



**Scottish
Water**

Always serving Scotland

Annual Water Quality Report
2009



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Foreword

I am pleased to present Scottish Water's Annual Water Quality Report for 2009.

This report is produced in accordance with the requirements of The Water Supply (Water Quality) (Scotland) Regulations 2001.

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. Water quality remains at an all time high and Scotland enjoys some of the best quality tap water which is rigorously tested to ensure it complies with the strictest standards.


During 2009, we conducted over 334,718 laboratory analyses on regulatory samples taken at treatment works, service reservoirs and customer taps. Of these, 99.83% were compliant with the stringent regulatory standards. In addition to regulatory monitoring, many more samples were analysed both in the laboratory and on-site for operational reasons providing additional checks and monitoring performance of our assets.

In 2009 we continued to deliver our capital investment programme to replace, refurbish or improve 187 treatment works before 2010. Within our programme a significant part of the investment is to improve the aesthetic (colour, taste & odour) quality of water at customers' taps, reflecting the fact that tap water should not only be wholesome, but also pleasant to drink.

The end of 2009 brought an extended period of low temperatures, snow and ice which caused problems for our customers with frozen and burst pipes. Across the country, Scottish Water staff worked around the clock in very difficult conditions to restore water and maintain our high standard of safe drinking supplies for our customers. We have had issues with treatment works and water supply systems freezing up and the number of burst mains was at about five times higher than the normal level for that time of year. In many areas, our water treatment works (WTW) ran at capacity in order to address leakage and keep customers in supply. To ensure the public health of customers was maintained throughout the cold spell, the sampling effort was accelerated, with extra samples being taken at customers' taps. I am extremely proud of the manner in which Scottish Water employees responded during this challenging period.

While we produce high quality water for our customers, there are occasions when water quality does not meet the high standards we expect. Although the number of events and incidents has reduced compared with previous years, we have experienced a couple of serious incidents associated with smaller supplies, described later in this report.

I hope you will find this report interesting and informative and that it demonstrates that Scottish Water is delivering clearer, fresher drinking water.



Richard Ackroyd
Chief Executive
Scottish Water

Introduction

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

Scottish Water is the fourth largest water services provider in the UK. In 2009 we served a population of 4.91 million. On average our household customers use approximately 883 million litres of water per day (Ml/d) and we supply approximately 466Ml/d to the non-household sector.

We had 282 operational water treatment works in 2009, with by far the largest number being located in the north west of Scotland, where they are sized to supply relatively small populations. Many of these treatment works were designed and built long before higher national and European Directive water quality standards came into force.

In 2009 we continued to deliver the Quality & Standards IIIa investment programme (2006-2010), the second biggest investment programme in the UK water industry over the period. This programme is driven not only by legislative standards but also by the aesthetic quality (colour, taste and odour) of the water at customers' taps. The programme includes over £600 million investment at 187 water treatment works which will improve drinking water supplied to approximately four million people. More than a further £50 million is being invested to maintain performance at key water assets such as pumping stations and storage tanks. Investment in the mains networks of around £30 million is reducing complaints from customers with respect to iron and manganese (sources of discolouration).

Completion of this investment will further improve the quality of water for our customers.

We have received the final determination from the Water Industry Commission detailing our investment allowance over 2010-2015. A programme of early start work is underway. We continue to work closely with the Drinking Water Quality Regulator for Scotland (DWQR) and health professionals to ensure water quality is of the highest possible standard and that public health is maintained.

Water Supply Assets and Supply Zones

During 2009, we had the following assets and supply zones in service and regularly monitored as part of the overall water quality sampling programme.

| Sampling Location | Number |
|-----------------------|--------|
| Water Treatment Works | 282 |
| Service Reservoirs | 1,058 |
| Water Supply Zones | 328 |

Overview to Water Quality in Scotland

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.

The quality of our drinking water supplies is carefully assessed by thorough monitoring of the supply system, using a wide range of analytical techniques. This provides quality assurance from source to the customers' taps. The analytical data produced and our operational practices are independently checked and audited annually by the DWQR. Samples taken as part of the mandatory programme are analysed at our in-house laboratories. The full laboratory and sampling organisation, structure and processes are also 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).

During 2009, 334,718 tests were carried out on water samples taken from water treatment works, service reservoirs and customers' taps for microbiological, physical and chemical parameters¹. From these tests, the overall compliance with microbiological and chemical standards was 99.83% (99.81% in 2008). This represents a continuation of the high standards in overall compliance achieved since the establishment of Scottish Water in 2002.

Full details of the quality of water supplied during 2009 are supplied in Appendices A and B.

Sampling and Analysis

Compliance with the statutory sampling program improved from 99.16% in 2008 to 99.54% in 2009 as a result of improvements to sample tap maintenance, program scheduling and resource management.

The Laboratory Group underwent significant change in 2009 with the closure of the Dundee laboratory. Scientific Services are now operating from laboratories in Edinburgh, Inverness, Stornoway and Orkney. The four remaining laboratories along with the sampling team continue to operate within a management system that is accredited to ISO17025 and Drinking Water Testing Specifications (DWTS). The management system undergoes annual external audits from the United Kingdom Accreditation Service (UKAS) and the Drinking Water Quality Regulator.

Scottish Water would like to acknowledge the significant contribution that the staff of the Dundee laboratory have made to the success of Scottish Water and its predecessors over the years.

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, TOC, residual disinfectant are not included.

Overview to Water Quality in Scotland *continued*

Information Submission

Throughout 2009, we continued to supply monthly electronic information submissions to the DWQR which identified our assets, the water sampling we have undertaken at those assets, and corresponding sample results. This data enables the DWQR to carry out independent detailed analysis of our performance.

We supply DWQR with laboratory and customer service data in a single submission, ensuring that the DWQR is provided with consistent and fully reconcilable information that is used in our daily operational activities. This year we were requested to provide even more detail around our customer service data enabling the DWQR to undertake a more in-depth analysis of this information.

During the year, we made improvements to our Events Notification process which now allows us to provide these in an electronic format acceptable to the DWQR.

Notwithstanding this, we are committed to continuous improvement building on the success of these systems. During 2010, we will continue to improve and develop systems and processes through the enhancement of the reporting tools, review and refinement of the processes and maximising the benefits from our work integrating the asset inventory and laboratory systems.

Cryptosporidium

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.

In 2009, we achieved 99.09% compliance (98.20% in 2008) against the statutory Cryptosporidium sampling requirements as determined by the risk assessment process detailed in The Directions. In doing so we collected and analysed over 15,000 samples. We continue to make improvements to achieve 100% compliance with the sampling requirements.

During 2009, we improved our compliance for membrane integrity testing, installed more turbidity monitors, and brought into service new membrane water treatment works. We also developed our delivery plan for 2010-15 which identified the 45 water treatment works most at risk from Cryptosporidium which will require investment to deliver robust treatment.

Scottish Water is committed to full compliance with The Directions. We continue to ensure that processes and procedures are complied with and that appropriate interventions are put in place to improve compliance further.

