WATER INDUSTRY COMMISSION for SCOTLAND

Reporter Services

Annual Return 2008-09
Reporter's Report

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SCOTTISH WATER'S ANNUAL RETURN 2008-09 REPORTER'S REPORT

CONTENTS

APPENDICIES

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1. INTRODUCTION

The Water Industry Commission for Scotland (WICS) has functions and duties under and the Water Industry (Scotland) Act 2002 as amended by the Water Services etc. (Scotland) Act 2005 for the regulation of the water industry in Scotland.

The WICS has appointed a named regulatory Reporter for the Scottish water industry to assist in the discharge of its duties. Mr David Arnell of Black & Veatch Limited is the named regulatory Reporter (the Reporter).

Scottish Water provides an Annual Return to WICS in June each year which is a detailed return on all aspects of its business. The return provides information which will allow WICS to benchmark a variety of cost and performance information with the water and sewerage companies and water only companies in England & Wales.

The Reporter was instructed by WICS to undertake an audit of the Annual Return for 2008-09 (AR09).

This report has been prepared by a Reporter's team under Mr Arnell's direction, composed of senior staff of Black & Veatch.

The team has followed the reporting requirements and has therefore focussed its attention on the tabular information. We have commented on Scottish Water's methodology either in an introduction to each set of tables or in our commentary on each table.

The team has studied the Annual Return 2009 as prepared by Scottish Water, and has followed a number of audit trails to establish the sources of information contained within that Return to assess its adequacy and accuracy.

Subject to the detailed comments stated in our report we believe that Scottish Water has met the reporting requirements, disclosed material assumptions and that Scottish Water's confidence grades are appropriate.

The audit report is divided into sections consistent with main sections of the Annual Return. An overview is provided of each section summarising key audit findings. Further sub-sections for each table in the return provide commentary on individual audits and detailed findings relevant to that table.

2. BOARD OVERVIEW

2.1 The Company's process for ensuring that the Board Overview is well founded

Day to day business in Scottish Water is controlled by the Business Management Team, chaired by the Chief Executive. Regulatory matters are delegated to the Regulatory Management Group. The Regulatory Management Group meets monthly throughout the year and comprises the Finance & Regulation, Customer Service Delivery and Asset Management Directors, and the General Manager Regulation. Commencing in January, the Regulatory Management Group sets out the management requirements of the Annual Return.

The Director of Finance and Regulation is also a member of the Board and regularly briefs the Board on regulatory issues. This ensures that the Board is well aware of the regulatory issues facing Scottish Water.

The Board Overview is drafted by the Regulation Department, using information available from the main report commentaries. A report, based on the Board Overview, and giving key messages is initially presented to the Audit Committee. The Audit Committee is chaired by a Non-Executive Director. The work of the Audit Committee is discussed at Board Meetings on a quarterly basis, or by exception if required. This year the Reporter was asked to address the Audit Committee during its meeting on the Annual Return.

The Annual Return and, in particular, the Board Overview is a major agenda item at the Board Meeting that takes place in June. One week before the meeting the Board Overview and a supplementary explanatory paper is circulated to the Board. At the meeting, the Board Overview and explanatory paper is presented to the Board by the Director of Finance and Regulation and discussed by the Board. Any changes that the Board requires are made following the meeting and the document is signed by the Chief Executive using the delegated powers given to him.

The Annual Return is not generally read in full by the Board, although that option is always open to them, as the Executive Directors responsible for the information in the Return are able to report on the systems, processes and control measures used in the production of the Return and give assurance to the Board.

The process described above is similar to those that we have seen elsewhere and we believe that Scottish Water has an effective process for ensuring that the Board Overview is well founded.

2.2 The effectiveness of the Annual Return process

Prior to the 2006/7 report year Scottish Water set up a new group, recently renamed as Governance, Information and Value (GIV), tasked with improving the quality of information required both within the business and for regulatory use. All non-financial information for the Annual Return has been managed by this group. Key features of the process are as follows:

- Prior to the Annual Return, the Regulation Department posts the Reporting Requirements, last year's company report, last year's Reporter's reports, a summary of last year's Reporter's recommendations and suggestions and last year's queries from WIC and their responses on a dedicated intranet site. Relevant parts are also emailed to those responsible for providing the information. This allows all providers of information to have a full background to the new submission.

- The GIV group appoints an "Annual Return Co-ordinator" who is responsible for agreeing the methods to be used and that the information is provided.

- Each table has a "table owner" who is a member of GIV and each line has a "line owner" who comes from the relevant operating department. Each table also has a technical reviewer, who again is generally a member of GIV, apart from the specialisations of leakage and finance where the relevant manager takes on this responsibility. Responsibility is therefore clearly defined. In the past we have had concerns that reviewers do not necessarily have sufficient technical knowledge. However, we now acknowledge that reviewers are senior people with a good knowledge of the business and that often an enquiring mind and the willingness to apply "sense checks" is worth more than detailed technical knowledge. We also note that Scottish Water has acknowledged when specialist knowledge is essential and has appointed reviewers accordingly.

- A "technical approach" is written for each table or, if appropriate, groups of lines. The technical approach gives information on the person producing the line and the IT system used to generate the information. The technical approach then gives further information on how the information is generated, including, where appropriate, the formulae used.

- The GIV group produces the tabular information and a draft narrative and undertakes quality assurance. The GIV group then sends the information to the Regulation Department.

- The Regulation Department reviews the commentary and undertakes its own checks on the tabular information. These checks include checks against prior years' information to see if trends and changes are sensible.

