Scottish Water

Always serving Scotland

Annual Water Quality Report 2010

Scottish Water
Always serving Scotland

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Foreword

Scottish Water provides a vital public service, essential to the health of the nation.

We provide good, clean, safe and high quality drinking water to 2.4 million households across Scotland. Every day we supply 844 million litres of safe, treated water drinking water to households and businesses in our drive to become Scotland's most valued and trusted business.

Water quality in Scotland has achieved its highest ever level and is rigorously tested to ensure it complies with the strictest standards. We want our customers to enjoy the look and taste of their public water supply.

During 2010, we conducted more than 300,000 laboratory analyses on regulatory samples taken at water treatment works (WTW), service reservoirs and customer taps. Of these, 99.86% complied with the stringent regulatory standards. This represents a continuing improvement in overall compliance since the establishment of Scottish Water in 2002.

Customers are now enjoying the benefits from our 2006-10 capital investment programme which was aimed at improving the aesthetic quality of water at customers' taps.

2010 started and finished with periods of extremely low temperatures, heavy snow and ice, including the coldest December (2010) on record. Throughout these periods we remained absolutely committed to maintaining our customers' supply, despite the challenges the appalling conditions set us. We dealt with the deepest frost we have ever seen in the ground which affected our pipes.

More than 2200 staff worked daily on weather related issues during this extreme weather. Staff from all parts of the organisation volunteered to answer calls and deliver bottled water to customers out of supply.

In December, nearly 2,000 burst water mains were repaired, and more than 55 million litres of water tankered. Scottish Water is now reviewing all its procedures to ensure we have the resources in place to deal with any extreme weather issues.

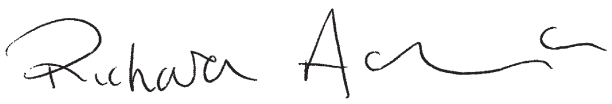
By contrast, an unusually prolonged dry weather period from January until May, the driest for 70 years, caused water levels to drop at two key supply reservoirs in Dumfries and Galloway.

Reservoir levels were monitored daily, overland pipes were laid, and other initiatives taken to manage the supply. Customers also worked with us by taking simple steps to save water.

We took early action by applying for a drought order in June for the affected areas. However, we were able to withdraw the application as rain soon followed allowing reservoirs to restock.

It is with deep regret that we learned of the death of the Drinking Water Quality Regulator (DWQR) Colin McLaren in November 2010. Our sincere condolences go to his family, his colleagues and his many friends. We worked closely with Colin and continue to work with the team at the DWQR to improve the quality of the drinking water in Scotland for our customers. He was greatly respected throughout Scottish Water and will be much missed by all.

I hope you will find this report interesting and informative. It demonstrates our commitment to deliver clearer, fresher drinking water and an improved service.



Richard Ackroyd
Chief Executive
Scottish Water

Introduction

Scottish Water continues to provide a very high standard of water quality as demonstrated in this report.

The quality of our drinking water supplies is carefully assessed by thorough monitoring of the supply system and using a wide range of analytical techniques. This provides quality assurance from the water source to customers' taps.

Samples taken as part of the mandatory programme are analysed at our in-house laboratories in Edinburgh, Inverness, Stornoway and Orkney. The full laboratory and sampling organisation, structure and processes are audited by the United Kingdom Accreditation Service (UKAS) and the DWQR to assess compliance with the ISO 17025 standard and the Drinking Water Testing Specification (DWTS).

Compliance with the statutory sampling programme was 99.40% in 2010.

We continue to work closely with the DWQR and health professionals to ensure water quality is of the highest possible standard and that public health is maintained.

Key Figures

- We serve 2.4 million households. On average we supply 844 million litres of water per day (Ml/d) to household customers and 445Ml/d to the non-household sector.
- During 2010 we operated 271 water treatment works, 1043 service reservoirs and 323 water supply zones.
- We took 324,305 scientific tests on water samples from water treatment works, service reservoirs and customers' taps.
- 99.86% of all tests met national and European microbiological and chemical standards.
- There has been a significant improvement in trihalomethanes compliance at customers' taps.
- The number of water quality related customer contacts reduced by 3,673 (15%) on the previous year.

Full details of the quality of water supplied during 2010 are provided in chapter 2 and appendices A and B.

Water Quality Analysis

In 2010 we carried out 324,305 scientific tests on water samples from water treatment works, service reservoirs and customers' taps[1].

Compliance with the statutory sampling programme fell slightly from 99.54% in 2009 to 99.40% in 2010, due to the severe weather seen across Scotland in January and again from late November. The extremely cold temperatures and prolonged covering of snow froze sample points and impacted on our ability to rapidly repair any damaged equipment over that period. In 2011 we are looking at further protecting our sample points against the impact of the weather.

The water quality data included in this report represents sampling and analysis carried out under The Water Supply (Water Quality) (Scotland) Regulations 2001 (the Regulations). These Regulations came in to full effect on 25th December 2003.

Information Submission

Throughout 2010, we continued to supply monthly electronic information submissions to the DWQR which identified the water samples taken at our assets, the corresponding sample results and public health event notifications. Over the course of the year, we also provided the DWQR with information on customer contacts, regulatory supply zones, and operational or out of service assets.

We ensure that the DWQR is provided with consistent, timely and reconcilable information which in turn provides customers with access to water quality details in their area. This also enables the DWQR to carry out independent detailed analysis of our performance and link customer tap sample results with customer contact information.

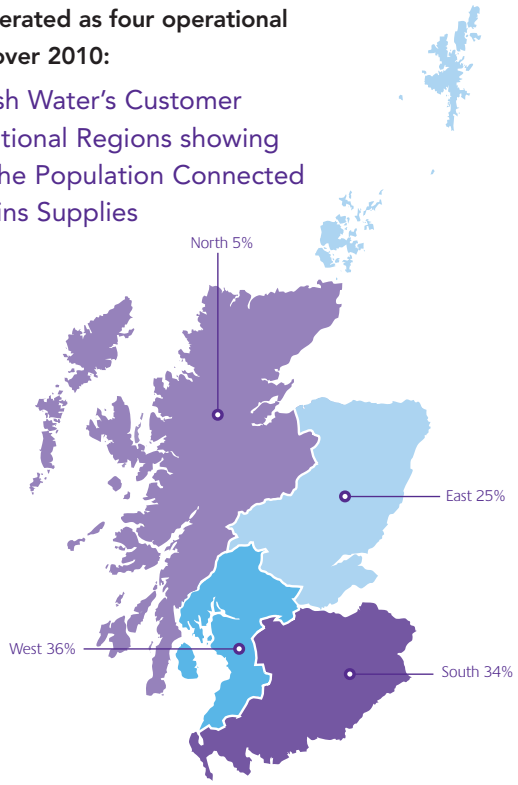
This year we have worked closely with the DWQR team to aid our understanding of their requirements and their understanding of the functionality of our systems.