Water Quality Summary

Microbiological Quality

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

(a) water leaving treatment works

In 2009, 30,999 samples were taken for faecal and total coliform analysis. Compliance with the faecal coliform standard was 99.98% (99.97% in 2008) and with the total coliform standard was 99.90% (99.76% in 2008).

(b) water in service reservoirs

In 2009, 53,109 samples were taken for faecal and total coliform analysis. Compliance with the faecal coliform standard was 99.98% (99.98% in 2008) and with the total coliform standard was 99.74% (99.75% in 2008).

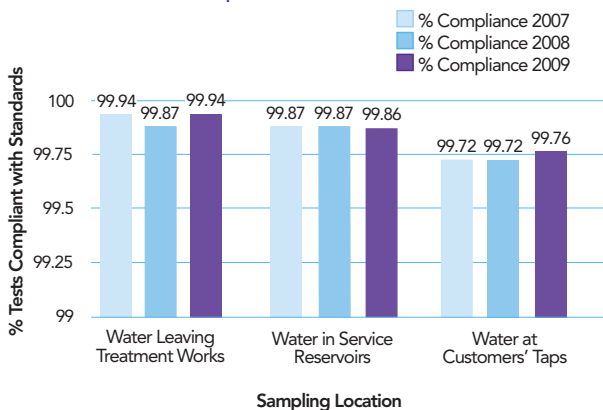
(c) water at customers' taps

In 2009, 14,386 samples were taken for faecal and total coliform analysis. Compliance with the faecal coliform standard was 99.97% (99.99% in 2008) and with the total coliform standard was 99.54% (99.45% in 2008).

1,654 samples were taken for enterococci analysis. Compliance with the enterococci standard was 100% (99.94% in 2008).

5,233 samples were taken for *clostridium perfringens* analysis. Compliance with the *clostridium perfringens* standard was 99.94% (99.94% in 2008).

Chart 1: Microbiological Water Quality % Tests Compliant with Standards (Average of Faecal and Total Coliform compliance)

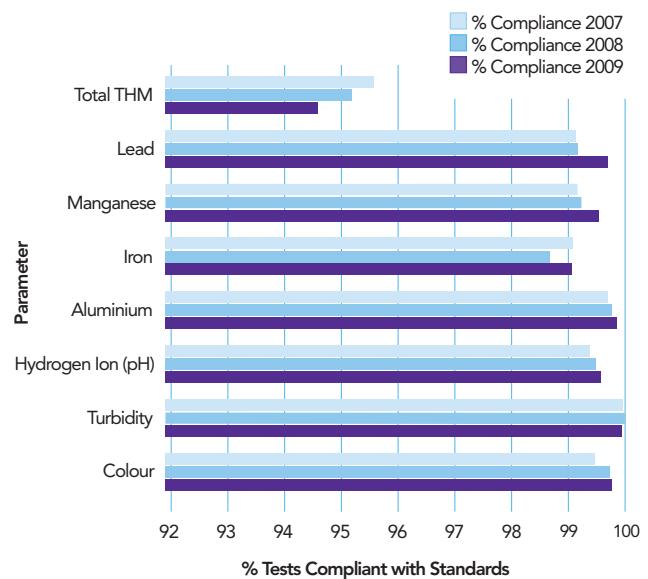


Physical and Chemical Quality

Physical and chemical quality standards apply to water supplied at customers' taps. 119,724 tests were carried out at customers' taps for all parameters during 2009. Of these, 99.77% were compliant with regulatory standards (99.75% in 2008).

Compliance rates for the eight key physical and chemical parameters in samples taken at customers' taps in 2009 are shown in the chart below, together with 2007 and 2008 for comparison.

Chart 2: Water at Customers' Taps Physical & Chemical Water Quality % Compliance with Standards



Water Quality Summary *continued*

Compliance with six of the key parameters has improved when compared with 2008 compliance levels and for five of the key parameters compared with 2007 levels. The most marked improvement in compliance has been made in lead, through optimisation of phosphate dosing, and manganese, through improvements in assets and operational procedures. The reduction in compliance for turbidity is only slight bearing in mind that compliance was at 100% in 2008. Iron compliance improved from 2008 and was comparable with 2007. The most notable deterioration relates to total trihalomethanes (THM). This is discussed further on page 12.

In addition to measuring physical and chemical quality at customers' taps we are required to monitor specific parameters, namely turbidity and nitrite, leaving treatment works.

The compliance rates for these parameters are tabulated below:

| Parameter | No. of tests 2009 | Compliance 2009 | Compliance 2008 | Compliance 2007 |
|------------|-------------------|-----------------|-----------------|-----------------|
| Turbidity* | 8,125 | 99.68% | 99.60% | 99.17% |
| Nitrite** | 2,994 | 99.83% | 99.90% | 99.91% |

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

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

There were five nitrite exceedances in 2009 compared to three in both 2008 and 2007.

Capital Investment to Improve Water Quality

In 2009 we continued to deliver the Q&SIIIa investment programme.

Investment in the 2006-2010 period has been targeted at water treatment works, treated water storage tanks, water pumping stations and in the distribution system.

The programme is delivering over £600 million investment at 187 water treatment works and more than a further £50 million to maintain performance at key water assets such as pumping stations and storage tanks. Investment in the mains networks of around £30 million is reducing complaints from customers with respect to iron and manganese (sources of discolouration).

Work is well underway on the Glencorse WTW scheme which will improve the quality of water supplied to Edinburgh as well as supporting growth in and around the city. 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.

As well as this, work was completed during 2009 on more than 60 schemes serving approximately 1,400,000 people to improve water quality compliance including aesthetic qualities such as taste and odour. These schemes include those at Daer, Bradan and Clatto water treatment works.

In the distribution system, key projects in Ayrshire have been completed to improve the iron and manganese aesthetic quality of water for customers. Throughout Scotland a large number of additional projects have been completed in 2009 or are underway to manage these aesthetic parameters.

In addition, work was completed in building the investment programme for the 2010-2015 business plan. A key emphasis in this period will be to install appropriate treatment at 45 sites to protect customers from the risks associated with Cryptosporidium and further extensive improvements in the networks to mitigate problems from iron and manganese.