- Final drafts as amended by the Regulation Department are sent back to GIV for final agreement.

- Starting this year, Line owners, table owners and managers are all required to formally sign off each item of work. This is done by means of a "sign off" sheet that is later filed.

- Final narratives are approved by the two executive directors responsible for the information.

The overall governance of the AR process is managed by a hierarchy of "groups":

1. The Regulatory Management Group meets monthly throughout the year to discuss regulatory matters and reports directly to the Business Management Team. The group is chaired by the General Manager Regulation.

2. The production of the Annual Return itself is managed by the "AR Governance Group" which meets weekly during the production process.

3. The process for producing the Annual Return is overseen by the "AR Steering Group" chaired by the General Manager Regulation.

We believe that this means that the Company does have an effective process for completing its Annual Return. In particular we believe that the new GIV group is a very positive step that since 2007 has improved the process over prior years.

No matter how good, any process cannot guarantee that no mistakes are made. In particular we note that some of the data entries require analysis of the raw data. This is often carried out in spreadsheets developed for the purpose by individual line and table owners. Random checks are carried out on spreadsheets. Such checks can allow some errors through but total checks would be very onerous, particularly given the time pressures for the production of the Return.

Last year we suggested that SW formally requires people to "sign off" their work. We are please to see that this has been implemented. We believe that this imposes a useful discipline.

2.3 Consistency of the Board overview statements and supporting data

We have reviewed the narrative in the Board Overview against the knowledge gained from our audit. We have not re-audited every factual statement or data entry made in the Overview against information given in the main report. We have commented on the detailed points in our main report and do not repeat them here.

Based on our review we believe that the comments made in the Board Overview give a balanced picture of the Company's accomplishments and are consistent with the Annual Return.

2.4 Co-operation between the Company and the Reporter

Co-operation between Scottish Water and the Reporter has always been good but in past years it has not always been possible for the Reporter to undertake his work to a time scale demanded by the overall programme.

The fact that the Annual Return and the Price Review were overlapping has made our work more difficult this year but this was to be expected.

We conclude that the process this year went relatively smoothly. We would have liked to have seen some items in a more complete form at our initial audits and where it was not possible updates automatically copied to us.

Difficulty remains in the final 3 weeks where the time needed for the Reporter to complete his drafts and for Scottish Water to review and comment on them remains very limited.

2.5 Key trends in Scottish Water's performance

General

We have read the commentaries in the Board Overview. We do not comment on financial indicators and competition, which are outside our remit. Where we do have knowledge we believe that the comments in the Board Overview are consistent with the Annual Return and also consistent with the information arising out of our audits.

Below we comment on some of the items raised in the Board's Overview.

Key outputs and service delivery

Scottish Water reports that it's OPA score has increased to 252, an increase of 1.6% over last year's 248. Scottish Water also reports that it has lost a potential 9 points following the removal of its non-household billing function. We have audited this figure and give detailed comments in our specific report on the OPA. Over the last few years we have seen Scottish Water steadily improving its performance across many areas of the business and believe that these are correctly reflected in the new score. We note that in most areas Scottish Water now has the infrastructure it needs in place such that it can drive further improvements. We believe that this is a very pleasing development.

During the report year Scottish Water has continued to improve its data capture from its operating staff. We have noted the continued efforts that are being made to ensure that data capture is both timely and accurate. We believe that through its GIV Group, Scottish Water has the right management structure in place to ensure that continuous improvement will be maintained.

As a member of the Regulatory Leakage Group the Reporter has seen the progress made by Scottish Water in improving its leakage control. Scottish Water now has all the infrastructure in place to undertake effective leakage control and to properly understand its water balance. Scottish Water has undertaken both short run and long run ELL calculations. The figures are not yet robust and SW is proposing to address this in the current year. This work should make the ELL significantly more robust.

This year Scottish Water exceeded its leakage target by a significant amount. While leakage was measured for the first time with a fair degree of accuracy there was uncertainty in the water balance largely due to doubt around non-household consumption. Different leakage levels were derived for the OPA and Annual Return. We understand that SW was required to continue previous methods of estimating leakage for both the OPA and the Annual Return and so neither were based on the newly measured bottom up leakage estimate. We believe that this has the potential for confusion. We believe that measured leakage results in the most accurate estimate and as soon as practicable should form a new starting position with revised targets being set in relation to it. SW already has the data to facilitate this change.

Since the Wholesale/Retail split Scottish Water no longer has instant access to some data that it needs to effectively run its business. This year there has been uncertainty over the correct levels of non-household consumption. We hope that the new organisations will rapidly learn to work productively together in order to investigate these uncertainties.

Compliance

Scottish Water continues to improve its drinking water quality compliance but there will always be some variability. Scottish Water's compliance in most parameters is now high but still marginally lags behind England and Wales in some parameters. We note that in the SR10 period Scottish Water proposes to undertake significant programmes of small water treatment works improvements and water mains rehabilitation that will allow it to improve on its existing levels of compliance.

The Company had 24 failing wastewater treatment works at the end of the report year compared with target for the year of no more than 39. Last year there were 30 failing works with the prior year's total of 47. This year's result is therefore pleasing, particularly as the Company has worked hard in this area. We note that the number of failures year on year will be determined in part by weather patterns.