We have further improved our quality assurance processes to facilitate smoother uploading of data into DWQR systems. We are committed to continuous improvement as demonstrated by additional development of our data repository which supports production of more automated data submissions.

During 2011, we will continue to monitor and build on the benefits already gained from past data improvement initiatives.

We operated as four operational areas over 2010:

Scottish Water's Customer Operational Regions showing % of the Population Connected to Mains Supplies



Water assets by area

Operational Area	No. of water treatment works	No. of service reservoirs	No. of water supply zones
East	59	397	67
North	132	264	132
South	41	210	61
West	39	172	63
Total	271	1,043	323

[1] These figures refer only to those regulatory parameters where compliance is calculable i.e. those which have a specific prescribed concentrations or value (PCV). Parameters such as agar plate counts, total organic carbon (TOC) and residual disinfectant are not included.

Microbiological Parameters

Microbiological standards apply to water leaving treatment works, service reservoirs and supplied at customers' taps.

Coliform organisms are present in large numbers in the intestine of all warm-blooded animals, but are also widely distributed in the environment. They are used as indicators of the integrity of the water supply system. Coliforms can also be present in domestic plumbing systems, with kitchen taps and sinks recognised as often being contaminated by these organisms. The *Escherichia coli* (*E.coli*) or faecal coliform organism is a coliform bacterium and has historically been regarded as the primary indicator of faecal contamination of both untreated and treated water. *E.coli* is present in the intestine of all warm-blooded animals.

The presence of coliforms or *E.coli* in water supplies can be as a result of sub-optimal operation of water treatment processes or ingress contamination from breaches in the integrity of the distribution system. It is important that the integrity and effectiveness of disinfection systems at our treatment works and within our distribution systems is maintained. To ensure this, the levels of residual disinfectant leaving treatment works and in the distribution system are closely monitored. In total 93,158 samples were taken and analysed.

Samples Taken for Residual Disinfectant

Sampling Location	Number of Samples Taken for Residual Disinfectant*
Water leaving water treatment works	29,000
Water in service reservoirs	49,859
Water at customers' taps	14,299

* There is no regulatory standard for residual disinfectant

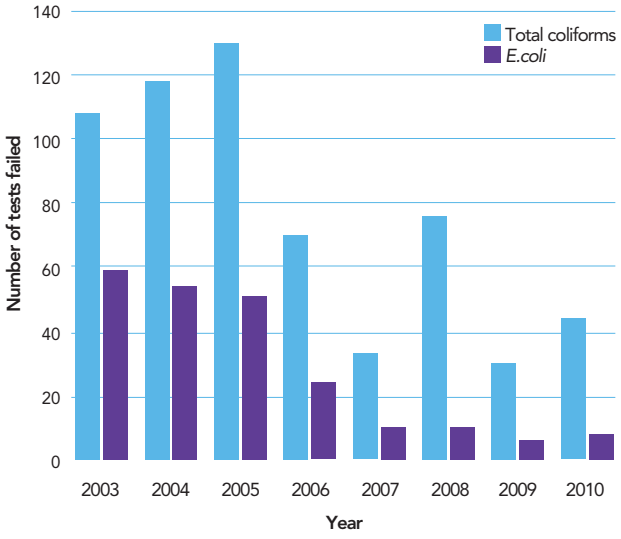
We also test for enterococci & *Clostridium perfringens* at customers' taps. Enterococci are used as secondary indicators of faecal pollution in water. The main use of this indicator organism is to assess the significance of coliform organisms in a sample in the absence of *E.coli*.

Tests for *Clostridium perfringens* are used as an indicator of faecal contamination in situations where other indicator organisms may not have survived. The presence of this organism when other faecal indicator organisms are absent may indicate a remote or intermittent pollution.

Water Treatment Works

In 2010, 29,092 samples were taken for *E.coli* and total coliform analysis. Compliance with the *E.coli* coliform standard was 99.97% and with the total coliform standard was 99.85%.

Chart 1: Microbiological Water Quality
Number of tests failed at water treatment works



Despite the slight dip in performance in 2010 compared with 2009, there has been an overall improving trend in compliance in microbiological water quality standards since the establishment of Scottish Water.

Coliform failures

The breakdown of failures by operational area is as follows:

44 failures were reported from a total of 29,092 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	11	99.84%
North	9	99.89%
South	14	99.79%
West	10	99.86%
Total	44	99.85%

***E.Coli* failures**

Eight failures were reported from a total of 29,092 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	4	99.94%
North	3	99.96%
South	0	100.00%
West	1	99.99%
Total	8	99.97%

Cryptosporidium

Cryptosporidium is a microscopic protozoan parasite which lives in the intestines of animals and people. *Cryptosporidium* oocysts are resistant to chemical disinfectants so need to be removed through fine filtration.

In addition to the Regulations, The *Cryptosporidium* (Scottish Water) Directions 2003 (The Directions) issued by Scottish Ministers outline duties and responsibilities to minimise the risk of *Cryptosporidium* in water supplies. There is no regulatory compliance standard for *Cryptosporidium*. The sampling programme is based on the level of risk at each water treatment works.

In 2010, 9,387 tests were carried out on final water samples at water treatment works, of which there were 311 *Cryptosporidium* positive samples.

No. of tests 2010	Number of samples	Total number of positives
2010	9,387	311
2009	10,388	418
2008	11,003	493

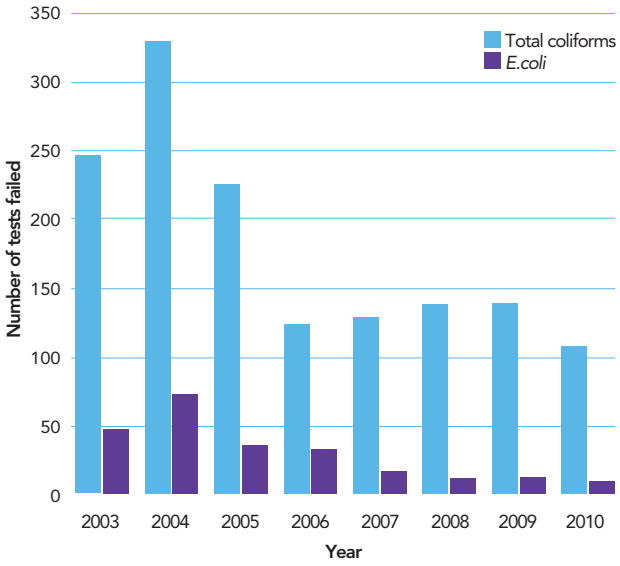
* Positives greater than or equal to 0.10 oocysts per 10 litres

Over the last few years the *Cryptosporidium* team has been working on an in-house molecular biology method for determining the species or genotype of *Cryptosporidium* in contaminated water samples. This information is of vital importance in responding to contamination incidents, because not all types of *Cryptosporidium* are pathogenic to humans. The efforts of the team culminated in a recent highly successful visit by UKAS, as a result of which we will become the only laboratory in the UK accredited to an international standard for this procedure.