Drinking Water Safety Plans

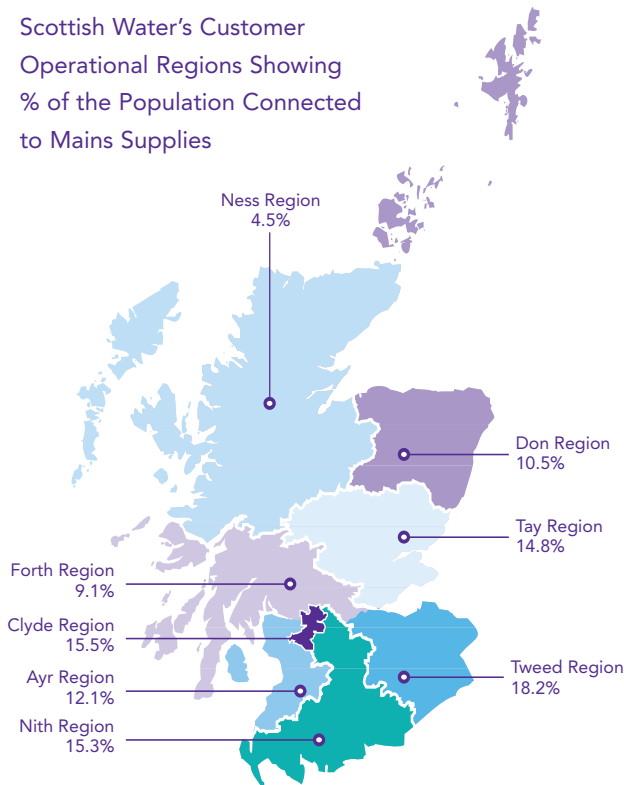
Drinking Water Safety Plans (DWSP), are an effective way of ensuring that a water supply is safe for human consumption and that it meets the health based standards and other regulatory requirements in a sustainable manner. A DWSP is based on a site specific risk assessment and management approach to 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 2009 we continued to develop and refine the DWSP process and successfully completed the 2008/09 regulatory target to have plans in place for a total of 93 public water supplies, covering 46% of the population.

During the latter part of 2009 progress continued towards completion of our 2009/10 regulatory target to have a total of 104 DWSP completed, covering over 50% of the population. We have continued to develop and improve the efficiency of this process including standardisation of interactive water supply system schematics. Each DWSP also incorporates an improvement plan which is used to track risk mitigation progress.

Water Quality Analysis

The raw water quality we treat in Scotland reflects the topographical diversity of the country. During 2009 we operated as eight operational regions – Ness, Don, Forth, Tay, Ayr, Clyde, Nith and Tweed.

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



Larger, high output treatment works are used to supply the main centres of population and are therefore mainly concentrated in the central belt and north east.

The Ness operational region contains by far the largest number of water treatment works. The great majority of these treatment works are sized to supply relatively small populations. Investment planned for 2010-15 will improve water quality and compliance at a number of these small rural works. Beyond 2015, risks associated with inadequate treatment will be addressed through the drinking water safety planning process and delivery of identified interventions.

Microbiological Parameters

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 *E.coli* or faecal coliform organism is a coliform bacteria 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 98,403 samples were taken and analysed.

Samples Taken for Residual Disinfectant

| Sampling Location | Number of Samples Taken for Residual Disinfectant* |
|-------------------------------|--|
| Water leaving Treatment Works | 30,945 |
| Water in Service Reservoirs | 53,071 |
| Water at Customers' Taps | 14,387 |

* There is no regulatory standard for residual disinfectant

Treatment Works

Coliform failures

The number of coliform failures at treatment works has improved to just 30 of a total of 30,999 samples in 2009 from 76 of a total of 31,488 samples in 2008. The breakdown of failures by operational area is as follows:

| Operational Area | No. of WTWs | No. of failures | Percentage of overall failures |
|------------------|-------------|-----------------|--------------------------------|
| Ness | 110 | 4 | 13.3% |
| Don | 44 | 1 | 3.3% |
| Forth | 50 | 8 | 26.7% |
| Tay | 16 | 4 | 13.3% |
| Ayr | 14 | 0 | 0.0% |
| Clyde | 6 | 1 | 3.3% |
| Nith | 20 | 2 | 6.7% |
| Tweed | 22 | 10 | 33.3% |
| Total | 282 | 30 | 100% |

E. Coli failures

6 failures were reported from a total of 30,999 samples.

| Operational Area | No. of WTWs | No. of failures | Percentage of overall failures |
|------------------|-------------|-----------------|--------------------------------|
| Ness | 110 | 1 | 16.7% |
| Don | 44 | 0 | 0.0% |
| Forth | 50 | 0 | 0.0% |
| Tay | 16 | 0 | 0.0% |
| Ayr | 14 | 0 | 0.0% |
| Clyde | 6 | 0 | 0.0% |
| Nith | 20 | 2 | 33.3% |
| Tweed | 22 | 3 | 50.0% |
| Total | 282 | 6 | 100% |

Service Reservoirs

Coliforms failures

138 coliform failures were reported from a total of 53,109 samples.

| Operational Area | No. of SRs | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 219 | 17 | 12.3% |
| Don | 221 | 49 | 35.5% |
| Forth | 134 | 14 | 10.1% |
| Tay | 181 | 28 | 20.3% |
| Ayr | 64 | 5 | 3.6% |
| Clyde | 26 | 0 | 0.0% |
| Nith | 120 | 16 | 11.6% |
| Tweed | 93 | 9 | 6.5% |
| Total | 1,058 | 138 | 100% |

E. Coli failures

12 failures were reported from a total of 53,109 samples.

| Operational Area | No. of SRs | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 219 | 1 | 8.3% |
| Don | 221 | 4 | 33.3% |
| Forth | 134 | 0 | 0.0% |
| Tay | 181 | 5 | 41.7% |
| Ayr | 64 | 1 | 8.3% |
| Clyde | 26 | 0 | 0.0% |
| Nith | 120 | 1 | 8.3% |
| Tweed | 93 | 0 | 0.0% |
| Total | 1,058 | 12 | 100% |

Water Quality Analysis *continued*

Customers' Taps

Coliform failures

The number of coliform failures at customers' taps has improved slightly to just 66 of a total of 14,386 samples in 2009, compared with 79 in 2008 of 14,468 samples. The breakdown of failures by operational area is as follows:

| Operational Area | No. of Zones | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 108 | 8 | 12.1% |
| Don | 48 | 15 | 22.7% |
| Forth | 56 | 8 | 12.1% |
| Tay | 18 | 15 | 22.7% |
| Ayr | 17 | 2 | 3.0% |
| Clyde | 20 | 3 | 4.5% |
| Nith | 30 | 11 | 16.7% |
| Tweed | 31 | 4 | 6.1% |
| Total | 328 | 66 | 100% |

E. Coli failures

4 failures were reported from a total of 14,386 samples.

| Operational Area | No. of Zones | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 108 | 0 | 0.0% |
| Don | 48 | 2 | 50.0% |
| Forth | 56 | 1 | 25.0% |
| Tay | 18 | 0 | 0.0% |
| Ayr | 17 | 0 | 0.0% |
| Clyde | 20 | 0 | 0.0% |
| Nith | 30 | 1 | 25.0% |
| Tweed | 31 | 0 | 0.0% |
| Total | 328 | 4 | 100% |

Physico-chemical Parameters

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

Treatment Works

Nitrite failures:

5 failures were reported from 2,994 samples. Failures were spread across four WTW where chloramination is practised.

| Operational Area | No. of WTWs | No. of failures | Percentage of overall failures |
|------------------|-------------|-----------------|--------------------------------|
| Ness | 110 | 0 | 0.0% |
| Don | 44 | 1 | 20.0% |
| Forth | 50 | 0 | 0.0% |
| Tay | 16 | 2 | 40.0% |
| Ayr | 14 | 0 | 0.0% |
| Clyde | 6 | 0 | 0.0% |
| Nith | 20 | 0 | 0.0% |
| Tweed | 22 | 2 | 40.0% |
| Total | 282 | 5 | 100% |

Turbidity failures:

26 failures were reported from 8,125 samples.

| Operational Area | No. of WTWs | No. of failures | Percentage of overall failures |
|------------------|-------------|-----------------|--------------------------------|
| Ness | 110 | 5 | 19.2% |
| Don | 44 | 5 | 19.2% |
| Forth | 50 | 3 | 11.5% |
| Tay | 16 | 4 | 15.4% |
| Ayr | 14 | 2 | 7.7% |
| Clyde | 6 | 2 | 7.7% |
| Nith | 20 | 3 | 11.5% |
| Tweed | 22 | 2 | 7.7% |
| Total | 282 | 26 | 100% |

Customers' Taps

Colour

12 failures of the colour standard were reported in 2009, from a total of 5,265 samples.

