34**

Dundee City Council

Public Supplies



Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	444	3	0.68	2	99.34
E. coli	444	0	0	0	100
Colour	152	1	0.66	1	99.34
Turbidity	152	0	0	0	100
Hydrogen ion (pH)	152	0	0	0	100
Aluminium	152	0	0	0	100
Iron	152	0	0	0	100
Manganese	152	0	0	0	100
Lead	16	0	0	0	100
Total Trihalomethanes	16	0	0	0	100
Other Parameters	1,303	0	0	0	100
All Parameters	**3,135**	**4**	**0.13**	**2**	**99.97**

Quality of Private Water Supplies

Dundee City has one Type B supply which was not sampled during 2010.

East Ayrshire Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

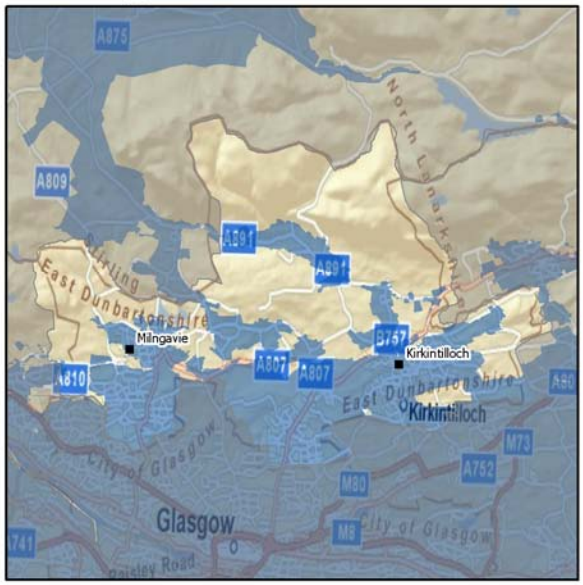
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,164	10	0.86	5	99.32
E. coli	1,164	1	0.09	1	99.91
Colour	412	0	0.0	0	100
Turbidity	412	0	0.0	0	100
Hydrogen ion (pH)	412	1	0.24	1	99.17
Aluminium	412	3	0.73	2	99.54
Iron	412	5	1.21	4	98.84
Manganese	412	9	2.18	6	97.18
Lead	80	0	0.0	0	100
Total Trihalomethanes	80	11	13.75	6	86.25
Other Parameters	4,417	0	0.0	0	100
All Parameters	**9,377**	**40**	**0.43**	**9**	**99.56**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	10	40.00	60.00	37	59.46	40.54
E. coli	10	40.00	60.00	36	36.11	63.89
Colour	9	0	100	-	-	-
Turbidity	10	0	100	34	11.76	88.24
Hydrogen ion (pH)	10	0	100	34	23.53	76.47
Aluminium	1	0	100	5	0	100
Iron	4	25.00	75.00	5	20.00	80.00
Manganese	4	50.00	50.00	6	33.33	66.67
Lead (25)	-	-	-	-	-	-
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	54	3.70	96.30	151	11.92	88.08
All Parameters	**112**	**11.61**	**88.39**	**308**	**22.08**	**77.92**

East Dunbartonshire Council

Public Supplies



Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,620	2	0.12	1	99.87
E. coli	1,620	0	0	0	100
Colour	576	0	0	0	100
Turbidity	576	0	0	0	100
Hydrogen ion (pH)	576	1	0.17	1	99.77
Aluminium	575	0	0	0	100
Iron	575	3	0.52	2	99.48
Manganese	575	0	0	0	100
Lead	104	1	0.96	1	98.96
Total Trihalomethanes	104	1	0.96	1	98.96
Other Parameters	6,101	0	0	0	100
All Parameters	**13,002**	**8**	**0.06**	**5**	**99.93**

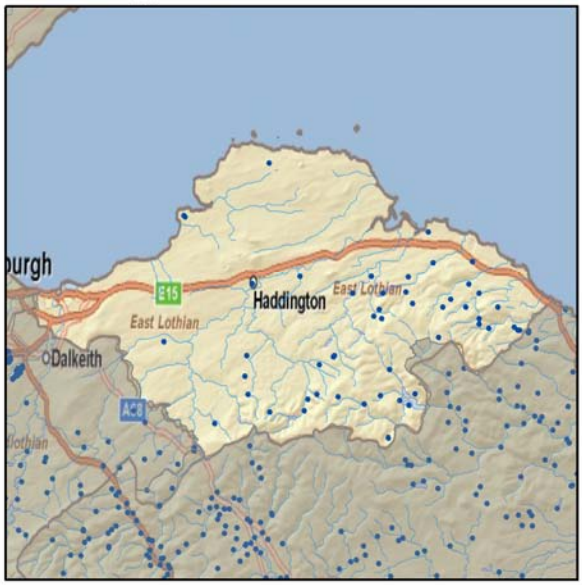
Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	-	-	-	2	0	100
E. coli	-	-	-	2	0	100
Colour	-	-	-	2	0	100
Turbidity	-	-	-	2	0	100
Hydrogen ion (pH)	-	-	-	-	-	-
Aluminium	-	-	-	-	-	-
Iron	-	-	-	-	-	-
Manganese	-	-	-	-	-	-
Lead (25)	-	-	-	-	-	-
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	-	-	-	2	0	100
All Parameters	**-**	**-**	**-**	**10**	**0**	**100**

East Lothian

Public Supplies

Private Supplies



Quality of the Public Water Supply

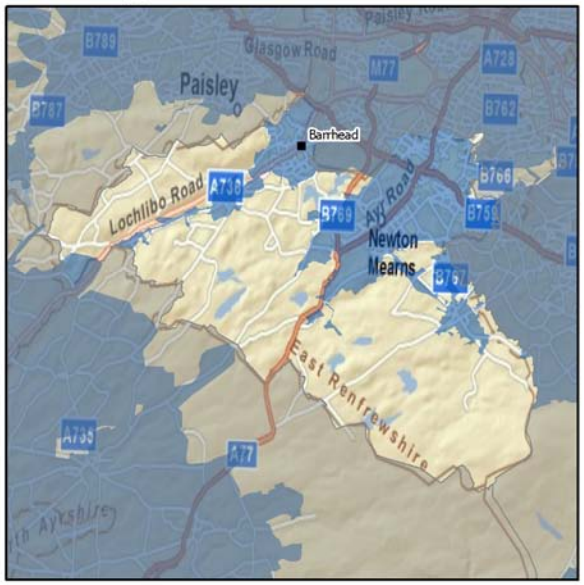
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	766	3	0.39	2	99.66
E. coli	766	0	0	0	100
Colour	254	0	0	0	100
Turbidity	254	0	0	0	100
Hydrogen ion (pH)	254	0	0	0	100
Aluminium	251	3	1.20	2	99.03
Iron	251	1	0.40	1	99.60
Manganese	251	0	0	0	100
Lead	49	1	2.04	1	98.21
Total Trihalomethanes	52	0	0	0	100
Other Parameters	3,161	0	0	0	100
All Parameters	**6,309**	**8**	**0.13**	**3**	**99.92**

Quality of Private Water Supplies

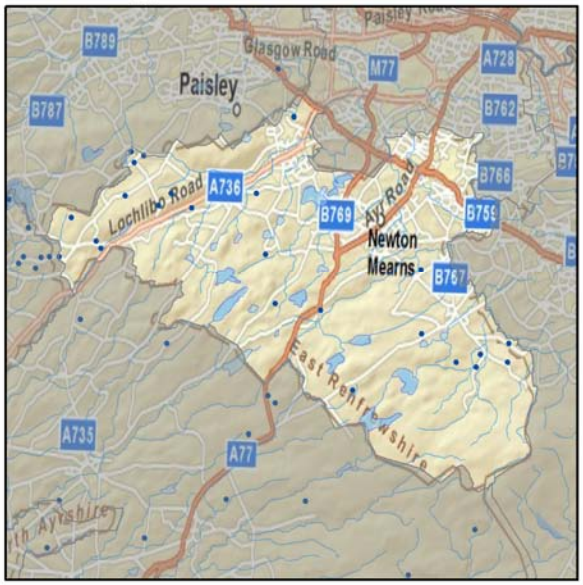
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	2	0	100	15	46.67	53.33
E. coli	2	0	100	15	40.00	60.00
Colour	2	0	100	4	0	100
Turbidity	2	0	100	13	0	100
Hydrogen ion (pH)	2	0	100	13	15.38	84.62
Aluminium	3	0	100	4	0	100
Iron	3	0	100	5	0	100
Manganese	3	0	100	5	40.00	60.00
Lead (25)	3	0	100	13	7.69	92.31
Total Trihalomethanes	-	-	-	3	0	100
Other Parameters	73	2.74	97.26	177	3.39	96.61
All Parameters	**95**	**2.11**	**97.89**	**267**	**8.99**	**91.01**