Service Reservoirs

In 2010, 49,896 samples were taken for *E.coli* and total coliform analysis. Compliance with the *E.coli* coliform standard was 99.98% and with the total coliform standard was 99.79%.

Chart 2: Microbiological Water Quality
Number of tests failed at service reservoirs



Coliform failures
107 coliform failures were reported from a total of 49,896 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	48	99.74%
North	22	99.83%
South	22	99.78%
West	15	99.82%
Total	107	99.79%

E.coli failures

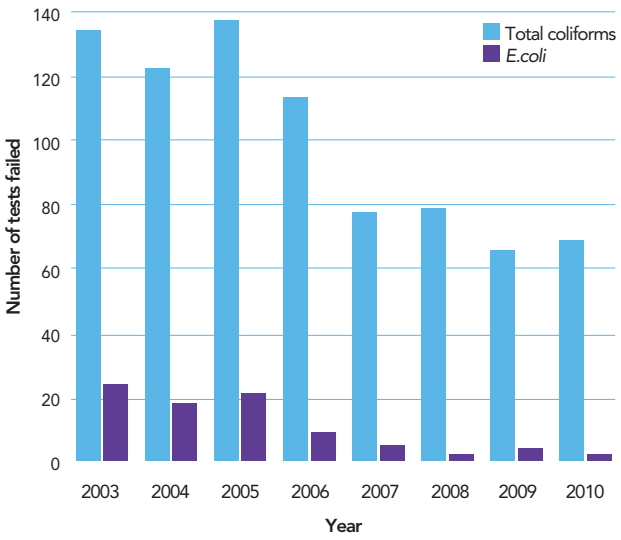
Nine failures were reported from a total of 49,896 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	5	99.97%
North	2	99.98%
South	2	99.98%
West	0	100.00%
Total	9	99.98%

Customers' Taps

In 2010, 14,305 samples were taken for *E.coli* and total coliform analysis. Compliance with the *E.coli* coliform standard was 99.99% and with the total coliform standard was 99.52%.

Chart 3: Microbiological Water Quality
Number of tests failed customers' taps



Coliform failures

The number of coliform failures at customers' taps has increased slightly to just 69 of a total of 14,305 samples in 2010, compared with 66 in 2009 of 14,386 samples. The breakdown of failures by operational area is as follows:

Operational Area	No. of failures	Percentage of tests compliant
East	29	99.18%
North	5	99.70%
South	20	99.54%
West	15	99.69%
Total	69	99.52%

E.coli failures

The number of *E.coli* failures at customers' taps has improved to just two failures of a total of 14,305 samples, compared with four in 2009 of 14,386 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	1	99.97%
North	0	100.00%
South	0	100.00%
West	1	99.98%
Total	2	99.99%

Enterococci

1,626 samples were taken for enterococci analysis of which one sample failed to comply with the enterococci standard. There were no failures in 2009.

Clostridium perfringens

5,201 samples were taken for *clostridium perfringens* analysis of which four samples failed to comply with the *Clostridium perfringens* standard. Compliance in 2010 was 99.92% (99.94% in 2009).

Physical and Chemical Quality

Physical and chemical parameters are monitored at customers' taps. In addition, turbidity and nitrite samples are taken at treatment works.

Water Treatment Works

Nitrite failures

Parameter	No. of tests 2010	Compliance 2010	Compliance 2009	Compliance 2008
Nitrite	2,859	99.90%	99.83%	99.90%

Standard for nitrite at treatment works is 0.1mgNO2/l as opposed to 0.5mgNO2/l at customers' taps.

There were three nitrite exceedances out of 2,859 samples in 2010 compared to five in 2009 from 2,994 samples.

Turbidity failures

Parameter	No. of tests 2010	Compliance 2010	Compliance 2009	Compliance 2008
Turbidity	7,854	99.64%	99.68%	99.60%

Standard of 1 NTU applies at treatment works as opposed to 4 NTU at customers' taps.

28 failures were reported from 7,854 samples, two more than in 2009.

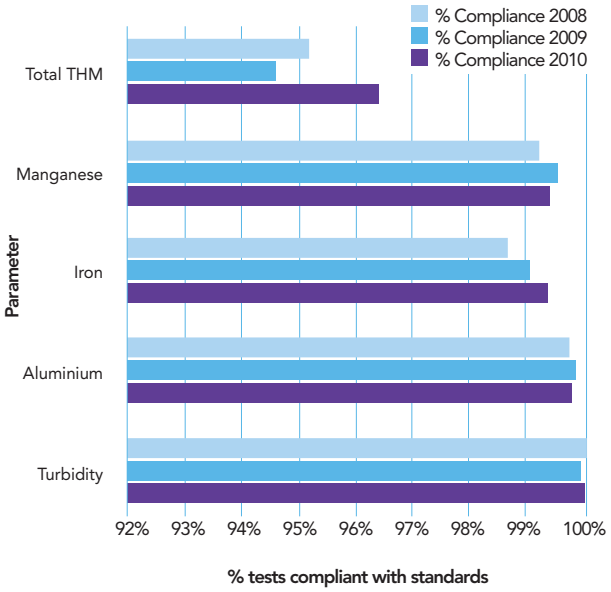
Operational Area	No. of failures	Percentage of tests compliant
East	6	99.71%
North	6	99.36%
South	8	99.61%
West	8	99.71%
Total	28	99.64%

Customers' Taps

Physical and chemical quality standards apply to water supplied at customers' taps. 120,179 tests were carried out at customers' taps for all parameters during 2010. Of these, 99.85% were compliant with regulatory standards (99.77% in 2009).[2]

Compliance rates for the five key physical and chemical parameters in samples taken at customers' taps in 2010 are shown in the chart below, together with 2008 and 2009 for comparison.

Chart 4: Physical and Chemical Water Quality Compliance with Standards at customers' taps



Compliance with three of the five key parameters has improved when compared with 2009 compliance levels.

[2] These figures exclude TOC and residual disinfectant.

Total THM

Trihalomethanes (THM) are formed by the reaction of chlorine with naturally occurring organic compounds in the water. THM formation can be minimised by removing as much of the organic material as possible prior to chlorination. Introduction of chloramination as a means of disinfection also reduces the potential for THM formation.