Colour in water supplies is normally due to the presence of coloured organic acids (humic and fulvic) derived from peat and soil humus, when they are not adequately removed during the water treatment process.

| Operational Area | No. of Zones | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 108 | 5 | 41.7% |
| Don | 48 | 6 | 50.0% |
| Forth | 56 | 0 | 0.0% |
| Tay | 18 | 1 | 8.3% |
| Ayr | 17 | 0 | 0.0% |
| Clyde | 20 | 0 | 0.0% |
| Nith | 30 | 0 | 0.0% |
| Tweed | 31 | 0 | 0.0% |
| Total | 328 | 12 | 100% |

Five of the twelve fails in 2009 were recorded in small supply zones in the Ness operational region. This is largely due to the minimal level of treatment on some of these rural supplies and the variable nature of raw water quality. Improvements to existing processes and the introduction of membrane based water treatment systems to smaller supplies are helping to reduce failures of the colour standard.

Three fails occurred in the Invercarnie supply zone. The remaining were single sample fails.

Overall 318 supply zones (97.0%) were fully compliant with the colour standard (20 mg/l Pt/Co).

Iron

49 failures of the iron standard were reported in 2009, from a total of 5,234 samples.

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. The iron standard is set for aesthetic reasons, and levels above the standard can give rise to discolouration and particles in the water.

| Operational Area | No. of Zones | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 108 | 4 | 8.2% |
| Don | 48 | 13 | 26.5% |
| Forth | 56 | 5 | 10.2% |
| Tay | 18 | 10 | 20.4% |
| Ayr | 17 | 7 | 14.3% |
| Clyde | 20 | 1 | 2.0% |
| Nith | 30 | 7 | 14.3% |
| Tweed | 31 | 2 | 4.1% |
| Total | 328 | 49 | 100% |

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 296 supply zones (90.2%) were fully compliant with the iron standard (200 µg Fe/l), an improvement on 2008 when 86% of zones were compliant.

Water Quality Analysis *continued*

Manganese

24 failures of the manganese standard were reported in 2009, from a total of 5,234 samples.

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

| Operational Area | No. of Zones | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 108 | 4 | 16.7% |
| Don | 48 | 1 | 4.2% |
| Forth | 56 | 4 | 16.7% |
| Tay | 18 | 1 | 4.2% |
| Ayr | 17 | 4 | 16.7% |
| Clyde | 20 | 2 | 8.3% |
| Nith | 30 | 7 | 29.2% |
| Tweed | 31 | 1 | 4.2% |
| Total | 328 | 24 | 100% |

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 307 supply zones (93.6%) were fully compliant with the manganese standard (50 µg Mn/l).

Total THM

89 failures of the trihalomethanes (THM) standard were reported in 2009, from a total of 1,646 samples. The number of failures has increased from 81 failures out of 1,684 samples in 2008.

THMs are formed by the reaction of chlorine with naturally occurring organic compounds in the water.

| Operational Area | No. of Zones | No. of failures | Percentage of overall failures |
|------------------|--------------|-----------------|--------------------------------|
| Ness | 108 | 45 | 50.6% |
| Don | 48 | 7 | 7.9% |
| Forth | 56 | 10 | 11.2% |
| Tay | 18 | 4 | 4.5% |
| Ayr | 17 | 11 | 12.4% |
| Clyde | 20 | 1 | 1.1% |
| Nith | 30 | 10 | 11.2% |
| Tweed | 31 | 1 | 1.1% |
| Total | 328 | 89 | 100% |

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. 61 of the failures occurred in small supplies, 45 of which in the Ness region. Three of these WTW are due for replacement in 2010.

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. Reduction of THM levels is a major driver for our current investment programme. The number of failures had been expected to reduce as key projects were completed. However analysis of the data shows that more water supply zones (WSZ) failed in 2009 than in 2008.

Approximately 70% of the failures have occurred in water supply zones which are supplied by WTW which either still have investment programmed in this investment period or have investment planned in the 2010 to 2015 investment period. Capital maintenance or process optimisation, where organic removal currently exists, are also key to improving overall Total THM compliance

Overall 274 supply zones (83.5%) were fully compliant with the THM standard (100 µg/l).

Lead

5 failures of the 25 µg Pb/l lead standard were reported in 2009, from a total of 1,654 samples.

The existence of lead at customers' taps is largely attributable to elements of lead pipework within customer properties or the connections to our network.

Overall 323 supply zones (98.5%) were fully compliant with the lead standard (25 µg Pb/l).

Water leaving treatment works is stabilised in order to minimise its tendency to dissolve the lead pipework. Dosing of orthophosphate compounds to reduce plumbosolvency is being extended to more treatment works and where it currently exists, we have been carrying out process optimisation. Lead pipe replacement is also currently undertaken as part of the ongoing mains rehabilitation programme or in small zones where it proves to be more cost effective than dosing.

We are working to reduce the occurrence of lead in customers' supplies as part of the ongoing investment programme, but customers remain responsible for replacing any lead pipe that still exists in their property.

Aluminium

7 failures of the aluminium standard were reported in 2009, from a total of 5,233 samples.

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.

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.

Overall 321 supply zones (97.9%) were fully compliant with the aluminium standard (200 µg Al/l).

Authorised Departures and Enforcement Notices

Authorised Departures

Authorised Departures may be required for any parameters that do not comply with the standards laid down in the Regulations. Departures are required 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 3 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.

Copies of the applications are submitted to the Water Industry Commission for Scotland, Waterwatch Scotland, the local Consultant in Public Health Medicine (CPHM) and the local authority (via Environmental Health departments) in the affected area. These parties have 30 days to make any representation to Scottish Ministers. Once a Departure has been granted Scottish Water must inform the population affected that a Departure from the Regulations has been granted and the conditions governing it.

Within the notification of the Departure the following information is provided:

- Parameters failing to meet Regulatory standards and the permitted maximum exceedance for the duration of the Departure.
- All water supply zones affected.
- Measures to be taken to rectify the problem (e.g. new treatment works).
- Timescale to rectify the problem.