Progress on the capital programme

Scottish Water reports that it is 99.55% complete on the Q&S2 programme and 81.1% complete on its Q&S3a programme against a target of 76.7%. Last year Scottish Water had completed some 46% of its Q&S3a programme indicating the very significant outputs completed in the year. This gives some confidence that Scottish Water is better placed to complete its Q&S3a programme compared to its Q&S2 programme, although it is currently forecasting a £149M overhang after April 2010. This is largely made up of 4 significant projects and risk allowances; the bulk of the programme in terms of numbers of projects will have been successfully delivered. If Scottish Water's current projections are realised this will be a much improved result compared to the Q&S2 programme.

Key supporting information

Water resources, supply demand balance and Security of Supply Index

Scottish Water reports its security of supply index for the third time this year. The results show that only 70% of the population are in zones with a surplus. In previous years Scottish Water has stated that it believes that only around 15% of its population (those with a deficit greater than 10%) are seriously at risk and that it will focus on these water resource zones in the immediate future. We continue to believe that Scottish Water's view is sensible.

As a result of our audit we noted that some parameters used in the supply demand balance calculation remain uncertain with further work required to improve the result. In particular Scottish Water needs to work as rapidly as possible towards a more robust Long Run Economic Level of leakage, in order to help inform it as to the most efficient way of closing its deficits.

Asset revaluation

In its narrative Scottish Water gives details of its revised asset valuation.

We audited Scottish Water's work for the 2nd draft business plan and we consider that the new valuation is significantly better than previous valuations.

Climate change and carbon footprint

We note that Scottish Water is actively looking at how it can minimise its emissions. It has also calculated its carbon footprint. We consider that this is sensible. Regulation in England and Wales is beginning to drive companies to innovate in these areas and it is to Scottish Water's advantage not to be left behind in what we believe will be a rapidly developing area.

We note that Scottish Water has included investment in hydro power and combined heat and power in its addendum to its 2nd draft business plan. We concur with Scottish Water's view that investment in such technologies will be necessary if it is to make significant improvements in its current energy balance.

Sustainable procurement

Scottish Water states that it is well advanced in developing its delivery model for the 2010-2014 period. Only outline details are given and much of the effectiveness of sustainable procurement comes in the contractual details, on which we cannot yet comment.

Scottish Water intends to continue developing frameworks for much of its procurement. This is now a well tried model and is effective provided that the details promote mutually supportive behaviour patterns.

3. AREAS OF MATERIAL DIFFERENCES OF OPINION

The Reporter's Protocol requires that the Reporter should summarise in a separate section of his report any material/significant areas where the Reporter's opinion is different from that of Scottish Water.

The Reporter's Protocol also required that the Reporter should annex to the reports to the Commission a summary schedule of his concerns and challenges and how they have been resolved, and in a separate section summarise any significant areas where agreement cannot be reached with Scottish Water.

A summary schedule of concerns and challenges and how they have been resolved are included in Appendix F.

There are no material or significant areas where the Reporter's opinion is different from that of Scottish Water.

4. SECTION A: BASE INFORMATION

4.1 Overview

Scottish Water has completed Tables A1 and A2 providing base information on connected and billed properties and population, volumes and loads. For this return the P tables were not explicitly audited, however the P tables are referred to where line items were derived from P table data.

In the main the methodology for compiling connection and billed property data for Table A1 and populations for Table A2, and reporting dates and for forecasting 'Year +1' is similar to methods used in previous annual returns. Since last year however, and linked to the submission of the 2nd draft Business Plan, more recently available data and data sources (2008 and 2009) have been used to compile the returns and forecasts including WIC4 (September 2008) and Central Market Agency (CMA) derived data produced from the migrated Business Stream HiAffinity database.

During 2008/09 Scottish Water has built on the methodologies and processes developed for the previous return, generally, compiling and reporting connected and billed properties and populations with a thorough and auditable approach. There has been increased use of more reliable source data and less need to interpret or extrapolate data from multiple sources than in previous years. There is consistency of approach between the A tables and the numbers reported in the SR10 2nd draft business plan submission although some numbers differ where more recent data has become available; for example the CMA data, available in March 2009 and the PCC Monitor data compiled in April and May 2009 for inclusion in the water balance.

Scottish Water has reduced confidence grades for data derived from the CMA (and LPs) from 'A' to 'B' to reflect the source of the data.

The audit included discussion with Scottish Water on the availability and quality of data from the CMA systems and its impact on its business performance; the two core data issues being availability of meter readings and number of vacant premises. Both issues could have revenue and water balance consequences and hence financial liability for Scottish Water but appear to result in little or no financial liability for Licence Providers (LP).

The Reporter's team undertook sample audits to understand Scottish Water's methodology and test data sources. Through the audit it was possible to verify that:

- Assessments of properties and populations are based on sound data making appropriate use of the latest published sources.
- The allocation of unmeasured domestic properties relies in part on the WIC4 (September 2008) returns from councils and growth rates 07 to 17 from C-tax base reports. The overall methodology changes introduced for AR08 have been followed for this return.
- Measured and unmeasured non-household property and consumption information was derived from the CMA supplied data following the migration of the Business Stream's billing system, HiAffinity database at the beginning of 2008. This data was not available for SR10 2nd draft Business Plan, which was based on an earlier abstract

of data direct from the HiAffinity database. There are therefore differences in some reported non-household numbers between SR10 and AR09, but the A and P tables should be consistent.

- In addition Scottish Water has identified issues with the quality of the CMA data used to populate some table lines. There has not been time to resolve all of the anomalies identified when preparing the table data; the CMA data were received in March 2009. However programmes are in place to resolve the known data issues within the current reporting year. The result is that some non-household line items imply significant changes since AR08 and with the figures presented in the SR10 2DBP. Scottish Water believes that part of the increases is likely to be attributable to data anomalies rather than real number changes.