The most marked improvement in compliance in 2010 has been made against the THM standard. In 2010 there were 59 failures from a total of 1,636 samples compared with 89 failures out of 1,646 samples in 2009. Reduction of THM levels was a major driver for the 2006-10 investment programme. The number of failures had been expected to reduce as key projects were completed. In addition we have continued to improve our disinfection control.

Operational Area	No. of failures	Percentage of tests compliant
East	8	97.79%
North	35	92.17%
South	1	99.75%
West	15	96.45%
Total	59	96.39%

A high percentage of Scottish Water's supplies are derived from upland sources containing significant levels of these organic compounds and consequently THM is a parameter subject to a high number of exceedances. Over half of the fails occurred in small rural supplies in the North region and many of these water treatment works are due for improvement during the 2010-15 investment period.

Overall, 284 supply zones (87.9% in 2010, 83.5% in 2009) were fully compliant with the THM standard (100 µg/l).

Manganese

Manganese occurs naturally in many raw waters, and concentrations can vary seasonally. The manganese standard is set for aesthetic reasons and to prevent unpleasant tastes.

31 failures of the manganese standard were reported in 2010, from a total of 5,197 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	3	97.77%
North	0	100.00%
South	5	99.68%
West	23	98.67%
Total	31	99.40%

The presence of manganese in water at customers' taps can be attributed to the accumulation of residual amounts not removed by the water treatment process. These deposits are dealt with by scouring and relining in the distribution system and the introduction of manganese removal stages in water treatment processes aimed at preventing their creation in the first place.

Overall, 305 supply zones (94.4%) were fully compliant with the manganese standard (50 µg Mn/l).

Iron

Iron occurs naturally in many raw waters. In addition corrosion of old cast iron mains in the distribution network can contribute to iron in customers' supplies. Like manganese, the iron standard is set for aesthetic reasons, and levels above the standard can give rise to discolouration and particles in the water.

32 failures of the iron standard were reported in 2010, from a total of 5,197 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	11	99.14%
North	3	99.53%
South	10	99.36%
West	8	99.54%
Total	32	99.38%

The presence of iron in water at customers' taps can be attributed to the accumulation of residual amounts not removed by the water treatment process or corrosion of old cast iron mains in the distribution network. These deposits are dealt with by scouring and relining in the distribution system.

Overall, 300 supply zones (92.9%) were fully compliant with the iron standard (200 µg Fe/l), an improvement on 2009 when 90.2% of zones were compliant.

Aluminium

Aluminium compounds occur naturally in soils and are also used as coagulants to remove colour and impurities from the raw water. The coagulated material is subsequently removed prior to the water entering supply. Failures of the aluminium standard are generally due to failures of these processes.

12 failures of the aluminium standard were reported in 2010, from a total of 5,197 samples.

Ongoing work to optimise existing processes along with the investment in new treatment works and enhancing control systems at existing works aims to minimise these failures.

Operational Area	No. of failures	Percentage of tests compliant
East	0	100.00%
North	2	99.69%
South	6	99.61%
West	4	99.77%
Total	12	99.77%

Overall, 314 supply zones (97.2%) were fully compliant with the aluminium standard (200 µg Al/l).

Turbidity

Turbidity is a measure of "cloudiness" of water and may be caused by treatment problems following heavy rainfall or re-suspension of inorganic particles settled in the network following a burst.

One failure of the turbidity standard was reported in 2010, from a total of 5,244 samples, compared to three failures in 2009 of 5,265 samples.

Operational Area	No. of failures	Percentage of tests compliant
East	1	99.92%
North	0	100.00%
South	0	100.00%
West	0	100.00%
Total	1	99.98%

Overall, 322 supply zones (99.7%) were fully compliant with the turbidity standard.

Capital and Operational Improvements

Capital Improvements

2010 has been a significant year with regard to investment to improve water quality.

The 2006-10 capital investment programme is now substantially complete. By the end of 2010 we had delivered all but 14 of the 187 schemes, costing £600 million, to improve water quality throughout Scotland.

The Glencorse WTW scheme which will improve the quality of water supplied to Edinburgh, as well as supporting growth in and around the city, is due for completion in 2011. This scheme has involved the use of innovative techniques for the manufacture of pipes on site and construction methods to reduce the impact on the environment.

During the year we completed major upgrade works at Marchbank in Edinburgh, Turret in the Forth Valley, Roberton in the Borders and Glendevon in Fife. These upgrades delivered significant benefits to a population of over 350,000. In addition a major scheme at Penwhirn WTW in Dumfries and Galloway has considerably improved THM compliance in that zone. High priority capital maintenance at small rural sites has had a big impact on THM compliance throughout Scotland.

In 2010, we implemented the first of several granular activated carbon and membrane replacement programs to be carried out over the next five years. This will help ensure water quality compliance at sites is maintained across Scotland.

Scottish Water has embarked on the 2010-15 capital investment programme with our new delivery partners. The key emphasis will be to install appropriate treatment at 45 small rural sites to protect customers from the risks associated with *Cryptosporidium* and to undertake extensive improvements in the networks to mitigate problems from iron and manganese.

Operational Improvements

Through 2010 we continued to further optimise our current assets and took a number of actions to ensure continuous improvement. These initiatives will not only help to resolve immediate systemic water quality issues, but ensure the identification and resolution of emerging issues in the longer term.

We carried out a root cause analysis of all of our assets' bacteriological failures and customers' tap chemical failures in order to better understand the source of problems. During 2010 a risk based water treatment works auditing programme was developed to target sites with performance issues.

We reviewed and adjusted disinfection levels at all of our water treatment works to ensure that they were appropriate to maintain bacteriological compliance whilst minimising any chlorine taste and odour contacts and disinfection by-products (THM). We also conducted a full review of current methods of secondary disinfection with a view to improving disinfection control at a number of service reservoir sites. To aid these reviews, we developed new reports to allow for easy identification and early intervention of disinfection level deviations.

We continued to rationalise and abandon treated water storage points to remove poor condition assets and reduce retention times. In addition, we reviewed and re-assessed the treated water storage point cleaning programme, basing the new programme upon appropriate risk of failure.

We undertook a review of the condition of all water treatment works and service reservoir sample points. As a result, in 2011 we will be investing in new sample points at a number of sites to ensure that the water being tested is representative of that leaving the tanks.

Sustainable Land Management

Sustainable land management is a project to be implemented in a number of drinking water catchments over the 2010-15 investment period. It provides the opportunity to control diffuse pollutants in drinking water sources in the catchment, as an alternative to new or additional treatment. We aim to work in partnership with land managers to ensure that activities in the catchment result in less pollution load reaching the treatment works. Such an approach will help secure compliance with drinking water standards where treatment is not technically feasible or where costs of new or additional treatment would be high.