East Renfrewshire Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

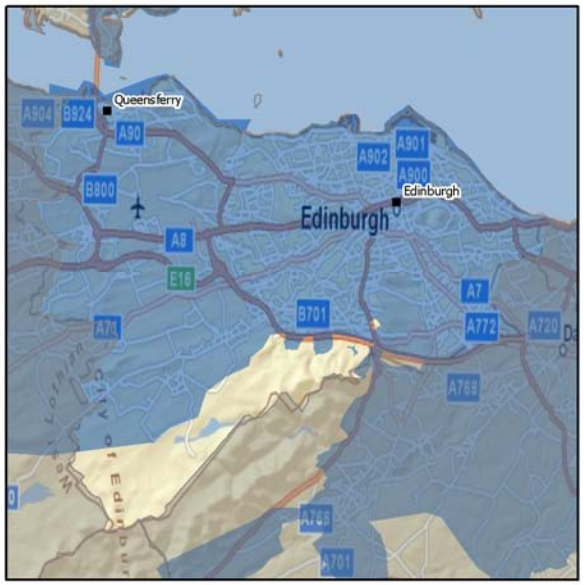
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	864	6	0.69	3	99.50
E. coli	864	0	0	0	100
Colour	320	0	0	0	100
Turbidity	320	0	0	0	100
Hydrogen ion (pH)	320	1	0.31	1	99.24
Aluminium	320	0	0	0	100
Iron	320	0	0	0	100
Manganese	320	1	0.31	1	99.24
Lead	88	0	0	0	100
Total Trihalomethanes	88	2	2.27	1	97.73
Other Parameters	4,255	0	0	0	100
All Parameters	**8,079**	**10**	**0.12**	**4**	**99.90**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	14	28.57	71.43	7	0	100
E. coli	14	14.29	85.71	7	0	100
Colour	3	0	100	-	-	-
Turbidity	3	0	100	5	40.00	60.00
Hydrogen ion (pH)	14	21.43	78.57	5	20.00	80.00
Aluminium	11	9.09	90.91	-	-	-
Iron	11	9.09	90.91	-	-	-
Manganese	11	18.18	81.82	-	-	-
Lead (25)	11	18.18	81.82	5	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	210	1.90	98.10	12	0	100
All Parameters	**302**	**6.29**	**93.71**	**41**	**7.32**	**92.68**

City of Edinburgh Council

Public Supplies



Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,844	4	0.22	3	99.81
E. coli	1,844	0	0	0	100
Colour	616	0	0	0	100
Turbidity	616	0	0	0	100
Hydrogen ion (pH)	616	1	0.16	1	99.85
Aluminium	610	4	0.66	3	99.37
Iron	610	3	0.49	2	99.54
Manganese	610	0	0	0	100
Lead	99	1	1.01	1	99.04
Total Trihalomethanes	104	0	0	0	100
Other Parameters	7,281	5	0.07	3	99.98
All Parameters	**14,850**	**18**	**0.12**	**8**	**99.93**

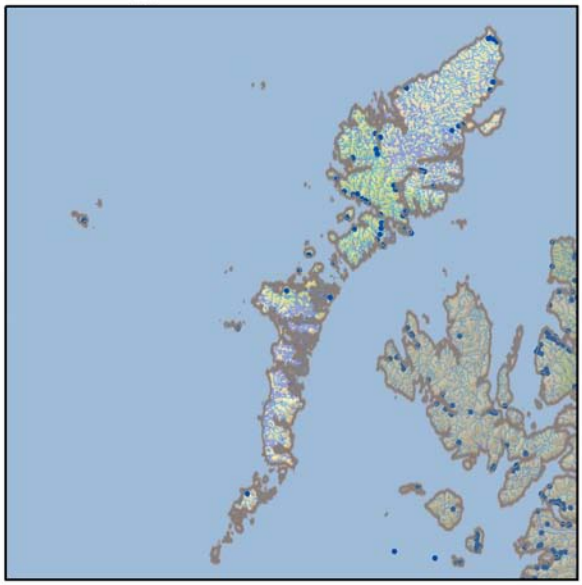
Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	2	0	100	1	100	0
E. coli	2	0	100	1	100	0
Colour	2	0	100	-	-	-
Turbidity	2	0	100	1	0	100
Hydrogen ion (pH)	2	0	100	1	0	100
Aluminium	2	0	100	-	-	-
Iron	2	0	100	-	-	-
Manganese	2	0	100	-	-	-
Lead (25)	2	0	100	1	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	46	10.87	89.13	4	0	100
All Parameters	**64**	**7.81**	**92.19**	**9**	**22.22**	**77.78**

Comhairle nan Eilean Siar

Public Supplies

Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	194	0	0	0	100
E. coli	194	0	0	0	100
Colour	74	1	1.35	1	98.75
Turbidity	73	0	0	0	100
Hydrogen ion (pH)	73	0	0	0	100
Aluminium	73	0	0	0	100
Iron	73	1	1.37	1	98.75
Manganese	73	0	0	0	100
Lead	62	0	0	0	100
Total Trihalomethanes	63	3	4.76	2	97.50
Other Parameters	2,292	0	0	0	100
All Parameters	**3,244**	**5**	**0.15**	**2**	**99.89**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	5	40.00	60.00	1	100	0
E. coli	5	20.00	80.00	1	100	0
Colour	6	33.33	66.67	-	-	-
Turbidity	6	0	100	1	0	100
Hydrogen ion (pH)	6	33.33	66.67	1	0	100
Aluminium	2	0	100	-	-	-
Iron	5	20.00	80.00	1	0	100
Manganese	5	20.00	80.00	1	0	100
Lead (25)	5	0	100	1	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	72	1.39	98.61	7	0	100
All Parameters	**117**	**8.55**	**91.45**	**14**	**14.29**	**85.71**

Falkirk Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

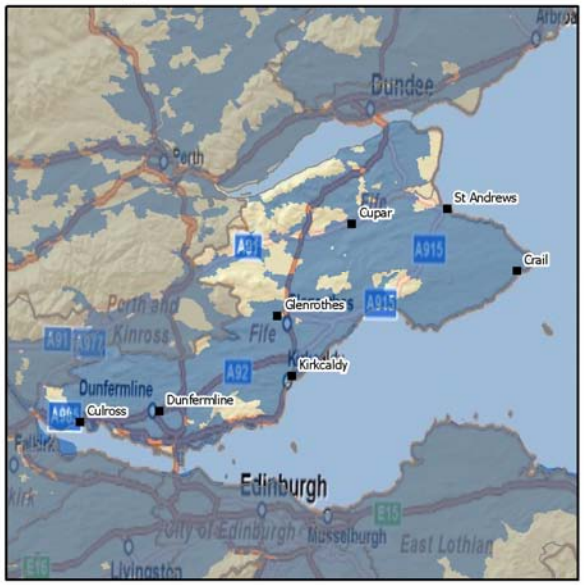
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,349	3	0.22	3	99.83
E. coli	1,349	0	0	0	100
Colour	499	0	0	0	100
Turbidity	499	0	0	0	100
Hydrogen ion (pH)	499	2	0.40	2	99.53
Aluminium	497	1	0.20	1	99.87
Iron	497	3	0.60	2	99.45
Manganese	497	4	0.80	4	98.98
Lead	87	0	0	0	100
Total Trihalomethanes	88	0	0	0	100
Other Parameters	5,246	1	0.02	1	99.99
All Parameters	**11,107**	**14**	**0.13**	**8**	**99.94**

Quality of Private Water Supplies

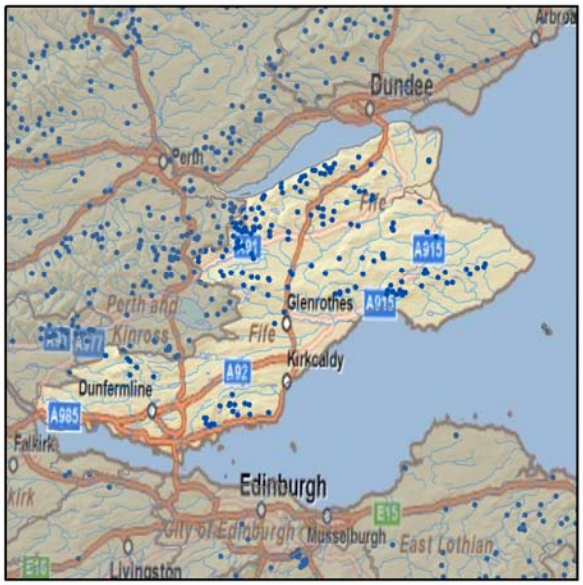
Falkirk Council did not report any samples during 2010.

Fife Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,068	7	0.66	7	99.07
E. coli	1,068	0	0	0	100
Colour	372	0	0	0	100
Turbidity	372	0	0	0	100
Hydrogen ion (pH)	372	0	0	0	100
Aluminium	371	0	0	0	100
Iron	371	1	0.27	1	99.79
Manganese	371	1	0.27	1	99.79
Lead	68	1	1.47	1	98.61
Total Trihalomethanes	68	0	0	0	100
Other Parameters	4,065	0	0	0	100
All Parameters	**8,566**	**10**	**0.12**	**6**	**99.94**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	26	15.38	84.62	24	54.17	45.83
E. coli	26	7.69	92.31	24	37.50	62.50
Colour	22	0	100	1	0	100
Turbidity	22	0	100	24	4.17	95.83
Hydrogen ion (pH)	24	0	100	24	0	100
Aluminium	21	0	100	1	0	100
Iron	20	5.00	95.00	2	0	100
Manganese	6	33.33	66.67	1	0	100
Lead (25)	12	0	100	24	16.67	83.33
Total Trihalomethanes	8	0	100	-	-	-
Other Parameters	753	3.32	96.68	124	9.68	90.32
All Parameters	**940**	**3.62**	**96.38**	**249**	**15.66**	**84.34**

Glasgow City Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	3,049	10	0.33	4	99.71
E. coli	3,049	0	0	0	100
Colour	1,073	0	0	0	100
Turbidity	1,073	0	0	0	100
Hydrogen ion (pH)	1,073	1	0.09	1	99.88
Aluminium	1,073	0	0	0	100
Iron	1,073	1	0.09	1	99.88
Manganese	1,073	8	0.75	1	99.54
Lead	180	1	0.56	1	99.46
Total Trihalomethanes	180	1	0.56	1	99.46
Other Parameters	10,868	0	0	0	100
All Parameters	**23,764**	**22**	**0.09**	**8**	**99.95**

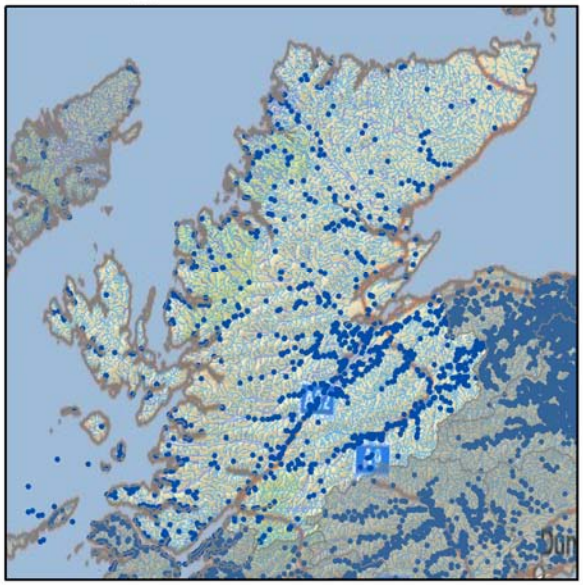
Quality of Private Water Supplies

Glasgow City does not have any Private Water Supplies.