- Customer numbers are reported at September 2008 while volumes relate to the monthly CMA settlement reports which are at different stages. Because of the reconciliation process, a fully reconciled report for 2008/09 will not be available until December 2009.

- There is consistency between the A tables and the E tables.

- More than one trade effluent customer can occupy a billed property in a year. The numbers reported are the numbers of premises with a trade effluent consent. Many of these properties are billed as measured or non-measured household supplies because it is not considered cost effective to carry out the sampling required to apply trade effluent charges.

- Trade effluent loads include loads discharged to PPP treatment works.

Audits of sources of data, methodologies and cross checks between table lines did not highlight any significant differences; minor anomalies and differences were discussed during the audit and changes applied during the audit. There were no significant outstanding anomalies on completion of the audit.

4.2 Table A1: Base Information – Connected and Billed Properties

Commentary by REPORTER

General commentary on population and household estimates

Population and property estimates and outputs to tables are derived from manipulation of data obtained from third parties. Scottish Water has used a consistent methodology for deriving population and household data and forecasting for both AR09 and SR10. The approach uses data from:

- GROS - Projected Population of Scotland (2006-based)
- GROS - Projected private household population, 2006-2031
- GROS - 2006-based household projections by household type and age group for all 32 local authority areas
- GROS - 2006-based projected population by sex and single year of age, Scotland 2006-2031
- Government Actuary's Department
- WIC4 Reports – Billing and Household data (September 2008) and 2004
- C-tax base reports, Growth rates 07 to 17
- Experian Water Demand Forecasts (February 2008)
- Experian Water Demand Forecasts - Autumn 2008 (26 November 2008)
- NHBC – New House Building Statistics, Annual Returns 2007/08.

The base data for property counts used to derive the reported numbers are abstracted from third party databases and the Scottish Water's corporate databases and extrapolated to represent the line description. Where appropriate base data are abstracted by Unitary Council areas and aggregated up into Water Resource Zones where more than one council area falls within the boundaries of the Water Resource Zone.

The domestic property data have been abstracted direct from WIC4 as at 30 September 2008 using the changes in discounts first reported in AR08. Therefore minimal manipulation has been required. However Scottish Water has completed a review of second homes and long term empty properties to confirm that the change in reported numbers was related to the change in policy and not numerical.

The same overall methodology has been used for Year +1 forecast (and SR10 projections reported for the 2nd DBP). Scottish Water developed a growth model that reflects the short term effect of the economic recession using "New Start" house building data derived from New House-Building Statistics published by the NHBC monthly. Data from the Annual Returns from 07/08 compared data with NHBC monthly statistics. The NHBC data, available by Local Council areas, and incorporating historic demolition (disconnections) data, have been used to re-profile new development for 2009/10 and 2010/11. Thereafter, Scottish Water is currently assuming that the GROS growth forecast profile will apply. For this Annual Return, the Year + 1 forecast are the re-profiled figures derived from the 2nd DBP.

The effect is that the populations and total households have been revised downwards from the 1st draft Business Plan to reflect the current economic climate. Scottish Water has assumed that the household growth downturn will be short lived, until 2010/11, with the upturn starting in January 2010, but with a time delay for new developments to become occupied. In the longer term future, growth patterns will highlight a trend towards lower occupancy households, although until house building restarts there is likely to be a short term increase in occupancy rate.

The Year +1 household forecasts assume that all growth will occur in the unmeasured household category, there being no growth to the small number of measured household before 2014.

The methodology and sample calculations were audited. We consider that the approach is thorough and provides a consistent approach for the business plan and annual returns.

For AR08 (the starting point for the SR10 forecasts) non-household premises data were abstracted direct from Business Stream's HiAffinity billing database as at 30 September 2007. However for this return, direct access to the Business Stream data was no longer available; the HiAffinity data having been migrated into the Central Market Agency (CMA) database in early 2008. The premises numbers and measured volumes reported in the return have therefore been abstracted from the CMA dataset provided to Scottish Water in March 2009, which uses data from September 2008. The reported numbers are not consistent with the SR10 returns because they are now based on more recent data.

For consistency with the SR10 BP forecasts, the Year +1 non-household forecasts are based on the assumed growth figures (premises numbers and volumes) reported for the Business Plan and not projected from the AR09 derived figures. Scottish Water did not anticipate that there would be such significant differences between the 2008/09 2DBP and AR09 non-household figures and there has been insufficient time to investigate the numerous data anomalies in the CMA data which will require responses from third parties to resolve. Scottish Water has raised a set of initial queries with CMA for resolution by the LPs.

We consider that the approach is thorough and provides a consistent approach for future business planning and annual returns. We confirmed that the same household projections have been used for drafts of the Tables A and B and except for the comments in the previous paragraph are consistent with the tables in the 2nd draft Business Plan.

Key points

Unmeasured households

- The method used to compile the 2009 return is similar to that used in the 2008 return. The Year +1 number of properties has been estimated by updating the 2008 WIC4 figures for total households using growth in the C-tax base 07 to 17 growth estimates and WIC4 information between 2004-05 and September 2008.

- The number of void properties is taken from the C-tax base where they are described as unoccupied exemptions. "Other exemptions" in the C-tax base are reported in the exempt line. As for AR08, second homes and long term empty properties are identified separately, the former being reported within "unmeasured household billed properties".

- As commented above, Scottish Water has been able to collate the 2008 WIC4 data into the appropriate reporting line item. Total dwellings have been factored for Year +1 based on the proportional increase in Total Household.