In addition, one of the requirements of the Water Framework Directive is that drinking water sources do not deteriorate in quality and sustainable land management is aligned with this objective.

During the first year of sustainable land management, we have established a team of staff who will work closely with the Scottish Environment Protection Agency in delivering diffuse pollution management in a number of priority catchments, including three drinking water protected areas.

Over the coming years, we will continue to evaluate the progress and performance of sustainable land management to ensure that it contributes towards the supply of wholesome drinking water and delivers value for customers.

Drinking Water Safety Plans

Drinking Water Safety Plans (DWSP), are an effective way of ensuring that a water supply is safe for human consumption and that it meets the health based standards and other regulatory requirements. A DWSP is based on a site specific risk assessment and management approach to all the steps in the water supply chain, from source to tap. The process facilitates the minimisation of contamination of source waters, the reduction or removal of contamination through treatment processes and the prevention of contamination during storage, distribution and handling of drinking water. In 2010 we continued to progress with the delivery of the DWSP process and successfully completed the 2009/10 regulatory target to have plans in place for a total of 104 public water supplies, covering 50% of the population.

Up to the end of 2010 a total number of 167 DWSP had been completed covering 68.7% of the population. We have continued to develop and improve the process.

Regulatory Based Commitments

Enforcement Notices

The DWQR has power to issue enforcement notices under the Water Industry (Scotland) Act 2002 Section 10.

The DWQR can serve an enforcement notice if he believes that Scottish Water has:-

- contravened or is contravening a drinking water quality duty;
- believes that the contravention is likely to recur or continue; and
- that Scottish Water is not taking appropriate steps to rectify the contravention or prevent it recurring.

The DWQR can, if he wishes, take advice from the local Health Authority and the local authority.

The notice must contain:

- details of the alleged contravention;
- his reasons for believing it to be a contravention;
- the date by which it is to be rectified;
- the steps he wants Scottish Water to take, including milestone dates; and
- the date on which the notice takes effect. This date must be no earlier than the day following the last day on which an appeal may be brought.

Loch Eck WTW - Manganese Contravention

Over recent years we have seen an increase in manganese detected in the raw water supplying Loch Eck WTW. As there is presently no manganese removal stage, Scottish Water has designed a cost effective and robust treatment process for its removal. In accordance with the second DWQR enforcement notice construction has started on the new process stage and is due to be completed in early 2012. Work to remove existing manganese deposits in the distribution system will continue into 2012.

Penwhirn WTW - Total THM and Iron Contraventions

Customers supplied by Penwhirn WTW are now benefiting from a more robust treatment process which has improved water quality with respect to the disinfection by-products, trihalomethanes. As part of the current investment programme work is still ongoing within the distribution system to make significant improvements in iron concentrations during 2011 as required by the DWQR enforcement notice.

Water Quality Undertakings

Under Section 76 E (4) (b) of the Water (Scotland) Act 1980 Scottish Water are able to give an Undertaking to Scottish Ministers which is a legal commitment to secure compliance with the Regulations. Each Undertaking sets out the steps to be taken, and the timescales for completion of each step, to ensure regulatory compliance.

Scottish Water inherited water quality Undertakings from the predecessor authorities. A table of Undertakings delivered during 2010 is included in Appendix C of this report. Of the 308 Water Quality Undertakings inherited from the predecessor authorities, 297 have been delivered, leaving 11 in 9 separate water supply zones.

During 2010, at the request of DWQR, Scottish Water began to draft Undertakings for the Forehill supply system in respect of pesticides and in the Muirdykes supply system in respect of manganese.

Authorised Departures

Authorised Departures may be required for any parameters that do not comply with the standards laid down in the Regulations and for water supply zones which have one or more parameters with recurring failures of the standard.

We are required to apply for an Authorised Departure to Scottish Ministers. In support of the application we must submit analytical data to quantify the extent of the problem and provide a detailed outline of the steps to be taken to secure compliance with the Regulations. An important part of the process is that we must give a commitment to a date when compliance will be secured. The maximum time period permitted under the Regulations for an Authorised Departure is three years (although a further departure may be permitted by Ministers if the problem cannot be rectified in this period). Authorised Departures will not be granted where there could be a potential danger to public health.

Scottish Water did not have any Authorised Departures in place in 2010.

Water Quality Incidents

We are required to notify the DWQR of failures to meet the quality standards (an event) laid down in the Regulations. The DWQR then decides whether an event is deemed serious enough to be declared as an incident.

In 2010 the DWQR deemed that 49 water quality events[3] were serious enough to be classified as incidents. They requested further information and actions in the form of an incident report on 18 of these incidents. These are listed in the table opposite.

Glenlatterach WTW Water Quality Incident

On 3rd May 2010 a landslide removed 30 metres of a raw water main supplying Glenlatterach WTW. A temporary pipe and raw water pumps were installed on 4th May.

To reduce the demand from Glenlatterach, additional supplies in the area were supplemented from Badentinan WTW. Water tankers from Elgin were used to top-up the clear water tank at Glenlatterach until the temporary pipeline was in operation.

Both the high aluminium failure and the high ammonium failures from the Glenlatterach WTW coincided with the reduction of flows into the WTW due to the failure of one of the two temporary raw water pumps. No further failures occurred once this set-up had been optimised.

The majority of reported customer complaints over the period related to discoloured water and were the result of reversing flows in the network while the temporary pumping arrangement was established and optimised.

As the landslide was within a Site of Special Scientific Interest and within an unstable area, there were a number of restrictions and health and safety issues that had to be addressed before any permanent repair work could proceed. Once design had been completed and all stakeholders had agreed that work could commence on site, the contractor completed the work within three weeks. The work was completed by 6th August 2010, allowing normal 80l/s raw water flows and automatic control to be restored to Glenlatterach WTW.

Amlaird WTW Water Quality Incident

From August 2010, Amlaird WTW experienced an increase in raw water colour from Craigendunton reservoir. In addition, the treatment works demand increased significantly during the severe weather in December. The treatment works was not designed to treat water with colours in excess of 400 Hazen and as a result chlorine levels had to be increased to safeguard the disinfection process. Consequently exceedances where recorded in distribution for iron and trihalomethanes. No bacteriological exceedances or detections of *Cryptosporidium* were recorded during this period.

Due to the deteriorating raw water quality during October, throughput from the Amlaird WTW was reduced and water supplies in the area were supplemented from Corsehouse WTW and Bradan WTW.

[3] Numbers correct at the time of printing

Significant effort was made by operations and process staff to alleviate the situation, however, whilst being successful in reducing both iron and THM levels, the PCV for both parameters was still breeched in distribution on occasions until January 2011.

Scottish Water has undertaken a full process review focussing on the potential causes of the variation in raw water quality along with completing process performance audits. The process review is complete and a number of actions have been identified to improve performance.