Highland Council

Public Supplies

Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,264	4	0.32	4	99.62
E. coli	1,264	0	0	0	100
Colour	481	5	1.04	5	97.99
Turbidity	481	0	0	0	100
Hydrogen ion (pH)	481	2	0.42	2	98.85
Aluminium	480	1	0.21	1	99.90
Iron	480	4	0.83	3	99.07
Manganese	480	0	0	0	100
Lead	296	1	0.34	1	98.85
Total Trihalomethanes	295	26	8.81	17	88.22
Other Parameters	11,784	10	0.08	4	99.98
All Parameters	**17,786**	**53**	**0.30**	**28**	**99.59**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	554	31.41	68.59	103	62.14	37.86
E. coli	554	12.27	87.73	105	26.67	73.33
Colour	523	30.98	69.02	71	28.17	71.83
Turbidity	525	1.52	98.48	71	4.23	95.77
Hydrogen ion (pH)	529	16.64	83.36	70	31.43	68.57
Aluminium	1	0	100	4	0	100
Iron	116	25.86	74.14	29	31.03	68.97
Manganese	96	10.42	89.58	24	16.67	83.33
Lead (25)	92	6.52	93.48	58	8.62	91.38
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	4,411	2.29	97.71	780	3.97	96.03
All Parameters	**7,401**	**8.74**	**91.26**	**1,315**	**14.14**	**85.86**

Inverclyde Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

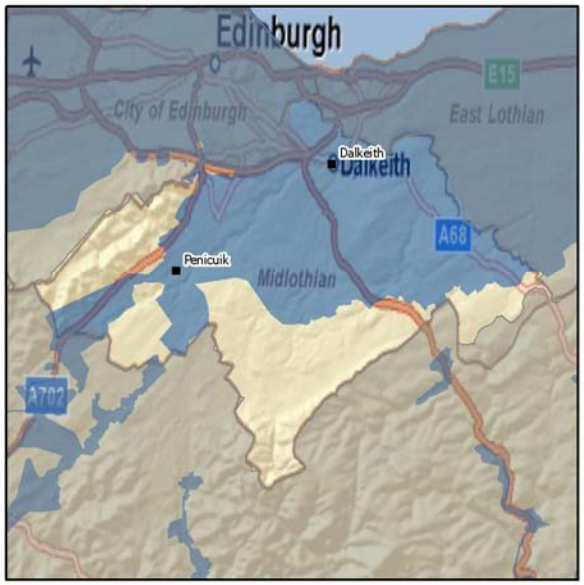
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	360	3	0.83	2	99.05
E. coli	360	0	0	0	100
Colour	124	0	0	0	100
Turbidity	124	0	0	0	100
Hydrogen ion (pH)	124	0	0	0	100
Aluminium	124	0	0	0	100
Iron	124	0	0	0	100
Manganese	124	0	0	0	100
Lead	32	0	0	0	100
Total Trihalomethanes	32	1	3.13	1	96.88
Other Parameters	1,600	0	0	0	100
All Parameters	**3,128**	**4**	**0.13**	**3**	**99.91**

Quality of Private Water Supplies

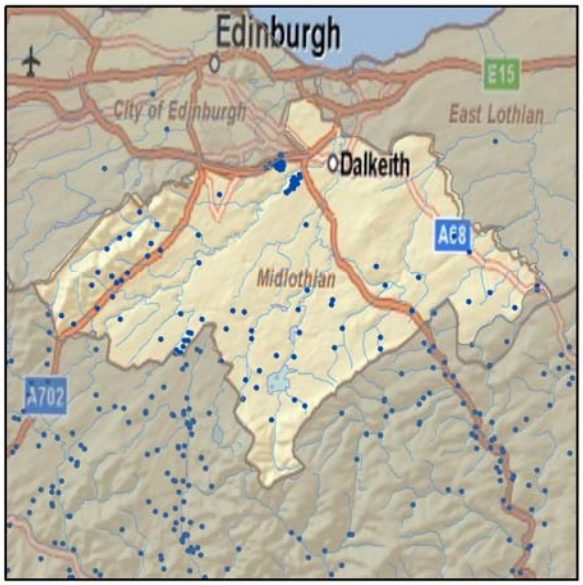
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	8	37.50	62.50	5	40.00	60.00
E. coli	8	25.00	75.00	5	20.00	80.00
Colour	7	14.29	85.71	-	-	-
Turbidity	8	0	100	3	0	100
Hydrogen ion (pH)	8	0	100	4	0	100
Aluminium	1	0	100	-	-	-
Iron	2	0	100	-	-	-
Manganese	1	0	100	-	-	-
Lead (25)	2	0	100	5	20.00	80.00
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	73	6.85	93.15	10	20.00	80.00
All Parameters	**118**	**9.32**	**90.68**	**32**	**18.75**	**81.25**

Midlothian Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

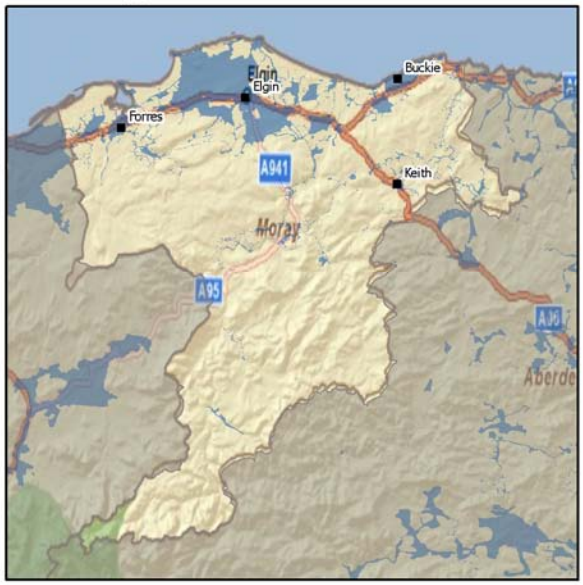
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	942	3	0.32	2	99.70
E. coli	942	0	0	0	100
Colour	326	0	0	0	100
Turbidity	326	0	0	0	100
Hydrogen ion (pH)	326	0	0	0	100
Aluminium	321	3	0.93	2	99.15
Iron	321	1	0.31	1	99.65
Manganese	321	0	0	0	100
Lead	61	1	1.64	1	98.44
Total Trihalomethanes	64	0	0	0	100
Other Parameters	4,042	2	0.05	1	99.99
All Parameters	**7,992**	**10**	**0.13**	**4**	**99.92**

Quality of Private Water Supplies

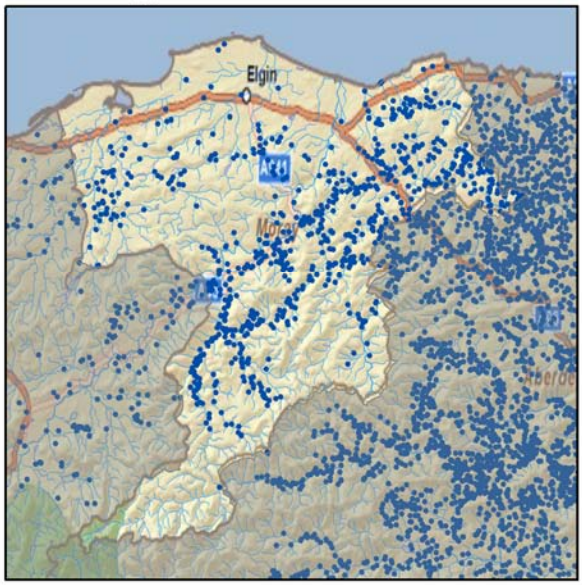
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	3	33.33	66.67	5	80.00	20.00
E. coli	3	33.33	66.67	5	40.00	60.00
Colour	3	0	100	4	0	100
Turbidity	3	33.33	66.67	5	20.00	80.00
Hydrogen ion (pH)	3	0	100	5	0	100
Aluminium	3	0	100	1	0	100
Iron	3	0	100	1	100.00	0.00
Manganese	-	-	-	1	0	100
Lead (25)	3	0	100	4	25.00	75.00
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	32	3.13	96.88	42	2.38	97.62
All Parameters	**56**	**7.14**	**92.86**	**73**	**13.70**	**86.30**