- The simplified benefit discount scheme with Full (25%) or Partial (up to 25%) discounts only has been used for this return.

- Unmeasured exempt households have increased from 59,162 in 2007/08 to 60,537 for this return, an increase of 1,374.

Measured properties and unmeasured non households

- The source of the data on measured properties and unmeasured non-household properties is the CMA data taken directly from the detailed settlement report.

- The Scottish Water Ellipse system is used for the revenue meter asset inventory. In the AR08 report we recommended that robust systems be developed to ensure that Ellipse and the CMA systems remain aligned. Scottish Water reports that it does not have "visibility" of the data records in the CMA database and that data quality issues and data gaps are currently hindering efficient management of their wholesale activities.

- There has been a net increase of 1,336 connections in "Measured non-household billed properties". The increase is a combination of new connections, a desk activity to identify gaps and reduction in non-household activity due to the economic downturn as reported in the Experian report.

- There is no significant change in "Exempt properties"; 4,114 for this reporting year and 4,429 in AR08.

- Unmetered non-household customers are currently charged for the cost of installing a meter if they opt to switch to a metered supply ahead of the full business metering switch over in 2010. Although the non-household customer metering programme is substantially complete, there have been no optant switches in AR09, essentially customers are waiting for a free meter.

General observations on the CMA data

Following the opening of the water market in Scotland for non-household customers on 1 April 2008, all wholesale charges due to Scottish Water from Licensed Providers (LPs) have been calculated by the Central Market Agency (CMA). In order to support this activity the CMA keeps a record in the Central Systems of all non-household supply points in Scotland along with all charging details (but the system has simplified how trade effluent charges are calculated). Data items relating to assets are owned by Scottish Water which is responsible for maintaining them via data flows to the CMA. LP owned data items include meter readings and customer attributes (such as vacancy status, exemption, rateable value and Supply Point address) and are maintained at the CMA by a similar mechanism. As this is a new source of data the following is a brief description of the processes and issues that impact Scottish Water and its performance.

There are four stakeholders interested in the water supply and sewerage services to a supply/discharge point; the customer, an LP, the CMA and Scottish Water. Each has data which is protected for legitimate commercial reasons by the CMA which alone holds all information. A customer is identified by supply point identifier (SPID or in trade effluent DPID) and a supply point may have multiple connections to the water distribution and sewerage systems and in each case there may be a domestic element.

In principle, the customer is served by an LP but Scottish Water retains a direct link for water meters which are owned by Scottish Water and for trade effluent consenting and policing. Scottish Water is responsible for meter connections and disconnections including the initial and final reads respectively. LPs are responsible for holding a contract with a customer, reading meters within prescribed time frames and invoicing customers. LPs pass service data to the CMA for storage on its Central Systems. The CMA is responsible for compiling the data and submissions to Scottish Water to calculate bulk wholesale service charges for the LPs. The CMA is responsible for holding the data and data shortfalls must be passed either way back through the CMA.

Except for trade effluent discharge meters, Scottish Water owns the assets used to derive the bill issued by the LPs. Each LP is responsible for reading meters and submitting the readings within (performance) target time frames; monthly or half yearly. However accurate billing and accounting for water usage relies on accurate and timely actions by Scottish Water, the CMA and the LPs. There are currently practical issues in the processes, data and database design and the calculations used to derive estimates of consumption and thereby sewage discharges.

Specific to compiling numbers for this return the CMA generates aggregated and disaggregated settlement reports for all market participants detailing the wholesale charges relevant to them. The disaggregated reports have been loaded into a temporary data mart (pending development of the reconciliation data mart which will be the enduring solution) and have been used as the basis for populating the 2008/9 P tables.

The settlement reports contain details of wholesale charge calculations per Service Element. A Service Element is any type of water or sewerage service which is associated with a Supply Point and which generates wholesale charges such as water meters, sewerage meters (these are virtual rather than physical meters and are used for charging purposes only), field taps, troughs, roads drainage and property drainage.

The most recent available settlement report that was available at 31 March 2009 for each month in the 2008/9 financial year has been used (except for trade effluent which, because of data issues, uses the volumes reported in the 2DBP, in conjunction with analytical data from 2008, to calculate load data for 08/09). This will ensure alignment with wholesale billed revenue in the General Ledger. The relevant report used for each month is listed below:

2008/09	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**January**	**February**	**March**
Settlement Report	R3	R3	R3	R2	R2	R2	R2	R2	R2	R1	R1	P1

Legend: P1 – Provisional Run (Month X – 16 business days)
R1 – 1st Reconciliation (Month X + 2 business days)

R2 – 2nd Reconciliation (Month X + 2 months)
R3 – 3rd Reconciliation (Month X + 8 months)

The settlement reports are produced from the Central Systems in accordance with the Market Code Subsidiary Documents (CSDs) which set out the processes and charging rules which are used to calculate wholesale charges at each Supply Point.

Properties receiving sewerage services are liable for drainage charges to cover property drainage and road drainage. Drainage charges for un-measured domestic customers are included in the general tariff charged. All connected properties are subject to road drainage charges on the assumption that a property connected to the sewerage service receives a benefit from the drainage of roads provided by Scottish Water. Connected properties which can demonstrate that they provide alternative arrangements for property drainage are exempt from charges.

Some properties have non-standard tariffs under special agreements but these are all now part of an LP's commercially agreed contract conditions and Scottish Water should not see them.