Water Quality Incident Reports Requested*

Location	Date	Population Affected	Water Quality Report Reason
Carron Valley WTW	06/01/2010	154,688	Elevated aluminium levels
Killin WTW	11/01/2010	737	Elevated aluminium levels
Bradan WTW	16/01/2010	185,444	Elevated aluminium levels
Turret WTW	16/01/2010	133,490	Process failure due to power failure
West Lewis WTW	18/01/2010	3,100	Elevated aluminium levels
Turret WTW	01/02/2010	133,490	Elevated pH
Glenlatterach WTW	03/05/2010	31,811	Elevated aluminium and ammonium levels
Newmore WTW	09/06/2010	13,598	Elevated turbidity and aluminium levels
Invercannie WTW	08/07/2010	10,599	Low chlorine levels
Assynt WTW	17/08/2010	29,943	Risk of loss of supply
Daer WTW	23/08/2010	312,896	Process failure
Glendevon WTW	26/08/2010	203,361	Elevated turbidity and aluminium levels
Amlaird WTW	26/08/2010	34,727	Elevated iron and THM levels
Picketlaw WTW	13/09/2010	34,811	Disinfection compromised by filtered water quality
Glenlatterach WTW	19/09/2010	31,811	Elevated manganese and iron levels
Gorthleck WTW	27/10/2010	469	Elevated manganese and iron levels
Whitehillocks RSZ	09/12/2010	4	Failure to respond adequately to consumer contact
Lintrathen RSZ	11/12/2010	20	Bacteriological contamination

*Correct at the time of printing.

Appendices

Appendix A

Microbiological Water Quality

Water Leaving Treatment Works

	Total Coliforms			*E.coli*		
Volume of water distributed from works (m^3/d)	No. of Samples	No. of Fails	Percentage exceeding PCV	No. of Samples	No. of Fails	Percentage exceeding PCV
Less than 3,000 m^3/d	9,400	12	0.13%	9,400	3	0.03%
3,000 to 12,000 m^3/d	5,752	10	0.17%	5,752	1	0.02%
More than 12,000 m^3/d	13,940	22	0.16%	13,940	4	0.03%
Totals	29,092	44	0.15%	29,092	8	0.03%

Water at Customers' Taps

	Total Coliforms			*E.coli*		
Size of Zone (population)	No. of Samples	No. of Fails	Percentage exceeding PCV	No. of Samples	No. of Fails	Percentage exceeding PCV
Less than 5,000 people	1,895	8	0.42%	1,895	1	0.05%
5,000 to 20,000 people	1,378	10	0.73%	1,378	0	0.00%
20,001 to 100,000 people	11,032	51	0.46%	11,032	1	0.01%
Totals	14,305	69	0.48%	14,305	2	0.01%

Water in Service Reservoirs

	Total Coliforms			*E.coli*		
Capacity of reservoir (m^3)	No. of Samples	No. of Fails	Percentage exceeding PCV	No. of Samples	No. of Fails	Percentage exceeding PCV
Less than 2,000 m^3	37,868	84	0.22%	37,868	8	0.02%
2,000 to 10,000 m^3	9,213	18	0.20%	9,213	1	0.01%
More than 10,000 m^3	2,815	5	0.18%	2,815	0	0.00%
Totals	49,896	107	0.21%	49,896	9	0.02%

Water at Customers' Taps

	Enterococci			*Clostridium perfringens*		
Size Band	No. of Samples	No. of Fails	Percentage exceeding PCV	No. of Samples	No. of Fails	Percentage exceeding PCV
Less than 5,000 people	611	1	0.16%	666	1	0.15%
5,000 to 20,000 people	350	0	0.00%	766	0	0.00%
20,001 to 100,000 people	665	0	0.00%	3,769	3	0.08%
Totals	1,626	1	0.00%	5,201	4	0.08%

Appendix B

Physical and Chemical Water Quality at Customers' Taps

Population size	Number of Zones	No. of Results	Results Failing PCV	Results Failing PCV (%)	Zones With PCV Failures
1,2 Dichloroethane					
Less than 5,000 people	196	613	0	0.00%	0
5,000 to 20,000 people	44	352	0	0.00%	0
20,001 to 100,000 people	83	671	0	0.00%	0
Total	323	1,636	0	0.00%	0
2,4,-Db					
Less than 5,000 people	25	87	0	0.00%	0
5,000 to 20,000 people	26	205	0	0.00%	0
20,001 to 100,000 people	73	584	0	0.00%	0
Total	124	876	0	0.00%	0
2,4-D					
Less than 5,000 people	25	87	0	0.00%	0
5,000 to 20,000 people	26	205	0	0.00%	0
20,001 to 100,000 people	73	584	0	0.00%	0
Total	124	876	0	0.00%	0
Aldrin					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	667	0	0.00%	0
Total	323	1,629	0	0.00%	0
Aluminium					
Less than 5,000 people	196	665	1	0.15%	1
5,000 to 20,000 people	44	766	3	0.39%	2
20,001 to 100,000 people	83	3,766	8	0.21%	6
Total	323	5,197	12	0.23%	9
Ammonium					
Less than 5,000 people	196	672	3	0.45%	3
5,000 to 20,000 people	44	767	2	0.26%	2
20,001 to 100,000 people	83	3,808	8	0.21%	2
Total	323	5,247	13	0.25%	7
Antimony					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	348	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,625	0	0.00%	0
Arsenic					
Less than 5,000 people	196	613	0	0.00%	0
5,000 to 20,000 people	44	349	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,627	0	0.00%	0
Asulam					
Less than 5,000 people	25	91	0	0.00%	0
5,000 to 20,000 people	6	48	0	0.00%	0
20,001 to 100,000 people	25	200	0	0.00%	0
Total	56	339	0	0.00%	0
Atrazine					
Less than 5,000 people	109	316	0	0.00%	0
5,000 to 20,000 people	8	64	0	0.00%	0
20,001 to 100,000 people	13	104	0	0.00%	0
Total	130	484	0	0.00%	0
Benzene					
Less than 5,000 people	196	613	0	0.00%	0
5,000 to 20,000 people	44	352	0	0.00%	0
20,001 to 100,000 people	83	671	0	0.00%	0
Total	323	1,636	0	0.00%	0
Benzo 3,4 Pyrene					
Less than 5,000 people	196	615	0	0.00%	0
5,000 to 20,000 people	44	351	0	0.00%	0
20,001 to 100,000 people	83	671	0	0.00%	0
Total	323	1,637	0	0.00%	0