Moray Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	527	3	0.57	1	99.72
E. coli	527	0	0	0	100
Colour	185	0	0	0	100
Turbidity	184	0	0	0	100
Hydrogen ion (pH)	184	0	0	0	100
Aluminium	168	0	0	0	100
Iron	168	2	1.19	1	99.38
Manganese	168	0	0	0	100
Lead	60	0	0	0	100
Total Trihalomethanes	60	0	0	0	100
Other Parameters	3,124	10	0.32	4	99.79
All Parameters	**5,355**	**15**	**0.28**	**5**	**99.81**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	95	26.32	73.68	31	29.03	70.97
E. coli	95	9.47	90.53	32	21.88	78.13
Colour	85	10.59	89.41	3	33.33	66.67
Turbidity	88	0	100	63	3.17	96.83
Hydrogen ion (pH)	92	4.35	95.65	75	8.00	92.00
Aluminium	84	0	100	3	0	100
Iron	88	2.27	97.73	67	14.93	85.07
Manganese	82	2.44	97.56	64	12.50	87.50
Lead (25)	82	2.44	97.56	62	1.61	98.39
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	1,335	0.75	99.25	348	2.01	97.99
All Parameters	**2,126**	**2.96**	**97.04**	**748**	**6.82**	**93.18**

North Ayrshire Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	684	8	1.17	4	99.40
E. coli	684	1	0.15	1	99.88
Colour	224	0	0	0	100
Turbidity	224	0	0	0	100
Hydrogen ion (pH)	224	1	0.45	1	98.96
Aluminium	224	2	0.89	1	99.67
Iron	224	4	1.79	3	98.79
Manganese	224	5	2.23	4	97.75
Lead	52	0	0	0	100
Total Trihalomethanes	52	6	11.54	3	90.63
Other Parameters	2,689	0	0	0	100
All Parameters	**5,505**	**27**	**49.00**	**17**	**99.67**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	22	27.27	72.73	10	20.00	80.00
E. coli	22	9.09	90.91	10	20.00	80.00
Colour	13	7.69	92.31	2	0	100
Turbidity	19	0	100	10	10.00	90.00
Hydrogen ion (pH)	19	0	100	9	11.11	88.89
Aluminium	3	0	100	2	0	100
Iron	4	0	100	4	50.00	50.00
Manganese	3	0	100	3	33.33	66.67
Lead (25)	9	0	100	9	11.11	88.89
Total Trihalomethanes	-	-	-	1	0	100
Other Parameters	184	2.17	97.83	90	3.33	96.67
All Parameters	**298**	**4.36**	**95.64**	**150**	**8.67**	**91.33**

North Lanarkshire Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	2,227	9	0.40	6	99.67
E. coli	2,227	0	0	0	100
Colour	820	0	0	0	100
Turbidity	820	0	0	0	100
Hydrogen ion (pH)	820	3	0.37	3	99.48
Aluminium	818	1	0.12	1	99.92
Iron	818	4	0.49	3	99.52
Manganese	818	1	0.12	1	99.92
Lead	144	0	0	0	100
Total Trihalomethanes	144	0	0	0	100
Other Parameters	8,580	0	0	0	100
All Parameters	**18,236**	**18**	**0.10**	**11**	**99.97**

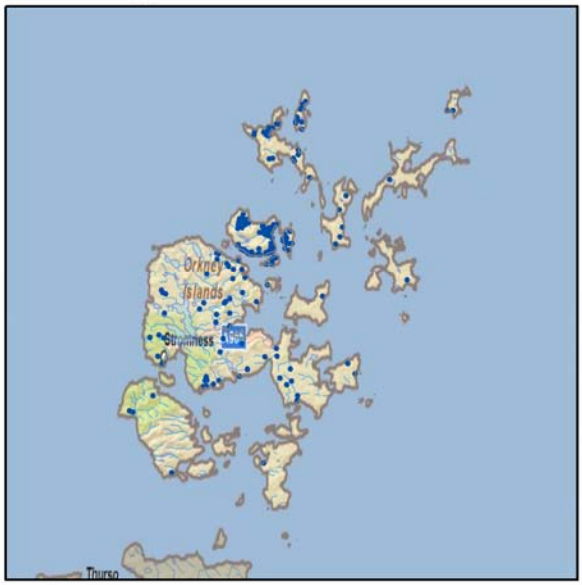
Quality of Private Water Supplies

North Lanarkshire Council did not report any samples during 2010.

Orkney Islands Council

Public Supplies

Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	136	4	2.94	1	99.07
E. coli	136	0	0	0	100
Colour	60	0	0	0	100
Turbidity	60	0	0	0	100
Hydrogen ion (pH)	60	0	0	0	100
Aluminium	60	0	0	0	100
Iron	60	1	1.67	1	99.65
Manganese	60	1	1.67	1	99.65
Lead	40	0	0	0	100
Total Trihalomethanes	40	3	7.50	2	95.83
Other Parameters	1,508	0	0	0	100
All Parameters	**2,220**	**9**	**0.41**	**2**	**99.87**

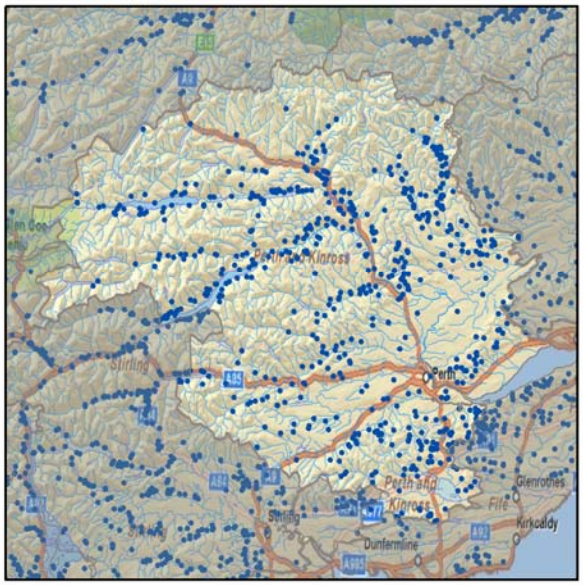
Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	19	47.37	52.63	24	58.33	41.67
E. coli	19	15.79	84.21	24	37.50	62.50
Colour	1	0	100	11	0	100
Turbidity	1	0	100	13	0	100
Hydrogen ion (pH)	1	0	100	13	0	100
Aluminium	1	0	100	9	0	100
Iron	1	0	100	9	0	100
Manganese	1	0	100	11	9.09	90.91
Lead (25)	1	0	100	13	0	100
Total Trihalomethanes	1	0	100	9	0	100
Other Parameters	123	2.44	97.56	538	1.67	98.33
All Parameters	**169**	**8.88**	**91.12**	**674**	**4.90**	**95.10**

Perth and Kinross Council

Public Supplies

Private Supplies



Quality of the Public Water Supply

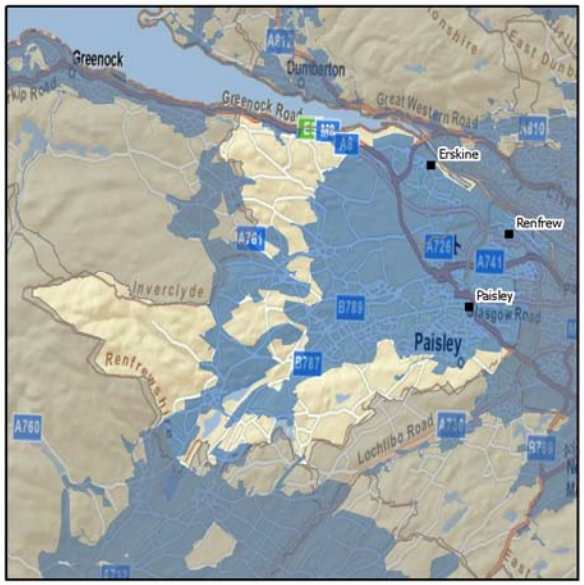
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,500	9	0.60	8	99.18
E. coli	1,500	0	0	0	100
Colour	532	0	0	0	100
Turbidity	532	0	0	0	100
Hydrogen ion (pH)	532	0	0	0	100
Aluminium	531	0	0	0	100
Iron	531	2	0.38	2	99.78
Manganese	531	3	0.56	3	99.60
Lead	104	1	0.96	1	99.17
Total Trihalomethanes	104	0	0	0	100
Other Parameters	5,994	5	0.08	3	99.93
All Parameters	**12,391**	**20**	**0.16**	**11**	**99.90**

Quality of Private Water Supplies

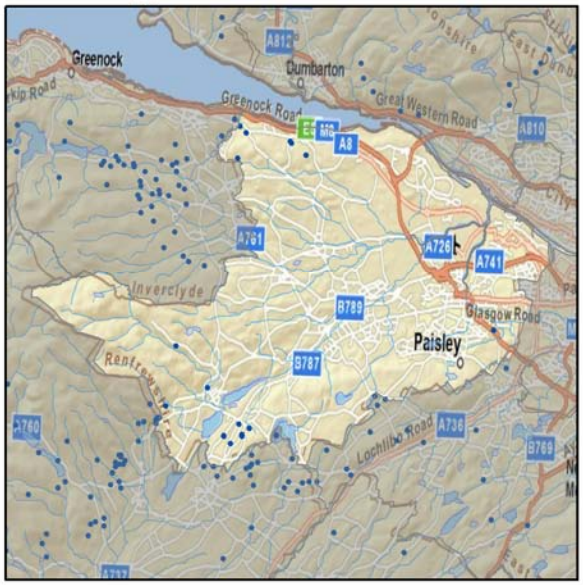
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	241	21.58	78.42	88	32.95	67.05
E. coli	241	16.18	83.82	88	21.59	78.41
Colour	230	17.39	82.61	4	25.00	75.00
Turbidity	235	1.70	98.30	76	1.32	98.68
Hydrogen ion (pH)	235	16.60	83.40	81	16.05	83.95
Aluminium	27	3.70	96.30	4	0	100
Iron	46	19.57	80.43	14	21.43	78.57
Manganese	32	12.50	87.50	7	14.29	85.71
Lead (25)	45	13.33	86.67	76	17.11	82.89
Total Trihalomethanes	24	4.17	95.83	-	-	-
Other Parameters	2,410	1.95	98.05	335	7.16	92.84
All Parameters	**3,766**	**6.43**	**93.57**	**773**	**13.45**	**86.55**