The method of notification depends on the size of the population affected. Small populations, 100 properties or less are notified by letter. For larger populations Scottish Water takes out a local press advert. Details of Authorised Departures currently in place are listed on the opposite page and can also be obtained from our website (www.scottishwater.co.uk) in the Publications section. Alternatively details can be obtained via our Helpline (0845 601 8855).

Appendix C shows water quality compliance with Authorised Departure limits in place in 2009.

Tarbert, Isle of Lewis – Colour Authorised Departure

Construction of a new membrane water treatment works commenced in 2009. Work will be completed in spring 2010 when customers will notice a significant improvement in overall water quality.

The following table lists the Authorised Departures that were in place at any time during 2009. The list includes all authorised departures granted, amended or that expired during 2009.

| Water Supply Zone | Communities within Water Supply Zone | Authorised Departure Parameters | Date Authorised Departure Granted | Authorised Departure End Date | Measures Completed by end of 2009 |
|-------------------|---|---------------------------------|-----------------------------------|-------------------------------|-----------------------------------|
| Lochinver | Lochinver, Strathan, Inverkircaig, Baddidarroch, Badnaban, Cruamer and Culag | THM | 22/06/2006 | 31/12/2008 | Yes |
| Palnure* | Palnure, Stornord, Bargaly, Carty, East Kirkland, West Kirkland, Carse of Clary, Carse of Barr and Glenturk | Colour, THM | 22/06/2006 | 01/04/2009 | No |
| Penwhirn Palnure* | Wigtown | Iron, THM | 22/06/2006 | 01/04/2009 | No |
| Sheildaig** | Sheildaig | Colour, THM | 22/06/2006 | 01/04/2009 | No |
| Tarbert*** | Aird Asaig, Bun Abhainn Eadarra, Caolas Scalpaigh, Carrigreich, Deiracleite, Eilean na Scalpaigh, Leacainn, Miabhaig, Tairbeart and Urgha | Colour | 22/06/2006 | 22/06/2009 | No |

* DWQR issued an enforcement notice for Penwhirn Water Supply Zone which now supplies former Palnure and Penwhirn Palnure zones.

*** At the time of writing a new WTW is currently being commissioned and completion is expected in early 2010.

** Included in 2010-2015 investment programme.

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; and
- 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;
- 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

Following the upgrade of the water treatment works at Loch Eck, increased manganese was detected in the raw water. As there presently is no manganese removal stage, Scottish Water is determining the most cost effective and reliable approach for its removal. The DWQR has issued an enforcement notice which requires Scottish Water to design a manganese treatment removal stage by June 2010 with construction beginning immediately thereafter.

Penwhirn WTW – Total THM and Iron contravention

Customers previously supplied by Barclye and Palnure are benefiting from improved water quality with respect to colour as Penwhirn WTW provides a significantly more robust treatment process than either Barclye or Palnure. However, due to raw water quality Penwhirn WTW also produces water into supply that has exceedances of the disinfection by-product, trihalomethanes. As part of the current investment programme there is a project to resolve this issue and a significant improvement is expected during 2010 as required by the DWQR enforcement notice.

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 2009 the DWQR deemed that 19 water quality events² were serious enough to be classified as incidents. They requested further information and actions in the form of an incident report on 15 of these incidents². These are listed in the table opposite.

Forehill WTW Water Quality Incident

Scottish Water received an elevated number of customer complaints regarding discoloured water within the Forehill Water Operational Area (WOA) over spring and summer 2009. Consequently, the DWQR requested an incident report to investigate this.

Samples confirmed that the water quality was sporadically non compliant with the quality standards required by the Regulations.

Following subsequent investigation, flushing of the trunk mains in October 2009 and cleaning of the clear water tank at Forehill resulted in a significant reduction in the number of discoloured water complaints within the Forehill WSZ.

Blairnamarrow WTW Water Quality Incident – Cryptosporidium

Following increased turbidity as a result of intense rainfall at Blairnamarrow WTW on 17 July 2009 a Cryptosporidium sample showed a positive Cryptosporidium count (592 oocysts or 3.277 oocysts/10litres).

On receiving the sample information, the Consultant in Public Health Medicine requested a boil water notice to be issued for the customers served from this WTW. This notice applied from 21-26 July 2009.

A temporary filtration unit installed as a Cryptosporidium barrier was not operational at the time of the event due to operational difficulties in running the plant whilst maintaining supply to all customers.

The water treatment works at Blairnamarrow remains at risk from Cryptosporidium breakthrough and a permanent Cryptosporidium barrier solution is currently being installed and the project is nearing completion.

Aboyne WTW Water Quality Incident

On Friday 4th September 2009, heavy rainfall within the catchment area for Aboyne water treatment works resulted in the detection of Cryptosporidium in the final water on 4 and 5 September 2009.

The Cryptosporidium sample results were received by Scottish Water on 8 September 2009 and were immediately discussed with the CPHM who requested a boil water notice to be issued to the 2,460 customers supplied from Aboyne water treatment works. This was issued by Scottish Water on 8 September 2009 and remained in place until 22 September 2009 when the CPHM was satisfied that Cryptosporidium levels had returned to normal background levels and that the risk to our customers had passed.

² Numbers correct at the time of printing

The existing treatment process at Aboyne WTW does not constitute a robust method for the removal of Cryptosporidium present in the raw water. Scottish Water will close the WTW and customers will be fed from Invercarnie WTW. The present estimate for completion of this work is during 2012. In the interim, we will continue to monitor levels of Cryptosporidium in final treated water.

Blairnamarrow WTW Water Quality Incident – High pH

A significant breach of the pH standard was reported by Scottish Water over 19–21 October 2009.

The incident occurred due to a fault in the sodium carbonate dosing system. This in turn resulted in a high level alarm for final water pH being generated. Subsequent investigations revealed that this alarm had been suppressed in January 2009 and therefore no alarm was received at the Operational Control Centre.

The high levels of final water pH resulted in the final water chlorine residual being reduced triggering a low chlorine alarm.

The Grampian Health Board CPHM requested that a 'do not use' notice be issued to all customers supplied by this works. Alternative water supplies were distributed to all properties in the water supply zone, leaflets delivered and distribution sampling continued. The 'do not use' restriction was in place from 09:40 on 21 October 2009 until the CPHM agreed that it could be removed at 11:30 on 22 October 2009.

26 customer complaints were received over the period 20-23 October 2009.

The DWQR has investigated this incident and submitted a report to the Procurator Fiscal recommending that Scottish Water is prosecuted for supplying water unfit for human consumption. At the time of writing this report the Procurator Fiscal's decision is still awaited.