Population size	Number of Zones	No. of Results	Results Failing PCV	Results Failing PCV (%)	Zones With PCV Failures
Boron					
Less than 5,000 people	196	611	0	0.00%	0
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,626	0	0.00%	0
Bromate					
Less than 5,000 people	196	609	0	0.00%	0
5,000 to 20,000 people	44	349	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,623	0	0.00%	0
Cadmium					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	348	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,625	0	0.00%	0
Chloride					
Less than 5,000 people	196	616	0	0.00%	0
5,000 to 20,000 people	44	351	0	0.00%	0
20,001 to 100,000 people	83	668	0	0.00%	0
Total	323	1,635	0	0.00%	0
Chlortoluron					
Less than 5,000 people	4	12	0	0.00%	0
5,000 to 20,000 people	5	39	0	0.00%	0
20,001 to 100,000 people	32	253	1	0.40%	1
Total	41	304	1	0.33%	1
Chromium					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	348	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,625	0	0.00%	0
Colour					
Less than 5,000 people	196	671	6	0.89%	6
5,000 to 20,000 people	44	767	0	0.00%	0
20,001 to 100,000 people	83	3,808	1	0.03%	1
Total	323	5,246	7	0.13%	7
Conductivity					
Less than 5,000 people	196	672	0	0.00%	0
5,000 to 20,000 people	44	767	0	0.00%	0
20,001 to 100,000 people	83	3,806	0	0.00%	0
Total	323	5,245	0	0.00%	0
Copper					
Less than 5,000 people	196	610	1	0.16%	1
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,625	1	0.06%	1
Cyanide					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	349	0	0.00%	0
20,001 to 100,000 people	83	663	0	0.00%	0
Total	323	1,624	0	0.00%	0
Cypermethrin					
Less than 5,000 people	18	65	0	0.00%	0
5,000 to 20,000 people	14	111	0	0.00%	0
20,001 to 100,000 people	52	419	0	0.00%	0
Total	84	595	0	0.00%	0
Diazinon					
Less than 5,000 people	150	459	0	0.00%	0
5,000 to 20,000 people	26	204	0	0.00%	0
20,001 to 100,000 people	58	468	0	0.00%	0
Total	234	1,131	0	0.00%	0

Physical and Chemical Water Quality at Customers' Taps *continued*

Population size	Number of Zones	No. of Results	Results Failing PCV	Results Failing PCV (%)	Zones With PCV Failures
Dicamba					
Less than 5,000 people	25	87	0	0.00%	0
5,000 to 20,000 people	26	205	0	0.00%	0
20,001 to 100,000 people	73	584	0	0.00%	0
Total	124	876	0	0.00%	0
Dieldrin					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	350	1	0.29%	1
20,001 to 100,000 people	83	667	0	0.00%	0
Total	323	1,629	1	0.06%	1
Diuron					
Less than 5,000 people	4	15	0	0.00%	0
5,000 to 20,000 people	5	40	0	0.00%	0
20,001 to 100,000 people	32	256	0	0.00%	0
Total	41	311	0	0.00%	0
Flumethrin					
Less than 5,000 people	18	65	0	0.00%	0
5,000 to 20,000 people	14	111	0	0.00%	0
20,001 to 100,000 people	52	419	0	0.00%	0
Total	84	595	0	0.00%	0
Fluoride					
Less than 5,000 people	196	610	0	0.00%	0
5,000 to 20,000 people	44	349	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,624	0	0.00%	0
Free Chlorine					
Less than 5,000 people	196	1, 894	0	0.00%	0
5,000 to 20,000 people	44	1,376	0	0.00%	0
20,001 to 100,000 people	83	11,030	0	0.00%	0
Total	323	14,300	0	0.00%	0
Gamma-HCH (Lindane)					
Less than 5,000 people	151	455	0	0.00%	0
5,000 to 20,000 people	23	183	0	0.00%	0
20,001 to 100,000 people	25	200	0	0.00%	0
Total	199	838	0	0.00%	0
Heptachlor					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	667	0	0.00%	0
Total	323	1,629	0	0.00%	0
Heptachlor epoxide					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	667	0	0.00%	0
Total	323	1,629	0	0.00%	0
Hydrogen ion (pH)					
Less than 5,000 people	196	672	5	0.74%	5
5,000 to 20,000 people	44	766	2	0.26%	2
20,001 to 100,000 people	83	3,806	2	0.05%	2
Total	323	5,244	9	0.17%	9
Iron					
Less than 5,000 people	196	665	3	0.45%	3
5,000 to 20,000 people	44	766	4	0.52%	3
20,001 to 100,000 people	83	3,766	25	0.66%	17
Total	323	5,197	32	0.62%	23
Isoproturon					
Less than 5,000 people	4	12	0	0.00%	0
5,000 to 20,000 people	5	39	0	0.00%	0
20,001 to 100,000 people	36	285	0	0.00%	0
Total	45	336	0	0.00%	0

Population size	Number of Zones	No. of Results	Results Failing PCV	Results Failing PCV (%)	Zones With PCV Failures
Lead					
Less than 5,000 people	196	610	4	0.66%	4
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	665	3	0.45%	3
Total	323	1,625	7	0.43%	7
Linuron					
Less than 5,000 people	4	15	0	0.00%	0
5,000 to 20,000 people	5	40	0	0.00%	0
20,001 to 100,000 people	32	256	0	0.00%	0
Total	41	311	0	0.00%	0
Manganese					
Less than 5,000 people	196	665	0	0.00%	0
5,000 to 20,000 people	44	766	7	0.91%	6
20,001 to 100,000 people	83	3,766	24	0.64%	12
Total	323	5,197	31	0.60%	18
MCPA					
Less than 5,000 people	25	87	0	0.00%	0
5,000 to 20,000 people	26	205	0	0.00%	0
20,001 to 100,000 people	73	584	0	0.00%	0
Total	124	876	0	0.00%	0
MCPB					
Less than 5,000 people	25	87	0	0.00%	0
5,000 to 20,000 people	26	205	0	0.00%	0
20,001 to 100,000 people	73	584	0	0.00%	0
Total	124	876	0	0.00%	0
MCPP(Mecoprop)					
Less than 5,000 people	25	87	0	0.00%	0
5,000 to 20,000 people	26	205	0	0.00%	0
20,001 to 100,000 people	73	584	0	0.00%	0
Total	124	876	0	0.00%	0
Mercury					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	349	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,626	0	0.00%	0
Metaldehyde					
Less than 5,000 people	4	14	0	0.00%	0
5,000 to 20,000 people	5	40	0	0.00%	0
20,001 to 100,000 people	36	286	0	0.00%	0
Total	45	340	0	0.00%	0
Metazachlor					
Less than 5,000 people	1	4	0	0.00%	0
5,000 to 20,000 people	3	24	0	0.00%	0
20,001 to 100,000 people	16	127	0	0.00%	0
Total	20	155	0	0.00%	0
Metsulfuron					
Less than 5,000 people	1	4	0	0.00%	0
5,000 to 20,000 people	3	24	0	0.00%	0
20,001 to 100,000 people	16	128	0	0.00%	0
Total	20	156	0	0.00%	0
Nickel					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	349	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,626	0	0.00%	0
Nitrate					
Less than 5,000 people	196	616	0	0.00%	0
5,000 to 20,000 people	44	465	0	0.00%	0
20,001 to 100,000 people	83	1,353	0	0.00%	0
Total	323	2,434	0	0.00%	0