Renfrewshire Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

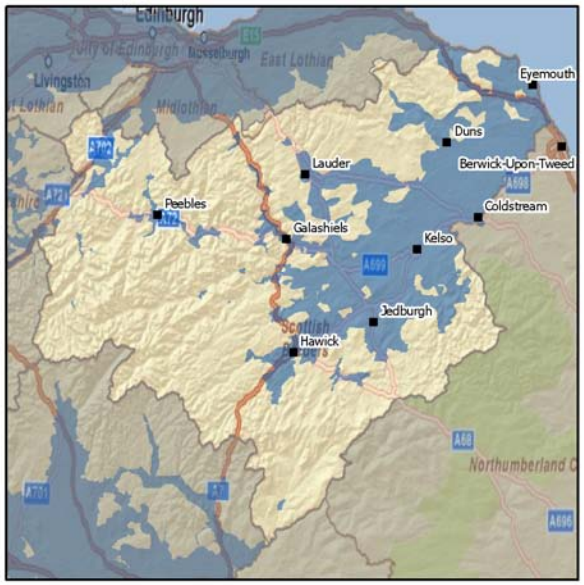
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,260	1	0.08	1	99.92
E. coli	1,260	1	0.08	1	99.92
Colour	448	0	0	0	100
Turbidity	447	0	0	0	100
Hydrogen ion (pH)	447	1	0.22	1	99.24
Aluminium	448	0	0	0	100
Iron	448	1	0.22	1	99.75
Manganese	448	10	2.23	3	98.03
Lead	88	0	0	0	100
Total Trihalomethanes	88	4	4.55	3	95.45
Other Parameters	4,903	0	0	0	100
All Parameters	**10,285**	**18**	**0.18**	**5**	**99.83**

Quality of Private Water Supplies

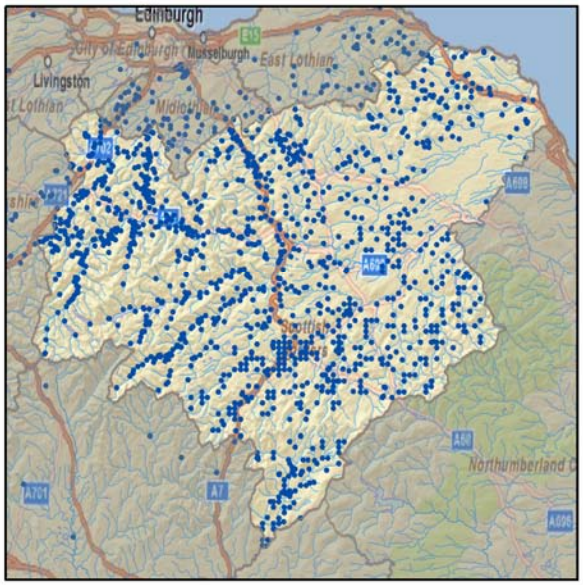
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	6	0	100	8	62.50	37.50
E. coli	6	0	100	8	50.00	50.00
Colour	-	-	-	-	-	-
Turbidity	-	-	-	5	0	100
Hydrogen ion (pH)	6	16.67	83.33	5	0	100
Aluminium	6	0	100	-	-	-
Iron	6	0	100	-	-	-
Manganese	6	0	100	-	-	-
Lead (25)	6	0	100	6	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	120	3.33	96.67	25	16.00	84.00
All Parameters	**162**	**3.09**	**96.91**	**57**	**22.81**	**77.19**

Scottish Borders Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

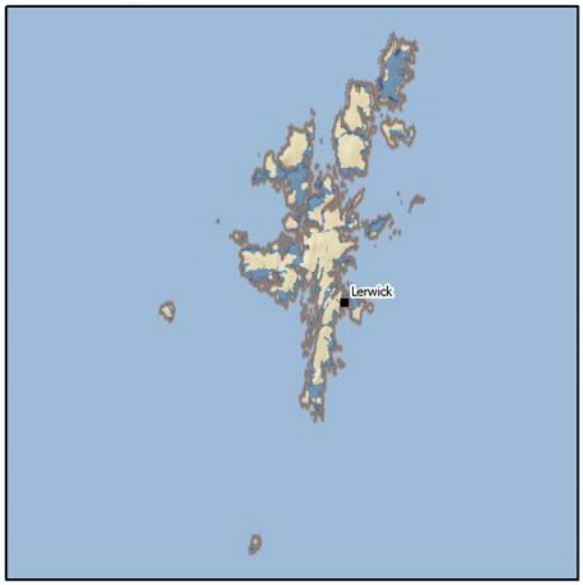
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	621	3	0.48	2	99.87
E. coli	621	0	0	0	100
Colour	251	0	0	0	100
Turbidity	251	0	0	0	100
Hydrogen ion (pH)	251	1	0.40	1	97.22
Aluminium	228	2	0.88	1	99.78
Iron	228	4	1.75	3	99.13
Manganese	228	3	1.32	1	99.31
Lead	95	0	0	0	100
Total Trihalomethanes	100	0	0	0	100
Other Parameters	4,349	2	0.05	2	99.99
All Parameters	**7,223**	**15**	**0.21**	**5**	**99.89**

Quality of Private Water Supplies

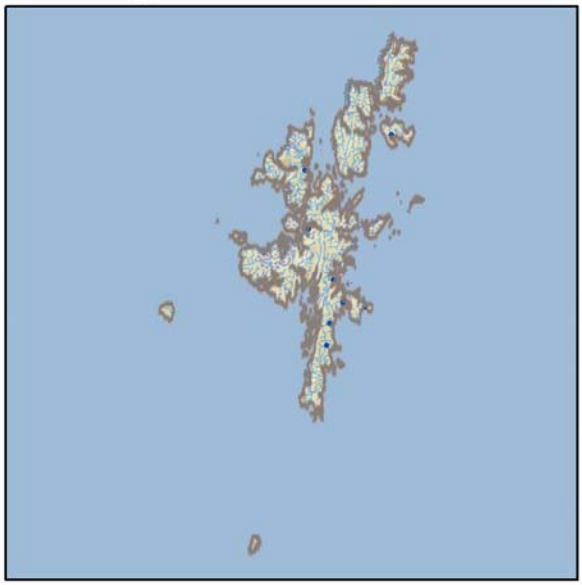
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	67	28.36	71.64	88	44.32	55.68
E. coli	67	22.39	77.61	88	26.14	73.86
Colour	62	0	100	38	5.26	94.74
Turbidity	63	0	100	78	2.56	97.44
Hydrogen ion (pH)	64	6.25	93.75	82	15.85	84.15
Aluminium	9	0	100	7	0	100
Iron	9	0	100	7	0	100
Manganese	9	11.11	88.89	7	0	100
Lead (25)	73	2.74	97.26	86	9.30	90.70
Total Trihalomethanes	4	0	100	-	-	-
Other Parameters	713	1.54	98.46	699	3.00	97.00
All Parameters	**1,140**	**4.56**	**95.44**	**1,180**	**9.15**	**90.85**

Shetland Islands Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	152	2	1.32	2	97.44
E. coli	152	1	0.66	1	98.08
Colour	70	0	0	0	100
Turbidity	70	0	0	0	100
Hydrogen ion (pH)	70	0	0	0	100
Aluminium	70	0	0	0	100
Iron	70	0	0	0	100
Manganese	70	0	0	0	100
Lead	45	0	0	0	100
Total Trihalomethanes	45	4	8.89	2	86.54
Other Parameters	1,772	0	0	0	100
All Parameters	**2,586**	**7**	**0.27**	**3**	**99.60**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	1	0	100	1	100	0
E. coli	1	0	100	1	100	0
Colour	-	-	-	-	-	-
Turbidity	1	0	100	-	-	-
Hydrogen ion (pH)	1	100	0	-	-	-
Aluminium	1	0	100	-	-	-
Iron	1	0	100	-	-	-
Manganese	1	0	100	-	-	-
Lead (25)	1	0	100	-	-	-
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	18	0.00	100.00	3	33.33	66.67
All Parameters	**26**	**3.85**	**96.15**	**5**	**60.00**	**40.00**

South Ayrshire Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	672	4	0.60	1	99.67
E. coli	672	0	0	0	100
Colour	228	0	0	0	100
Turbidity	228	0	0	0	100
Hydrogen ion (pH)	228	0	0	0	100
Aluminium	228	3	1.32	2	99.09
Iron	228	2	0.88	2	99.35
Manganese	228	6	2.63	4	96.02
Lead	40	0	0	0	100
Total Trihalomethanes	40	6	15.00	4	85.00
Other Parameters	2,341	0	0	0	100
All Parameters	**5,133**	**21**	**0.41**	**5**	**99.54**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	16	6.25	93.75	26	57.69	42.31
E. coli	16	0	100	26	26.92	73.08
Colour	14	0	100	4	0	100
Turbidity	16	6.25	93.75	26	7.69	92.31
Hydrogen ion (pH)	16	12.50	87.50	26	19.23	80.77
Aluminium	12	0	100	2	50.00	50.00
Iron	12	0	100	3	100	0
Manganese	12	0	100	3	66.67	33.33
Lead (25)	-	-	-	-	-	-
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	288	1.39	98.61	108	9.26	90.74
All Parameters	**402**	**1.99**	**98.01**	**224**	**20.09**	**79.91**