Water Quality Incident Reports Requested*

| Location | Date | Population Affected | Water Quality Report Reason |
|--------------------------|------------|---------------------|---------------------------------------|
| Craignure WTW | 10/02/2009 | 199 | Disinfection failure |
| Killylour WTW | 26/03/2009 | 242 | Telemetry alarm issues |
| Forehill WSZ | 01/04/2009 | 30,294 | Discoloured Water |
| Eskbank Dalkeith WSZ | 10/04/2009 | 68,582 | Discoloured Water |
| Elgol WTW | 11/05/2009 | 61 | Elevated metal and colour levels |
| Blairnamarrow WTW | 17/07/2009 | 342 | Cryptosporidium and boil water notice |
| Tullibardine WSZ | 31/07/2009 | 31,772 | Failure to follow DOMS process |
| Tobermory WTW | 02/08/2009 | 1,325 | High levels of aluminium in water |
| Aboyne WTW | 04/09/2009 | 2,460 | Cryptosporidium & boil water notice |
| Blairnamarrow WTW | 19/10/2009 | 342 | High pH levels in water |
| Roberton WTW | 29/10/2009 | 23,944 | Aluminium dosing control failure |
| South Hoy WTW | 02/11/2009 | 421 | Disinfection failure |
| Carron Valley WTW | 22/11/2009 | 154,883 | Process failure (following power cut) |
| Invercarnie WTW | 02/12/2009 | 10,574 | Coagulation failure |
| Nanofiltration membranes | 2009 | <500 | THM precursors (membrane performance) |

*Correct at the time of printing

Water Quality Undertakings

Scottish Water inherited Undertakings to Scottish Ministers in terms of Section 76 E (4)(b) of the Water (Scotland) Act 1980.

These Undertakings were given by the predecessor authorities as a commitment to secure compliance with the Regulations. The Q&S II investment programme (2002-2006) was largely driven by these Undertakings.

A table of Undertakings delivered during 2009 is included in Appendix D of this report. Of the 308 Water Quality Undertakings inherited by Scottish Water from the predecessor authorities, 288 have been delivered, leaving 20 in 16 separate water supply zones.

Appendix A
Microbiological Water Quality



Appendix A

Microbiological Water Quality

Water Leaving Treatment Works

| Volume of water distributed from works (m ³ /d) | Total Coliforms | | | Faecal Coliforms | | |
|--|-----------------|--------------|--------------------------|------------------|--------------|--------------------------|
| | 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 | 9,407 | 13 | 0.14% | 9,407 | 3 | 0.03% |
| 3,000 to 12,000 m ³ /d | 6,171 | 5 | 0.08% | 6,171 | 1 | 0.02% |
| More than 12,000 m ³ /d | 15,421 | 12 | 0.08% | 15,421 | 2 | 0.01% |
| Totals | 30,999 | 30 | 0.10% | 30,999 | 6 | 0.02% |

Water at Customers' Taps

| Size of Zone (population) | Total Coliforms | | | Faecal Coliforms | | |
|---------------------------|-----------------|--------------|--------------------------|------------------|--------------|--------------------------|
| | No. of samples | No. of Fails | Percentage exceeding PCV | No. of samples | No. of Fails | Percentage exceeding PCV |
| Less than 5,000 people | 1,916 | 12 | 0.63% | 1,916 | 0 | 0.00% |
| 5,000 to 20,000 people | 1,451 | 6 | 0.41% | 1,451 | 0 | 0.00% |
| 20,001 to 100,000 people | 11,019 | 48 | 0.44% | 11,019 | 4 | 0.04% |
| Totals | 14,386 | 66 | 0.46% | 14,386 | 4 | 0.03% |

Water in Service Reservoirs

| Capacity of reservoir (m ³) | Total Coliforms | | | Faecal Coliforms | | |
|---|-----------------|--------------|--------------------------|------------------|--------------|--------------------------|
| | No. of samples | No. of Fails | Percentage exceeding PCV | No. of samples | No. of Fails | Percentage exceeding PCV |
| Less than 2,000 m ³ | 40,461 | 121 | 0.30% | 40,461 | 10 | 0.02% |
| 2,000 to 10,000 m ³ | 10,013 | 15 | 0.15% | 10,013 | 2 | 0.02% |
| More than 10,000 m ³ | 2,635 | 2 | 0.08% | 2,635 | 0 | 0.00% |
| Totals | 53,109 | 138 | 0.26% | 53,109 | 12 | 0.02% |

Water at Customers' Taps

| Size Band | Enterococci | | | <i>Clostridium perfringens</i> | | |
|--------------------------|----------------|--------------|--------------------------|--------------------------------|--------------|--------------------------|
| | No. of samples | No. of Fails | Percentage exceeding PCV | No. of samples | No. of Fails | Percentage exceeding PCV |
| Less than 5,000 people | 622 | 0 | 0.00% | 679 | 0 | 0.00% |
| 5,000 to 20,000 people | 368 | 0 | 0.00% | 783 | 1 | 0.13% |
| 20,001 to 100,000 people | 664 | 0 | 0.00% | 3,771 | 2 | 0.05% |
| Totals | 1,654 | 0 | 0.00% | 5,233 | 3 | 0.04% |

Physical and Chemical Water Quality at Customers' Taps



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 | 197 | 617 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 366 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,646 | 0 | 0.00% | 0 |
| 2,4,-Db | | | | | |
| Less than 5,000 people | 23 | 79 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 27 | 212 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 72 | 572 | 0 | 0.00% | 0 |
| Total | 122 | 863 | 0 | 0.00% | 0 |
| 2,4-D | | | | | |
| Less than 5,000 people | 23 | 79 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 27 | 212 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 72 | 572 | 0 | 0.00% | 0 |
| Total | 122 | 863 | 0 | 0.00% | 0 |
| Aldrin | | | | | |
| Less than 5,000 people | 197 | 619 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,651 | 0 | 0.00% | 0 |
| Aluminium | | | | | |
| Less than 5,000 people | 197 | 678 | 2 | 0.29% | 2 |
| 5,000 to 20,000 people | 47 | 783 | 1 | 0.13% | 1 |
| 20,001 to 100,000 people | 84 | 3,772 | 4 | 0.11% | 4 |
| Total | 328 | 5,233 | 7 | 0.13% | 7 |
| Ammonium | | | | | |
| Less than 5,000 people | 197 | 679 | 5 | 0.74% | 4 |
| 5,000 to 20,000 people | 47 | 794 | 3 | 0.38% | 2 |
| 20,001 to 100,000 people | 84 | 3,787 | 7 | 0.18% | 5 |
| Total | 328 | 5,260 | 15 | 0.29% | 11 |
| Antimony | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 665 | 0 | 0.00% | 0 |
| Total | 328 | 1,655 | 0 | 0.00% | 0 |
| Arsenic | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 0 | 0.00% | 0 |
| Asulam | | | | | |
| Less than 5,000 people | 23 | 81 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 7 | 48 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 25 | 196 | 0 | 0.00% | 0 |
| Total | 55 | 325 | 0 | 0.00% | 0 |
| Atrazine | | | | | |
| Less than 5,000 people | 110 | 325 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 8 | 64 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 14 | 108 | 0 | 0.00% | 0 |
| Total | 132 | 497 | 0 | 0.00% | 0 |
| Benzene | | | | | |
| Less than 5,000 people | 197 | 617 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 366 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,646 | 0 | 0.00% | 0 |