Population size	Number of Zones	No. of Results	Results Failing PCV	Results Failing PCV (%)	Zones With PCV Failures
Nitrite					
Less than 5,000 people	196	616	1	0.16%	1
5,000 to 20,000 people	44	465	2	0.43%	2
20,001 to 100,000 people	83	1,354	7	0.52%	4
Total	323	2,435	10	0.41%	7
Odour					
Less than 5,000 people	196	672	0	0.00%	0
5,000 to 20,000 people	44	768	0	0.00%	0
20,001 to 100,000 people	83	3,808	2	0.05%	2
Total	323	5,248	2	0.04%	2
PAH - Total					
Less than 5,000 people	196	615	0	0.00%	0
5,000 to 20,000 people	44	351	0	0.00%	0
20,001 to 100,000 people	83	671	0	0.00%	0
Total	323	1,637	0	0.00%	0
Permethrin					
Less than 5,000 people	18	65	0	0.00%	0
5,000 to 20,000 people	14	111	0	0.00%	0
20,001 to 100,000 people	52	419	0	0.00%	0
Total	84	595	0	0.00%	0
Pesticides - Total					
Less than 5,000 people	196	815	0	0.00%	0
5,000 to 20,000 people	44	500	0	0.00%	0
20,001 to 100,000 people	83	1,595	0	0.00%	0
Total	323	2,910	0	0.00%	0
Propetamphos					
Less than 5,000 people	150	459	0	0.00%	0
5,000 to 20,000 people	26	205	0	0.00%	0
20,001 to 100,000 people	58	468	0	0.00%	0
Total	234	1,132	0	0.00%	0
Selenium					
Less than 5,000 people	196	612	0	0.00%	0
5,000 to 20,000 people	44	348	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,625	0	0.00%	0
Simazine					
Less than 5,000 people	109	316	0	0.00%	0
5,000 to 20,000 people	8	64	0	0.00%	0
20,001 to 100,000 people	13	104	0	0.00%	0
Total	130	484	0	0.00%	0
Sodium					
Less than 5,000 people	196	611	0	0.00%	0
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	323	1,626	0	0.00%	0
Sulphate					
Less than 5,000 people	195	608	0	0.00%	0
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	665	0	0.00%	0
Total	322	1,623	0	0.00%	0
Taste					
Less than 5,000 people	196	672	0	0.00%	0
5,000 to 20,000 people	44	768	0	0.00%	0
20,001 to 100,000 people	83	3,807	2	0.05%	2
Total	323	5,247	2	0.04%	2
Tetrachloroethene & Trichloroethene					
Less than 5,000 people	196	613	0	0.00%	0
5,000 to 20,000 people	44	352	0	0.00%	0
20,001 to 100,000 people	83	671	0	0.00%	0
Total	323	1,636	0	0.00%	0

Population size	Number of Zones	No. of Results	Results Failing PCV	Results Failing PCV (%)	Zones With PCV Failures
Tetrachloromethane					
Less than 5,000 people	196	613	0	0.00%	0
5,000 to 20,000 people	44	352	0	0.00%	0
20,001 to 100,000 people	83	671	0	0.00%	0
Total	323	1,636	0	0.00%	0
Thifensulfuron-methyl					
Less than 5,000 people	1	4	0	0.00%	0
5,000 to 20,000 people	3	24	0	0.00%	0
20,001 to 100,000 people	16	128	0	0.00%	0
Total	20	156	0	0.00%	0
TON Ratio					
Less than 5,000 people	196	616	0	0.00%	0
5,000 to 20,000 people	44	465	0	0.00%	0
20,001 to 100,000 people	83	1,353	0	0.00%	0
Total	33	2,434	0	0.00%	0
Total chlorine					
Less than 5,000 people	196	1,893	0	0.00%	0
5,000 to 20,000 people	44	1,376	0	0.00%	0
20,001 to 100,000 people	83	11,030	0	0.00%	0
Total	323	14,299	0	0.00%	0
Total organic carbon					
Less than 5,000 people	196	616	0	0.00%	0
5,000 to 20,000 people	44	350	0	0.00%	0
20,001 to 100,000 people	83	671	0	0.00%	0
Total	323	1,637	0	0.00%	0
Total Trihalomethanes					
Less than 5,000 people	196	613	36	5.87%	24
5,000 to 20,000 people	44	352	11	3.13%	7
20,001 to 100,000 people	83	671	12	1.79%	8
Total	323	1,636	59	3.61%	39
Tribenuron-methyl					
Less than 5,000 people	1	4	0	0.00%	0
5,000 to 20,000 people	3	24	0	0.00%	0
20,001 to 100,000 people	16	128	0	0.00%	0
Total	20	156	0	0.00%	0
Turbidity					
Less than 5,000 people	196	672	0	0.00%	0
5,000 to 20,000 people	44	766	0	0.00%	0
20,001 to 100,000 people	83	3,806	1	0.03%	1
Total	323	5,244	1	0.02%	1

Appendix C

Water Quality Undertakings Completed during 2010

Zone Name	Quality Parameter	Undertaking Date	Date Undertaking Delivered	Work currently complete
Ballater	Crypto	31/12/2005	31/03/2010	Coagulation and continuously washing filter
Ballater	THM	31/12/2003	31/03/2010	Coagulation and continuously washing filter
Bressay	THM	31/12/2006	09/09/2010	Main out from Lerwick
Kinlochbervie	THM	31/12/2008	31/03/2010	Nanofiltration membrane
Loch Lee (Grampian)	THM	31/12/2008	25/01/2010	Existing plant refurbishment
Newton Stewart	THM	25/12/2002	05/11/2010	Mained out from Penwhirn
Tarbert (WI)	THM	31/12/2006	23/12/2010	Coagulation and ultrafiltration membrane
Ullapool	Crypto	31/12/2005	31/05/2010	New borehole source & ultrafiltration membrane
Ullapool	THM	31/12/2005	31/05/2010	New borehole source & ultrafiltration membrane

Contact Details

For more information on drinking water quality in your area, call our Customer Helpline **0845 601 8855*** and ask to speak to a member of our Public Health team. Alternatively, you can contact us via our website: www.scottishwater.co.uk

Or you can write to us at:
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*We record all calls for quality and training purposes.

Scottish Water

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