South Lanarkshire Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	2,001	13	0.65	7	99.40
E. coli	2,001	0	0	0	100
Colour	692	0	0	0	100
Turbidity	692	0	0	0	100
Hydrogen ion (pH)	692	0	0	0	100
Aluminium	691	2	0.29	1	99.75
Iron	691	0	0	0	100
Manganese	691	0	0	0	100
Lead	127	0	0	0	100
Total Trihalomethanes	128	0	0	0	100
Other Parameters	7,354	0	0	0	100
All Parameters	**15,760**	**15**	**0.10**	**7**	**99.98**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	26	30.77	69.23	20	40.00	60.00
E. coli	26	23.08	76.92	20	20.00	80.00
Colour	14	0	100	2	50.00	50.00
Turbidity	26	0	100	16	6.25	93.75
Hydrogen ion (pH)	26	11.54	88.46	16	31.25	68.75
Aluminium	14	0	100	2	0	100
Iron	14	0	100	2	0	100
Manganese	12	0	100	2	0	100
Lead (25)	25	4.00	96.00	16	6.25	93.75
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	558	1.25	98.75	213	2.82	97.18
All Parameters	**741**	**3.37**	**96.63**	**309**	**8.41**	**91.59**

Stirling Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,019	2	0.20	2	99.88
E. coli	1,019	0	0	0	100
Colour	379	0	0	0	100
Turbidity	379	0	0	0	100
Hydrogen ion (pH)	379	0	0	0	100
Aluminium	379	0	0	0	100
Iron	379	3	0.79	2	99.67
Manganese	379	2	0.53	2	99.75
Lead	109	1	0.92	1	99.34
Total Trihalomethanes	109	1	0.92	1	99.34
Other Parameters	5,253	4	0.08	2	99.98
All Parameters	**9,783**	**13**	**0.13**	**7**	**99.94**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	54	18.52	81.48	36	58.33	41.67
E. coli	54	11.11	88.89	35	34.29	65.71
Colour	49	8.16	91.84	31	9.68	90.32
Turbidity	43	2.33	97.67	29	3.45	96.55
Hydrogen ion (pH)	43	2.33	97.67	34	11.76	88.24
Aluminium	4	0	100	-	-	-
Iron	42	11.90	88.10	31	9.68	90.32
Manganese	4	0	100	-	-	-
Lead (25)	43	6.98	93.02	33	6.06	93.94
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	617	1.78	98.22	259	5.79	94.21
All Parameters	**953**	**4.30**	**95.70**	**488**	**12.50**	**87.50**

West Dunbartonshire Council

Public Supplies

Private Supplies

Quality of the Public Water Supply

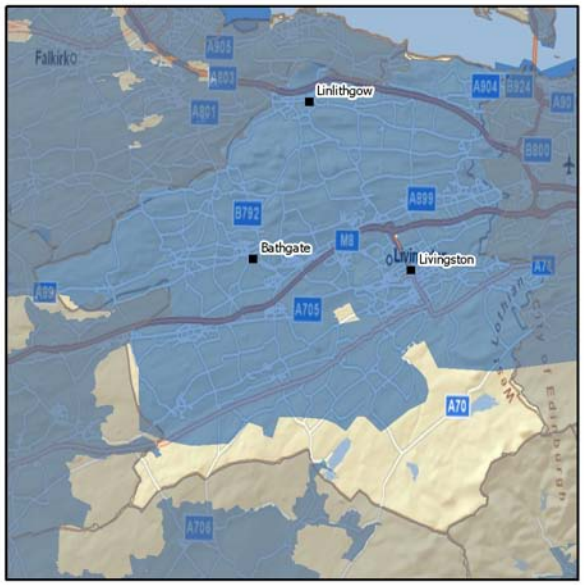
Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	972	0	0	0	100
E. coli	972	0	0	0	100
Colour	344	0	0	0	100
Turbidity	343	0	0	0	100
Hydrogen ion (pH)	343	0	0	0	100
Aluminium	344	0	0	0	100
Iron	344	0	0	0	100
Manganese	344	0	0	0	100
Lead	72	1	1.39	1	98.75
Total Trihalomethanes	72	2	2.78	2	97.50
Other Parameters	3,921	0	0	0	100
All Parameters	**8,071**	**3**	**0.04**	**2**	**99.92**

Quality of Private Water Supplies

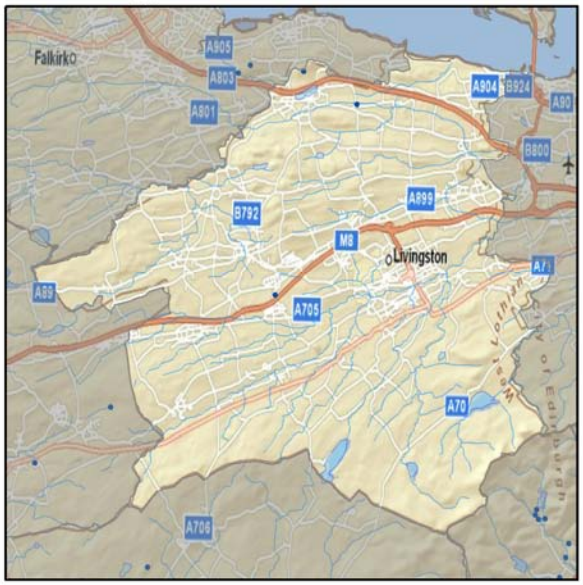
Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	4	25.00	75.00	2	100	0
E. coli	4	50.00	50.00	2	100	0
Colour	-	-	-	-	-	-
Turbidity	-	-	-	2	0	100
Hydrogen ion (pH)	1	0	100	2	0	100
Aluminium	2	0	100	-	-	-
Iron	2	0	100	-	-	-
Manganese	1	0	100	-	-	-
Lead (25)	2	0	100	3	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	18	5.56	94.44	4	50.00	50.00
All Parameters	**34**	**11.76**	**88.24**	**15**	**40.00**	**60.00**

West Lothian Council

Public Supplies



Private Supplies



Quality of the Public Water Supply

Parameter name	Total number of tests	Total number of fails	% of fails	Number of zones with failures	Mean Zonal Compliance (%)
Coliform Bacteria	1,285	5	0.39	3	99.74
E. coli	1,285	0	0	0	100
Colour	467	0	0	0	100
Turbidity	467	0	0	0	100
Hydrogen ion (pH)	467	2	0.43	2	99.53
Aluminium	465	2	0.43	2	99.73
Iron	465	1	0.22	1	99.80
Manganese	465	1	0.22	1	99.87
Lead	75	0	0	0	100
Total Trihalomethanes	76	0	0	0	100
Other Parameters	4,873	0	0	0	100
All Parameters	**10,390**	**11**	**0.11**	**6**	**99.97**

Quality of Private Water Supplies

Parameter	Number of Type A Tests	% of Type A Fails	Compliance (%)	Number of Type B Tests	% of Type B Fails	Compliance (%)
Coliform Bacteria	8	50.00	50.00	3	66.67	33.33
E. coli	8	25.00	75.00	3	33.33	66.67
Colour	8	0	100	3	0	100
Turbidity	8	0	100	3	0	100
Hydrogen ion (pH)	8	0	100	3	0	100
Aluminium	8	0	100	3	0	100
Iron	8	0	100	3	0	100
Manganese	8	0	100	3	0	100
Lead (25)	8	0	100	4	0	100
Total Trihalomethanes	-	-	-	-	-	-
Other Parameters	200	0.50	99.50	54	3.70	96.30
All Parameters	**272**	**2.57**	**97.43**	**82**	**6.10**	**93.90**

Annexes

A. The Regulatory Framework

The regulatory standards for drinking water quality in Scotland largely stem from European Directives. These standards are based on guidelines values, developed by the World Health Organisation (WHO), to protect public health.

A summary of Scotland's key domestic water quality legislation includes:

The Water (Scotland) Act 1980

- *Scottish Water must supply wholesome water for domestic purposes. It is a criminal offence to supply water unfit for human consumption;*
- *enables Scottish Ministers to take enforcement action against Scottish Water if it fails in its duty to supply wholesome water (as defined in the relevant regulations) unless the failure is trivial or Scottish Water is complying with a legally binding undertaking to remedy the matter;*
- *local authorities must take appropriate steps to keep themselves informed about the wholesomeness of public water supplies in their area and notify Scottish Water and DWQR, if not satisfied; and*
- *local authorities are required to secure improvements to private water supplies if they consider them necessary.*

The Water Supply (Water Quality) (Scotland) Regulations 2001

- *The 2001 regulations came into force on 25 December 2003;*
- *transpose the requirements of Council Directive 98/83/EC on the quality of water intended for human consumption into Scottish legislation for public supplies;*
- *define wholesomeness by setting standards for 40 parameters and a further 11 indicator parameters;*
- *intended for human consumption into Scottish legislation;*
- *define wholesomeness by setting standards for 40 parameters and a further 11 indicator parameters;*
- *set and define, the supply zone as the basic unit for quality monitoring;*
- *specify sampling requirements for samples taken at taps within zones, at service reservoirs and at WTW; and*
- *require Scottish Water to publish an annual report and keep a public register of water quality in its area.*

The Water Industry (Scotland) Act 2002

- *Created the post of Drinking Water Quality Regulator for Scotland (DWQR);*
- *set out responsibility for enforcing the Water Supply (Water Quality) (Scotland) Regulations 2001;*
- *defines DWQR's independent status;*
- *defines DWQR's powers to obtain information, powers of entry or inspection and powers of enforcement; and*
- *defines DWQR's emergency powers to require a water supplier to carry out works to ensure quality of water supplied is safe for public consumption.*

Water Framework Directive 2000 (WFD 2000/60/EC)

- *Implemented by the Water Environment and Water Services (Scotland) Act 2003 and the Water Environment (Controlled Activities) (Scotland) Regulations 2011.*
- *aims to protect, enhance and restore surface and groundwaters and prevent, or reverse, any deterioration in quality;*
- *ensures that water use is sustainable;*
- *repeals Surface Water Abstraction Directive; and*
- *establishes systems for managing water environments, including River Basin Management Plans;*