Trade effluent data is more complex because of Scottish Water's need to police discharge consents and protect WwTWs. A trade effluent consent is set up in agreement with the trader as to volume, effluent quality discharge, seasonal and other conditions (e.g. pea processors or fish processors may need particular arrangements). A copy of the availability parameters (volume, settled Biochemical Oxygen Demand load and Total Suspended Solids Loads) in the consent is given to the CMA for wholesale charging purposes. Scottish Water continues contact with the trader through regular, random or composite quality sampling and, possibly, effluent meter reading. An effluent meter is supplied and owned by a trader although SW may assess its performance.

In operation, the LP reads any meters, water supply and effluent, works out the numbers of days of discharge and passes the data through the CMA. The CMA passes the aggregated data onto Scottish Water so that it can invoice the wholesale charges to appropriate LPs.

The more significant issues that impact the numbers reported by Scottish Water are:

<u>Process issues:</u>

- There is an "effective date" when a new connection (SPID/DPID) is made from which charging should start. SW is responsible for making the connection and for supplying the data to the CMA. On receipt of the data from the CMA, the LP should then complete a sequence of actions in a specific order. If the sequence is not followed the SPID is not put into trade on the "effective date", but the service is live.

- Meters identified for exchange require a closing reading (by Scottish Water) prior to being replaced. Meter exchanges can be requested by any of the four stakeholders. However the process does not accommodate stopped meters; the prime cause of a request for an exchange, where the meter may not have been recording for some months (including consecutive reading periods). An agreed estimated final reading would be an equitable method of assessing consumption for both the customer and Scottish Water. Otherwise the volume is "lost" in the water balance as leakage; that is it becomes a Scottish Water efficiency performance issue and financial loss. It will not represent lost income to the LP.

Data issues:

- Scottish Water cannot check the completeness of the data to confirm or otherwise that all properties or addresses are charged because the non-domestic properties are handled by the LPs who alone have detailed address details

- The LPs are responsible for meter readings within prescribed time frames. The CMA prepares meter reading performance reports, but does not report performance of meters which are not read. The presumption is that there are penalties applied where an action is not completed within the prescribed time scale but there is no penalty for not performing an action.

- The LP instructs Scottish Water when to disconnect a service (through the CMA). There is no correlation between a last reading by the LP and the final reading by Scottish Water. Assuming that the instruction to disconnect is issued on the day of the LP's last reading and disconnection, there is the question of who is responsible for usage and value of water between the instruction and disconnection.

- Data migration from the LPs databases to CMA's Central Systems database in early 2008 resulted in a significant increase in water records, but not a similar increase in sewerage records. Scottish Water is currently using a 4-man team to investigate billing records to identify premises "gaps" and thereby unbilled unmeasured and measured premises. Scottish Water is also in the process of setting up a project to identify duplicate billings and review archived records.

- Low Volume Interface for data entry - Scottish Water has visibility of data it enters. There is no audit trail. High Volume Interface for data entry leaves an audit trail but Scottish Water does not have visibility of the records.

- There is no facility for data "read only" for common critical data. Scottish Water can enter data onto the Central Systems but does not have "visibility" of the data set to assess data validity or credibility.

- The correct category, rateable value or flag controls the billed sum and effective consumption and thereby the water balance. Scottish Water has no control over the correct category being used. There is no incentive for the LPs to correctly assign categories.

Calculation issues:

- The systems will not automatically manage meter rollover. Currently Scottish Water manually adjusts the data derived from the CMA. However, it is time consuming, but all under reporting of water usage impacts the water balance.

- A zero meter reading record can result from premises becoming vacant without being reported, no access to the meter or the meter failed. Whatever the data and cause of the zero reported consumption, the "data" should be recorded, quantity and value of water assigned and the effective consumption included in the water balance.

- The CMA process for each charging month includes an 8 month reconciliation process within which there are 4 reconciliation stages. Therefore for financial year reconciliation the Annual consumption up to March will only be available at the end of December (9 months after the reporting period). In order to report water usage and the water balance for the AR schedule, the reconciled usage for the 12 previous months is aggregated recognising that the volumes for only 4 months will be final (R3) reconciliation and that the volumes for the remaining 8 months will be based on different stages of the reconciliation process. In theory as all parties become more familiar with usage patterns, the initial estimate and early reconciliations should become more robust and thereby nearer to the R3 reconciliations. However currently Scottish Water is reporting wide percentage ranges between initial and R3 values.

All the above add uncertainty to the reported connection numbers and volumes billed through LPs and, by default, also have a negative impact on any assessment of the operational efficiency of Scottish Water. Clearly it is in the interests of Scottish Water to identify data anomalies and procedural issues that reduce the confidence in the reported data, but there must also be corresponding responsibility for CMA and the LPs to investigate data anomalies, improve the quality of reported data and address procedural issues in order to minimize volumetric and financial "leakage". We recognise that Scottish Water, the CMA and LPs are coordinating efforts to resolve a number of these issues; however we recommend that solutions to all issues that impact customer service and Scottish Water's performance targets be agreed and implemented in the near future.

Additional line specific observations are included in the commentary below.

Methodology - Unmeasured Domestic Properties

Scottish Water has used a consistent methodology for reporting and forecasting property and population numbers for AR09 and the SR10 Business Plan. The methodology is essentially the same as used for the AR08 returns when the methodology was improved to reflect the improved quality of source data and to take account of the change in national policy for dealing with second homes and long term empty properties. These categories are now included in the unmeasured household billed properties count. The approach uses the data listed above.