| Population size | Number of Zones | No. of Results | Results Failing PCV | Results Failing PCV (%) | Zones With PCV Failures |
|--------------------------|-----------------|----------------|---------------------|-------------------------|-------------------------|
| Benzo (a) Pyrene | | | | | |
| Less than 5,000 people | 197 | 614 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 365 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,642 | 0 | 0.00% | 0 |
| Boron | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,653 | 0 | 0.00% | 0 |
| Bromate | | | | | |
| Less than 5,000 people | 197 | 620 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,652 | 0 | 0.00% | 0 |
| Cadmium | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 0 | 0.00% | 0 |
| Chloride | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 0 | 0.00% | 0 |
| Chlortoluron | | | | | |
| Less than 5,000 people | 4 | 16 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 6 | 44 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 30 | 238 | 4 | 1.68% | 1 |
| Total | 40 | 298 | 4 | 1.34% | 1 |
| Chromium | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 1 | 0.27% | 1 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 1 | 0.06% | 1 |
| Colour | | | | | |
| Less than 5,000 people | 197 | 679 | 8 | 1.18% | 8 |
| 5,000 to 20,000 people | 47 | 799 | 3 | 0.38% | 1 |
| 20,001 to 100,000 people | 84 | 3,787 | 1 | 0.03% | 1 |
| Total | 328 | 5,265 | 12 | 0.23% | 10 |
| Conductivity | | | | | |
| Less than 5,000 people | 197 | 679 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 779 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 3,787 | 0 | 0.00% | 0 |
| Total | 328 | 5,265 | 0 | 0.00% | 0 |
| Copper | | | | | |
| Less than 5,000 people | 197 | 621 | 2 | 0.32% | 2 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,653 | 2 | 0.12% | 2 |
| Cyanide | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 0 | 0.00% | 0 |

Appendix B

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 |
|----------------------------|-----------------|----------------|---------------------|-------------------------|-------------------------|
| Cypermethrin | | | | | |
| Less than 5,000 people | 18 | 63 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 16 | 120 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 52 | 413 | 0 | 0.00% | 0 |
| Total | 86 | 596 | 0 | 0.00% | 0 |
| Diazinon | | | | | |
| Less than 5,000 people | 151 | 465 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 28 | 216 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 59 | 464 | 0 | 0.00% | 0 |
| Total | 238 | 1,145 | 0 | 0.00% | 0 |
| Dicamba | | | | | |
| Less than 5,000 people | 23 | 79 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 27 | 212 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 72 | 572 | 0 | 0.00% | 0 |
| Total | 122 | 863 | 0 | 0.00% | 0 |
| Dieldrin | | | | | |
| Less than 5,000 people | 197 | 619 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,651 | 0 | 0.00% | 0 |
| Diuron | | | | | |
| Less than 5,000 people | 4 | 16 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 6 | 44 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 30 | 239 | 0 | 0.00% | 0 |
| Total | 40 | 299 | 0 | 0.00% | 0 |
| Flumethrin | | | | | |
| Less than 5,000 people | 18 | 61 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 16 | 119 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 52 | 409 | 0 | 0.00% | 0 |
| Total | 86 | 589 | 0 | 0.00% | 0 |
| Fluoride | | | | | |
| Less than 5,000 people | 197 | 620 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,652 | 0 | 0.00% | 0 |
| Free Chlorine | | | | | |
| Less than 5,000 people | 197 | 1,916 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 1,449 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 11,021 | 0 | 0.00% | 0 |
| Total | 328 | 14,386 | 0 | 0.00% | 0 |
| Gamma-HCH (Lindane) | | | | | |
| Less than 5,000 people | 151 | 463 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 24 | 188 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 26 | 204 | 0 | 0.00% | 0 |
| Total | 201 | 855 | 0 | 0.00% | 0 |
| Heptachlor | | | | | |
| Less than 5,000 people | 197 | 619 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,651 | 0 | 0.00% | 0 |
| Heptachlor epoxide | | | | | |
| Less than 5,000 people | 197 | 619 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,651 | 0 | 0.00% | 0 |

| Population size | Number of Zones | No. of Results | Results Failing PCV | Results Failing PCV (%) | Zones With PCV Failures |
|--------------------------|-----------------|----------------|---------------------|-------------------------|-------------------------|
| Hydrogen ion (pH) | | | | | |
| Less than 5,000 people | 197 | 679 | 15 | 2.21% | 12 |
| 5,000 to 20,000 people | 47 | 799 | 4 | 0.50% | 3 |
| 20,001 to 100,000 people | 84 | 3,787 | 3 | 0.08% | 3 |
| Total | 328 | 5,265 | 22 | 0.42% | 18 |
| Iron | | | | | |
| Less than 5,000 people | 197 | 679 | 5 | 0.74% | 5 |
| 5,000 to 20,000 people | 47 | 783 | 12 | 1.53% | 9 |
| 20,001 to 100,000 people | 84 | 3,772 | 32 | 0.85% | 18 |
| Total | 328 | 5,234 | 49 | 0.94% | 32 |
| Isoproturon | | | | | |
| Less than 5,000 people | 4 | 16 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 6 | 44 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 34 | 270 | 0 | 0.00% | 0 |
| Total | 44 | 330 | 0 | 0.00% | 0 |
| Lead | | | | | |
| Less than 5,000 people | 197 | 622 | 2 | 0.32% | 2 |
| 5,000 to 20,000 people | 47 | 368 | 1 | 0.27% | 1 |
| 20,001 to 100,000 people | 84 | 664 | 2 | 0.30% | 2 |
| Total | 328 | 1,654 | 5 | 0.30% | 5 |
| Linuron | | | | | |
| Less than 5,000 people | 4 | 16 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 6 | 44 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 30 | 239 | 0 | 0.00% | 0 |
| Total | 40 | 299 | 0 | 0.00% | 0 |
| Manganese | | | | | |
| Less than 5,000 people | 197 | 679 | 2 | 0.29% | 2 |
| 5,000 to 20,000 people | 47 | 783 | 8 | 1.02% | 5 |
| 20,001 to 100,000 people | 84 | 3,772 | 14 | 0.37% | 14 |
| Total | 328 | 5,234 | 24 | 0.46% | 21 |
| MCPA | | | | | |
| Less than 5,000 people | 23 | 79 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 27 | 212 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 72 | 572 | 0 | 0.00% | 0 |
| Total | 122 | 863 | 0 | 0.00% | 0 |
| MCPB | | | | | |
| Less than 5,000 people | 23 | 79 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 27 | 212 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 72 | 572 | 0 | 0.00% | 0 |
| Total | 122 | 863 | 0 | 0.00% | 0 |
| MCPP(Mecoprop) | | | | | |
| Less than 5,000 people | 23 | 79 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 27 | 212 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 72 | 572 | 1 | 0.17% | 1 |
| Total | 122 | 863 | 1 | 0.12% | 1 |
| Mercury | | | | | |
| Less than 5,000 people | 197 | 621 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,652 | 0 | 0.00% | 0 |
| Nickel | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 1 | 0.27% | 1 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 1 | 0.06% | 1 |