The Private Water Supplies (Scotland) Regulations 2006

- *The 2006 Regulations came into force on 3 July 2006;*
- *transpose the requirements of Council Directive 98/83/EC on the quality of water intended for human consumption into Scottish legislation in relation to private water supplies;*
- *define wholesomeness in accordance with the EC Drinking Water Directive 98/83/EC;*
- *require local authorities to classify private supplies according to size and use;*
- *require local authorities to monitor, risk assess and report on private supplies in their area according to classification and risk; and*
- *provide advice to private supply owners and ensure improvements are carried out.*

The Water Quality (Scotland) Regulations 2010

- *The 2010 Regulations came into force on 20 April 2010.*
- *further transpose the requirements of Directive 98/83/EC, most particularly, in respect of water quality failures which are attributable to the domestic distribution system in establishments and premises where water is supplied to the public;*
- *require local authorities to investigate such water quality failures to determine its cause;*
- *instruct remedial action through the service of a notice on the person who owns, or is responsible for, the domestic distribution system;*
- *ensure that affected consumers are notified of any risk to their health.*

The 2010 Regulations also make a number of technical amendments to the Water Supply (Water Quality) (Scotland) Regulations 2001 and the Private Water Supplies (Scotland) Regulations 2006 to:

- *create a duty to minimise contamination from disinfection by-products and to verify the effectiveness of the disinfection process.*

The Private Water Supplies (Notices) (Scotland) Regulations 2006

- *The Notices Regulations came into force on 3 July 2006;*
- *enable a local authority to serve a notice under section 76G and 76H of the Water Scotland Act 1980 to require those responsible to undertake remedial action to improve a failing private water supply; and*
- *failure by the responsible person(s) to comply with the terms of a notice without reasonable excuse is an offence.*

The Private Water Supplies (Grants) (Scotland) Regulations 2006

- *The Grant Regulations came into force on 3 July 2006 and are intended to assist users of private water supplies to bring their supplies up to modern standards;*
- *make provision as to how local authorities are to carry out their duties under section 47 of the Local Government in Scotland Act 2003;*
- *define who compromises an 'eligible person' for the purposes of receiving a grant; and*
- *provide for the amount of grant which is available (which will be the lower of £800 or the amount of approved expenditure). In a case of undue hardship a local authority may award in excess of that amount.*

The *Cryptosporidium* (Scottish Water) Directions 2003

- *The* Cryptosporidium *(Scottish Water) Directions 2003 came into force on 1 January 2004;*
- *requirement for risk assessment on all of Scottish Water's supplies;*
- *sets out sampling requirements for raw and final water;*
- *sets out design, operation and incident management requirements to minimise risk from* Cryptosporidium*; and*
- *sets out sampling and analysis requirements for* Cryptosporidium.

The Scottish Water (Objectives for 1st April 2010 to 31st March 2015) Directions 2009

In support of the Government's objective for a healthier Scotland, the Scottish Ministers issued Directions to Scottish Water to deliver a number of specified objectives in the period 1 April 2010 to 31 March 2015. In relation to drinking water quality these include:

- *Delivering appropriate treatment solutions to a number of sites to reduce the risk of cryptosporidium from entering the supply system;*
- *commencing a programme of water mains rehabilitation that will reduce the risk of water quality being degraded by the condition of the distribution system when in steady state flow conditions;*
- *delivering the necessary improvements to ensure that water supply zones are protected against conditions that have a probability of a 1 in 40 year return period; and*
- *establishing water safety plans, as promoted by the World Health Organisation, for all public drinking water supplies.*

B. Index of Information Letters issued during 2010

Information Letter number	Title
1/2010	*Cryptosporidium* Standard Operating Protocols (SOPs) 2009
1/2010 – Annex A	Sampling and Transportation of Samples – For the Monitoring of *Cryptosporidium* Oocysts in Treated Water Supplies
1/2010 – Annex B	Laboratory and Analytical Procedures – For the Monitoring of *Cryptosporidium* Oocysts in Treated Water Supplies in Accordance with the *Cryptosporidium* (Scottish Water) Directions 2003
2/2010	Sets out a new water quality measurement, the Disinfection Index, which is designed to define the stability of chlorine residual in water leaving a water treatment works and to compare that stability to a predefined standard.
3/2010	Relates to the requirements of the DWQR with regard to tracking drinking water events reported by Scottish Water. The letter complements Information Letter 3/2008 "Reporting Significant Drinking Water Quality Events and Incidents to DWQR".

Copies of these letters are available on the DWQR website:

www.dwqr.org.uk

C. Undertakings and Enforcement Notices

Since Scottish Water was formed in 2002, much investment has taken place to improve the quality of Scotland's water supplies and ensure they meet regulatory standards. Where persistent failures occur, Scottish Ministers may, on the advice of DWQR, request a legally binding Undertaking from Scottish Water under Section 76E of the Water (Scotland) Act 1980. When an Undertaking is granted, Scottish Water must advertise it in the affected area so that local consumers are aware of the issue and steps being taken to remedy the failure.

Where DWQR perceives that a lack of progress is being made by Scottish Water or there appears to be a reluctance to resolve an ongoing issue, DWQR may issue an enforcement notice against Scottish Water. Enforcement notices require Scottish Water to take specific actions within a timescale specified by DWQR. Failure to comply with an Enforcement Notice could result in prosecution of Scottish Water or DWQR commissioning the required work and recouping costs from Scottish Water.

Scottish Water had two Enforcement Notices active in 2010. Details are provided below. Additionally, work is in progress to finalise Undertakings at Muirdykes in respect of manganese and Forehill in respect of pesticides.

Water Supply Zone	Location	Type of Commitment	Nature	Completion Date
Penwhirn (incl. Palnure)	Galloway	Enforcement Notice	To secure compliance for the THM and iron parameters	30/11/2011
Loch Eck	Dunoon	Enforcement Notice	Construction of a manganese removal process at WTW, followed by cleansing of the distribution system	31/12/2012

D. Audit and Inspection of Scottish Water

Audit and inspection of Scottish Water's activities is an important part of DWQR's role. Technical audits ensure that Scottish Water is complying with the Regulations in respect of the treatment and distribution of water to consumers, as well as following water industry best practice. Audits also enable DWQR to engage with Scottish Water staff at all levels and across the country, to communicate expectations and raise awareness of water quality issues and the part individuals play in safeguarding public health. Inspections undertaken by DWQR in 2010 are detailed in the table below.

A key aspect of the way the water industry in Scotland is regulated is that Scottish Water takes and analyses its own drinking water samples from around the country. This ensures that regulatory monitoring is efficient and cost effective, but it does require DWQR to ensure every stage in the process operates in accordance with the Regulations and to the highest standards of accuracy. This is especially important in Scotland where samples are collected from remote areas and transported to a central laboratory. It is vital that these samples are collected and transported in such a way that they remain representative of the water supply from which they were taken. DWQR requires Scottish Water's laboratories to be accredited to ISO 17025 and the Drinking Water Testing Specification (DWTS). This accreditation is verified by the independent United Kingdom Accreditation Service (UKAS) via an annual inspection, but DWQR also directly inspects Scottish Water's sampling, transportation and analysis to ensure wider aspects of best practice are followed and that the correct response to failures occurs.

DWQR also inspects the way in which Scottish Water handles contacts from consumers regarding water quality issues. It is important that advice given to consumers is accurate and that concerns about drinking water quality are followed up and dealt with appropriately by the company. Occasionally, a consumer contact may be the first indication of a problem with the water supply. It is vital that such issues are spotted and trigger prompt action.

Month	Location	Audit Type
Mar-10	Forehill Water Supply Zone	Distribution System
Apr-10	Rawburn Water Supply Zone	Distribution System
May-10	Bonnybridge Scottish Water Contact Centre	Mains Repair Consumer Contacts
Jun-10	Wick (Calder) Water Supply Zone Penwhirn Water Supply Zone	Distribution System Distribution System
Jul-10	Invercannie WTW	Treatment Works
Sep-10	Edinburgh Laboratory	Sampling and Analysis
Oct-10	Inverness Laboratory Castor Bay, Northern Ireland Co. Roscommon, Eire	Sampling and Analysis Treatment Works (Benchmarking with DWI NI) Groundwater Sources (Benchmarking with Irish E.P.A)
Nov-10	Newmore WTW Assynt WTW Gorthleck WTW	Treatment Works Treatment Works Treatment Works

E. Drinking Water Quality in Scotland 2010

Investment in Drinking Water Quality

The DWQR works closely with Scottish Water (SW) to decide what needs to be done to improve and/or protect drinking water quality across Scotland. DWQR is part of a process called Quality and Standards (Q&S) that requires the quality regulators (DWQR for drinking water and SEPA for environmental water) to agree with SW on the improvements necessary over the next five to ten years. SW then estimates the costs of these improvements and puts forward a business plan to the economic regulator, the Water Industry Commission for Scotland, who decides on whether these costs are reasonable or not and suggests where efficiencies can be made.

Q&S3A ran from 1 April 2006 until 31 March 2010 and the current phase of investment (Q&S3B) runs from 1 April 2010 to 31 March 2015. Discussions on what needs to be done beyond March 2015 are in progress.

Since the end of Q&S3A was reached on 31 March 2010, the DWQR's 2009 report gave some examples of what had been achieved through investment in drinking water quality during the period. Overall about 3.6 million people across Scotland are receiving better quality water and a more consistent level of disinfection as a result of investment during the period 2006 – 2010.

Currently, the focus is on completing the few projects that are outstanding from previous investment periods as well as progressing projects in Q&S3B. One of the projects remaining from the previous period is the new Glencorse WTW for Edinburgh which will replace both Alnwickhill and Fairmilehead WTWs. DWQR has visited this works on a number of occasions during its construction and is pleased to note good progress. This new works should become operational during the summer of 2011.