Scottish Water has based the number of unmeasured domestic properties receiving water and wastewater services on the 2008 WIC4 mid year return. Scottish Water considers that this year's WIC4 return provided the most reliable data to date.

The WIC4 return for each council area includes numbers for:

- Total households.
- Households connected to water and wastewater.
- Households connected to water only.
- Households connected to wastewater only.
- Households with no connections.

The household information is further sub-divided by Council Tax band and includes Council Tax reductions where applicable. Scottish Water compiles this data into a format which is suitable for further analysis.

The Ctaxbase returns for each council are received as one large spreadsheet containing each council's data and a whole of Scotland section. Scottish Water uses this to prepare its annual return. The Ctaxbase return lists the following information:

- A breakdown of dwellings by band.
- Total no of dwellings on the valuation list
- Number of exempt dwellings
- Number of chargeable dwellings and those subject to disabled reduction
- Number of dwellings effectively subject to tax by virtue of disabled relief
- Number of adjusted chargeable dwellings
- Number of dwellings entitled to discount: 25%,
- Number of dwellings which were second homes, long term empty, or with disregarded adults (as for AR08, only disregarded adults are in the 50% discount, the other two have no discount)
- Number of others entitled to no discount
- No of unoccupied exemptions
- No of other exemptions.
- Equivalent no of dwellings for RSG purposes
- Ratio to Band D
- No of Band D Equivalents for RSG purposes

WIC4 data is used as the base information: total household numbers, households connected to water and wastewater, households connected to water only, households connected to wastewater only and households with no connections. The data is also split by band and within band by benefit category (i.e. no benefit, partial benefit or full benefit). The households are also split by reduction category (no reduction, new reduction, 25% reduction, 50% reduction and no charge). The WIC4 2004 data was similarly split, but the reduction categories were as follows: no reduction, 25% and 50% reduction and no charge.

The same growth figures were used for both water and wastewater. The growth model used to project populations and household for SR10 includes a reducing adjustment for 2009/10 to account for the impact of the economic downturn on house building. The Year +1 number of properties has been estimated by updating the 2008 WIC4 figures for total households using the Ctaxbase growth forecast 2007 – 2017 and reduced based on data in *NHBC – New House Building Statistics, Annual Returns 2007/08* and trend forecasts in *Experian Water Demand Forecasts - Autumn 2008 (26 November 2008)* to predict a one year reduction to the 2009/10 forecast number from the growth model and thereafter growth following the model but from the lower total in 2009/10. The figures may be a slight overestimate as all properties may not be connected to both services.

The total by band and discount category is reported in the P tables. The P tables were not audited for this annual return.

Methodology – Measured property data

Measured property data for the A and P tables have been provided by CMA. There has been an increase in both metered household and non-household connections.

Methodology – Unmeasured non-household property data

The CMA data used to derive the figures for this entry indicates a large increase in the number of unmeasured non-household properties. Scottish Water has not had time to fully analyse the causes of the significant increase or to resolve suspected data anomalies before compiling this return. However Scottish Water has initiated investigations to establish where there were legitimate increases and where duplicate or erroneous records are included in the dataset.

The data was obtained from the CMA in March 2008 following the migration of Licence Providers' databases into the CMA Central Systems database at the beginning of 2008. Specifically Scottish Water is not confident of the numbers compiled for this return because there is a significant increase in the number of vacant properties from 6,397 to 25,925 (>300% increase). The current total number of voids is only slightly greater than the total increase in connected properties for the year.

During the audit, the CMA data were inspected and sample analyses tried, using a range of filters to demonstrate the observed data anomalies. There has been an increase in properties paying a fixed standing charge through the CMA where before they were deemed uneconomical to bill. However Scottish Water reports that the records also indicate a significant increase in Supply Point ID "gains" with a variety of "flags" indicating customer attached, service attached and vacant. The vacant category can include archived and duplicate records and demolished premises. We anticipate that the number of unmeasured non-households will reduce in AR09/10, including the voids number, as a result of the investigations and data cleansing exercises that should be completed during this period. However, if the exercise is to be effective, Scottish Water will need the cooperation of and coordination with CMA and the LPs. Scottish Water states that the problem has been discussed with CMA. It is clearly in the interests of Scottish Water to be able to report accurate measured volumes and numbers and then to be able to use the quantities in the water balance, and other performance calculations. However, we question to what extent cleansing and validating data provided by third parties should be the responsibility of Scottish Water.

When auditing for AR08 and the 1st draft SR10 Business Plan, an anomaly was identified in reporting field trough numbers, some of which were on fixed charge, some metered but a large number were not recorded. Since AR08, Scottish Water has extended its survey work to better understand the scale of the number of unrecorded water troughs. The current estimate is that there are about 13,600 billed troughs and 6,146 unbilled troughs, representing an overall reduction on last years estimate of about 9,500, the number of billed troughs having increased from 7,828.

The methodology and description presented in the Scottish Water report "IIP Project 119: Taps and Troughs" are considered reasonable, but we suggest that more work is required to improve the quality of the unbilled trough data, that unbilled troughs be assigned a SPID identification and billed either by quantity or fixed standing charge and that all feeds to multiple troughs are metered. We assume that for future returns the billed property data and volumes delivered data will be supplied by the CMA.