Appendix B

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 |
|---------------------------|-----------------|----------------|---------------------|-------------------------|-------------------------|
| Nitrate | | | | | |
| Less than 5,000 people | 197 | 621 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 477 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 1,325 | 0 | 0.00% | 0 |
| Total | 328 | 2,423 | 0 | 0.00% | 0 |
| Nitrite | | | | | |
| Less than 5,000 people | 197 | 621 | 2 | 0.32% | 2 |
| 5,000 to 20,000 people | 47 | 476 | 4 | 0.84% | 3 |
| 20,001 to 100,000 people | 84 | 1,325 | 25 | 1.89% | 9 |
| Total | 328 | 2,422 | 31 | 1.28% | 14 |
| Odour | | | | | |
| Less than 5,000 people | 197 | 677 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 799 | 1 | 0.13% | 1 |
| 20,001 to 100,000 people | 84 | 3,785 | 2 | 0.05% | 2 |
| Total | 328 | 5,261 | 3 | 0.06% | 3 |
| PAH - Total | | | | | |
| Less than 5,000 people | 197 | 614 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 365 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,642 | 0 | 0.00% | 0 |
| Permethrin | | | | | |
| Less than 5,000 people | 18 | 63 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 16 | 120 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 52 | 413 | 0 | 0.00% | 0 |
| Total | 86 | 596 | 0 | 0.00% | 0 |
| Pesticides - Total | | | | | |
| Less than 5,000 people | 197 | 766 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 496 | 1 | 0.20% | 1 |
| 20,001 to 100,000 people | 84 | 1,430 | 1 | 0.07% | 1 |
| Total | 328 | 2,692 | 2 | 0.07% | 2 |
| Propetamphos | | | | | |
| Less than 5,000 people | 151 | 465 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 28 | 216 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 59 | 464 | 0 | 0.00% | 0 |
| Total | 238 | 1,145 | 0 | 0.00% | 0 |
| Selenium | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 0 | 0.00% | 0 |
| Simazine | | | | | |
| Less than 5,000 people | 110 | 325 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 8 | 64 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 14 | 108 | 0 | 0.00% | 0 |
| Total | 132 | 497 | 0 | 0.00% | 0 |
| Sodium | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,653 | 0 | 0.00% | 0 |
| Sulphate | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,653 | 0 | 0.00% | 0 |

| Population size | Number of Zones | No. of Results | Results Failing PCV | Results Failing PCV (%) | Zones With PCV Failures |
|--|-----------------|----------------|---------------------|-------------------------|-------------------------|
| Taste | | | | | |
| Less than 5,000 people | 197 | 677 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 798 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 3,785 | 2 | 0.05% | 2 |
| Total | 328 | 5,260 | 2 | 0.04% | 2 |
| Tetrachloroethene & Trichloroethene | | | | | |
| Less than 5,000 people | 197 | 617 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 366 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,646 | 0 | 0.00% | 0 |
| Tetrachloromethane | | | | | |
| Less than 5,000 people | 197 | 617 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 366 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 663 | 0 | 0.00% | 0 |
| Total | 328 | 1,646 | 0 | 0.00% | 0 |
| TON Ratio | | | | | |
| Less than 5,000 people | 197 | 621 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 477 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 1,325 | 0 | 0.00% | 0 |
| Total | 328 | 2,423 | 0 | 0.00% | 0 |
| Total chlorine | | | | | |
| Less than 5,000 people | 197 | 1,916 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 1,449 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 11,022 | 0 | 0.00% | 0 |
| Total | 328 | 14,387 | 0 | 0.00% | 0 |
| Total organic carbon | | | | | |
| Less than 5,000 people | 197 | 622 | 0 | 0.00% | 0 |
| 5,000 to 20,000 people | 47 | 368 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 664 | 0 | 0.00% | 0 |
| Total | 328 | 1,654 | 0 | 0.00% | 0 |
| Total Trihalomethanes | | | | | |
| Less than 5,000 people | 197 | 617 | 55 | 8.91% | 35 |
| 5,000 to 20,000 people | 47 | 366 | 23 | 6.28% | 10 |
| 20,001 to 100,000 people | 84 | 663 | 11 | 1.66% | 9 |
| Total | 328 | 1,646 | 89 | 5.41% | 54 |
| Turbidity | | | | | |
| Less than 5,000 people | 197 | 679 | 1 | 0.15% | 1 |
| 5,000 to 20,000 people | 47 | 799 | 0 | 0.00% | 0 |
| 20,001 to 100,000 people | 84 | 3,787 | 2 | 0.05% | 2 |
| Total | 328 | 5,265 | 3 | 0.06% | 3 |

Compliance against Authorised Departure Limits



Appendix C

Compliance against Authorised Departure Limits

| Regulation Water Supply Zone | Authorised Departure Parameter | Authorised Departure Limit | Date Authorised Departure Granted | No. Samples Taken in 2009 with AD | No. Failures | Percentage Compliance |
|------------------------------------|--------------------------------|----------------------------|-----------------------------------|-----------------------------------|--------------|-----------------------|
| Distribution for Lochinver | THM - Total | 150 | 22/06/2006 | 12 | 0 | 100% |
| Distribution for Palnure* | Colour | 22 | 22/06/2006 | 0 | 0 | n/a |
| Distribution for Palnure* | THM - Total | 150 | 22/06/2006 | 0 | 0 | n/a |
| Distribution for Penwhirn Palnure* | Iron | 360 | 22/06/2006 | 0 | 0 | n/a |
| Distribution for Penwhirn Palnure* | THM - Total | 150 | 22/06/2006 | 0 | 0 | n/a |
| Distribution for Sheildaig | Colour | 35 | 22/06/2006 | 4 | 0 | 100% |
| Distribution for Sheildaig | THM - Total | 170 | 22/06/2006 | 12 | 0 | 100% |
| Distribution for Tarbert | Colour | 40** | 22/06/2006 | 4 | 0 | 100% |
| Total | | | | 32 | 0 | 100% |

* Since maining out Palnure WTW from Penwhirn WTW the Palnure and Penwhirn Palnure water supply zones ceased to exist as of 01 January 2009.

** Scottish Water applied for and was granted a modification to increase the colour departure limit.

Water Quality Undertakings completed during 2009



Appendix D

Water Quality Undertakings Completed during 2009

| Zone Name | Quality Parameter | Undertaking Date | Date Undertaking Delivered | Work currently complete |
|---------------|-------------------|------------------|----------------------------|-------------------------------------|
| Altnaharra | THM | 31/12/2006 | 31/07/2009 | Nanofiltration membrane installed |
| Arnisdale | THM | 31/12/2008 | 08/06/2009 | Granular activated carbon installed |
| Badcaul | THM | 31/12/2008 | 17/09/2009 | Nanofiltration membrane installed |
| Lochinver | THM | 31/12/2006 | 07/11/2009 | Nanofiltration membrane installed |
| Scourie | THM | 31/12/2008 | 14/12/2009 | Nanofiltration membrane installed |
| Spey Regional | Crypto | 31/12/2005 | 06/03/2009 | Ultrafiltration membrane installed |
| Spey Regional | THM | 31/12/2005 | 06/03/2009 | Chloramination installed |





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