As well as improving the quality of water at WTWs across Scotland, SW is preparing Drinking Water Safety Plans (DWSPs) for all of its supplies, following the approach recommended by the World Health Organisation. This process should be complete by late 2011, when the challenge will shift to ensuring they are kept up to date and that key risks are addressed through investment or by other means.

A DWSP should identify all the potential risks in the supply chain from the source, through the treatment works, within the distribution system and at consumers' taps. Based on these plans, Scottish Water will be able to prioritise its future investment in drinking water and continue to protect public health. This is a significant shift away from a reactive approach which addresses water quality issues only once they have occurred. The more proactive DWSP approach is aimed at catching issues before they become a problem.

Developing DWSPs for all the water supplies across Scotland is a significant task. It requires input from a number of different areas of Scottish Water to identify where the risks to water quality are throughout the system. The process assigns a score to each risk using a matrix which considers both the likelihood that it might happen and the severity of the consequences if it does. The higher the score, the greater the priority to fix or mitigate the risk of something occurring. DWQR recognised the size of the task and

agreed a phased approach to deliver all the DWSPs. Since this task is now almost complete the focus is moving towards analysing the DWSPs to identify the higher risks to water quality and to start to build the next investment programme for Q&S4 (April 2015 to March 2025) by including projects to mitigate those risks to an acceptable level.

SW and its customers should reap the benefits of this proactive approach to the management of water supply systems in the years to come. Providing the risks are identified and mitigation measures are put in place, there should be fewer failures and consequently more reliable water quality with consumers having greater trust in the product as a result.

Cryptosporidium is a risk at some water supplies in Scotland. Most of the work on improving treatment processes to address this issue will be completed towards the end of the current investment period of Q&S3B (2010 – 2015) as it takes some time to go through the planning / design stages and to construct the chosen process on site.

Another area of investment in the current period is in relation to the problem of discolouration caused by iron and manganese. A consistent methodology has been used to identify supply zones where work is required, and work is commencing in this period. Further studies will identify zones where remedial work is needed in the next investment period commencing in 2015. This work should greatly improve the visual appearance of drinking water in those areas affected by this problem.

F. Categories of Drinking Water Quality Contacts

Appearance of the Water

Discoloured Water

Water with a discernable taint or colour caused by suspended or dissolved matter. Two of the most common causes are a yellow taint caused by dissolved organic matter arising from peat in upland sources and more general orange, brown or black discolouration caused by suspended particles of iron (orange/brown) and manganese (black). Iron discolouration may occur through natural iron present in the raw water passing through inadequate treatment or from corrosion of cast iron distribution mains. Manganese is present in some raw waters and may not be removed if treatment is inadequate.

Milky Cloudy Water

Water which has a milky appearance is caused by tiny bubbles of entrained air which dissolve in the water under pressure but come out of solution at the consumer's tap. A number of causes are possible including burst mains, malfunctioning pumps and throttled consumer stop taps. If air is the cause of the milky water, the cloudy appearance will clear in a glass of water from the bottom up.

Particles in Water

Visible particulate matter in water which is otherwise not discoloured. This can be caused by corrosion of iron mains or deposits of sand, grit or other material present in the main being re-suspended following a change in the flow in the main.

Organisms in Water

This category includes complaints of insects or other animals in the water supply. Most complaints arise where an insect has crawled up a tap or is present in the sink. Very occasionally water systems can contain animals which may arise from the raw water, treatment works or within the mains themselves. This is extremely rare, however organisms such as midge larvae (Chironomid) or water shrimp (Aesellus) have occasionally been found in domestic supplies.

Taste or Smell of the Water

Chlorine Taste/Smell

Excess residual chlorine or the reaction of chlorine with phenolic compounds which may be present in household plumbing can result in taste and smells. Chlorine taste and smells should dissipate if the water is left to stand in the fridge for a few hours. It will also not be present after boiling. Phenolic tastes can be more persistent. Common descriptions used by customers include TCP, medicinal, swimming pool, bitter, and chemical. Common sources of phenol include washing machine hoses, tap washers and kettles. British Standard approved plumbing products which do not contain phenol should be used in all plumbing installations.

Metallic Taste

Metallic tastes may arise from an excess of iron, aluminium or other metal dissolved in the water, although normally there will also be visible discolouration.

Solvent/Fuel Taste/Smell

This is not a common problem and if it arises it should be investigated immediately. Possible causes include spillages of petrol or hydrocarbons that have percolated through the soil and penetrated plastic pipes.

Musty/Earthy Taste/Smell

Musty or earthy tastes can arise due to naturally occurring compounds present in raw waters that have not been removed by the treatment process. Geosmin is one such compound commonly associated with earthy/musty tastes. Complaints are more common in the summer months when biological activity is highest – algal blooms in raw water sources are common causes of widespread musty tastes.

TCP / Chemical Taste

Sometimes consumers report that their drinking water has an unusual taste. Such tastes can be hard to describe, but a common description is TCP, medicinal or chemical. This can have a number of causes, but a common cause is where the small amount of chlorine added to the water to keep it safe reacts with phenol in plastics and rubbers in household plumbing and appliances to produce harmless compounds that have a very strong taste and smell that persists in cold and boiled drinks. Washing machine and dishwasher hoses, tap washers and kettles have all been shown to cause the problem under certain circumstances. The use of British Standard approved appliances and fittings will prevent the problem.

Other categories

Illness due to Water

Illnesses caused by public drinking water supplies are extremely rare in the UK as the quality of water is so high. Occasionally, consumers have concerns that their water supply is affecting their health in some way, but usually Scottish Water is able to demonstrate that the water is not the cause. DWQR expects Scottish Water to take all such concerns very seriously indeed, to investigate each contact very thoroughly and sample appropriately to demonstrate that the water supplied is wholesome. It is also expected that Scottish Water will provide reassurance to consumers and assist them by providing information on the quality of their water supply that they can discuss with their doctor if appropriate.

Other

Scottish Water receives a small number of contacts that do not easily fit into any other category. These may include other tastes and odours, or issues relating to lead plumbing and fungal growth on bathroom fittings.

G. Statistical Methods Used in the Report

Water Quality Compliance Data for Local Authority Areas

In order to present drinking water quality data by local authority area in Section 5, it has been necessary to report data for the group of supply zones within that area. Water supply zone boundaries do not fit local authority boundaries exactly, so the data for any supply zone which falls wholly or partly into the local authority area has been included.

This approach means that data from some supply zones is included twice or more in Section 5. For example, the same data for Alnwickhill B supply zone is included in the sections for East Lothian, Midlothian and City of Edinburgh.

Mean Zonal Compliance

DWQR used the Mean Zonal Compliance Index for the first time in the 2005 report. This is a helpful tool when considering water quality at national, regional and local level as it provides a simple means of summarising drinking water compliance and comparing year on year performance. All drinking water quality regulators in the UK are now reporting Mean Zonal Compliance figures using the same methodology, so it should therefore be possible to make comparisons using this index across the UK.

Zonal Compliance

Mean zonal compliance for an area is built up from zonal compliance figures for individual parameters in individual supply zones. Zonal compliance is simply the percentage of samples meeting the PCV for that parameter.

Mean Zonal Compliance

The Mean Zonal Compliance (MZC) for a parameter may be built up for a particular group of supply zones by taking the arithmetic mean of zonal compliances for that parameter across all the supply zones of interest. MZC may be produced for a local authority area, region or for Scotland as a whole in this way.

Overall Compliance

The Overall Compliance for any group of supply zones is the arithmetic mean of the MZCs for every parameter. An Overall Compliance figure for Scotland may be calculated in this way. In 2010, DWQR has used the same parameters in this calculation as the other UK regulators, namely the 40 parameters in Schedule 1 of the 2001 Regulations that have a numerical standard. The full list of parameters may be found in *Table 3.4b* of this report.

Pesticides

All parameters are weighted equally in the calculation but the sheer number of pesticide determinands has the potential to skew the Overall Compliance calculation by placing undue weight on pesticide analysis. For that reason, results for the individual pesticides not specifically mentioned in Schedule 1 of the Regulations have been pooled to produce a single "All Pesticides" parameter. The large number of different pesticides analysed every year, is determined using a risk assessment process to define specific sampling requirements in each supply zone.

Zones with small populations

Some of the water supply zones in Scotland are very small, serving populations in single figures. Regulatory sample frequencies are based on population, hence sampling for certain parameters in these zones is infrequent, with perhaps only two samples being taken for each parameter per year. If one of these samples fails, this will adversely affect mean zonal compliance to a much greater extent than a sample failure in a large supply zone. This is unavoidable, and in calculations of regional mean zonal compliance, this effect is compensated for by the large number of these small zones which are present in individual regions such as the North West.

Distribution Maintenance Index

The Distribution Maintenance Index (DMI) is the same as the Operational Performance Index (TIM) used in previous DWQR reports. It is used to reflect the performance of the distribution system for a zone or collection of zones, and is simply the arithmetic mean of the MZCs for turbidity, manganese and iron for the zone.

Worked Example

Zonal Compliance

The zonal compliance for iron for a notional supply zone, Zone 1, is calculated as follows:

	No. samples taken for iron	No. samples failing	Zonal Compliance (Iron)
Zone 1	52	2	**96.15**

Mean Zonal Compliance

In order to calculate the MZC for iron for a group of 10 zones which include Zone 1, the arithmetic mean of all the zonal compliances for iron is taken.

Zone 1	96.15
Zone 2	98.6
Zone 3	100
Zone 4	100
Zone 5	100
Zone 6	100
Zone 7	100
Zone 8	100
Zone 9	100
Zone 10	100
MZC	**99.48**

Overall Compliance

To calculate overall compliance for the group of 10 zones, the arithmetic mean of the MZC for every parameter is calculated.