Methodology – Properties connected during the report year

The method of recording household and business new connections has not changed since 2007/08. All new connections are recorded on a Scottish Water WAMS/Ellipse system from which reports can be produced by month, year or for a defined period. A small number of new water connections (374) do not have a corresponding foul water drainage connection due to self-treatment. There were 18,681 new water connections during 2008/09 and 18,307) sewer connections of which about 3.9% were non-household connections in each category. For the purpose of reporting and billing it is assumed that each new foul connection also entails a surface water connection unless the customer proves otherwise. The number of new connections during 2008/09 was 21.5% lower than in the previous reporting year.

Methodology – Trade effluent

The methodology for reporting trade effluent is similar to that used in previous years. Scottish Water had proposed to used data provided by the CMA (The CMA provides the number of registered days for a charging period and a volume derived from meter readings or assessed from the last meter reading), and to match "in charge" parameters in order to derive the reported figures. Scottish Water received upwards of 18000 lines of trade effluent data at the year end for AR09, but back calculation of charges revealed that the CMA had not used the appropriate billing parameters in some 4000 lines. In addition, the CMA reported a total TE volume of around 33Mm³ compared to the 38Mm³ reported the previous year. It was therefore decided to use the 2DBP figures for the AR09 return. Operating and availability charges are given at wholesale prices.

During the audit Scottish Water stated that the total trade effluent volume (line A2:43) in the year as presented through the CMA data was 33,007,000 m^3 compared with the SR10 assessment of 38,341,000 m^3 and the AR08 reported volume of 38,224,600 m^3 (14% reduction). Scottish Water considers that this reduction from historic performance was unexpected, even allowing for the down-turn in the Scottish economy. Scottish Water compared the charge derived from the CMA data with the charge SW expected and flagged for investigation those records with more than 2% difference. The analysis identified 4000 lines (22% of the CMA trade effluent data lines) where Scottish Water believes the charges are potentially incorrect. We were able to see how the CMA data was presented to Scottish Water and how the data had been processed.

The data for DPID 10123A01 were reviewed, a monthly read account. The historic records suggest that a full year volume is likely to be in the order of about 2,160,000 m^3. However the CMA recorded volume (and billing) accounts for only 375,276 m^3. Twelve monthly meter readings would be expected for this account, but only three records are non-zero and only two of these are around the company's normal output. This particular customer is easily identified (although not the LP) because of its size and consent conditions. Scottish Water believes that the business has continued to operate normally for the whole year. We were able to see similar data gaps for other DPIDS although DPID 10123A01 was volumetrically the greatest. We therefore conclude that the CMA reported volumes are incomplete.

We are concerned that Scottish Water considers the quantity of sewage recorded by the CMA's figures for trade effluent is 15% less than it believes was actually collected. Since the major trade effluent customers are all metered, it is likely that the total trade effluent volume as recorded by the CMA could be disproportionately under-reported. Scottish Water demonstrated its reasoning for its concern during the trade effluent audit. A lower confidence grade would then need to be applied to all reported volume/weight figures.

As Scottish Water has more confidence in trade effluent figures estimated from its own data it has used these figures in the return instead of the CMA-derived figures. The return is therefore based on known and assessed trade effluent flows and consents in the same methodology as in previous years. The figures are used consistently throughout calculations for flow and load figures in the AR09 return.

Trade effluent strengths are recorded on the basis of settled COD for wholesale charging purposes. In addition, Scottish Water takes a wide range of settled BOD samples, primarily for loads discharged to PPP plant to provide data required under the commercial terms of the contract. The extent of BOD information sampling provides a reasonably robust basis for estimating BOD loads where direct measurements are not available.

For the purpose of estimating works loads, the company takes the measured volume of trade effluent in the report year times the average measured concentration in the report year. Trade effluent bills are normally based on the volume in the relevant billing period times the average measured concentration in the previous calendar year. This approach was applied to provide both the trader and the company with reasonable certainty on bills in a period and continues in use in wholesale charging. It does result in a difference in the reported loads in the A tables and billing information in the P tables.

The company applies a standard factor of 1.482 to uplifted settled loads used for billing to the unsettled loads reported in the A tables. This factor is an average of an historic set of measurements. We expect it to be reasonably representative across Scottish Water as a whole but less robust for individual treatment works.

Individual trade waste discharges are attributed to the relevant treatment works allowing loads to be summed for each works. The loads receiving secondary treatment are then summed based on the works types which are those used to complete tables E3 and E8
Figures are reported for all treatment works including PPP works.

Comments by line

Line 1, 6, 12 & 17: The number of unmeasured household billed plus exempt and excluding void properties has increased by 17,566 since the previous return.

Growth in connected unmeasured dwellings with water was 20,273 (0.86%) including exempt properties, less than was forecast in AR08 (23,410). The number of exempt properties, increased by 1,374 to a total of 60,537 during the period. The occupancy ratio for occupied households has reduced during the year from 2.18 to 2.17 and is predicted to fall during this coming year to 2.16.

Lines 2, 7: The number of metered households is small (604) compared with the number of unmeasured households (2,335,284). However there has been an increase of 74 in the last year as a result of a review of the unmeasured non-household billing data following the CMA migration exercise that transferred a number of SPID records from non-household to measured household; two significant changes being the inclusion of dwelling units above commercial properties (flats above public houses) previously included under the commercial count and nurses accommodation attached to NHS properties which for previous years were reported as a single billing record.

Lines 4, 9: The numbers of measured non-household water properties has increases in the year by 1,336 to 77,849. In addition there are 14,434 vacant properties. The numbers are supplied by CMA from their Central Systems.

Line 3, 8, 14, 25 & 32: Unmeasured non-household connected properties have increased significantly by 24,689 to 79,845 including exempt and vacant properties. The majority of this increase is attributable to the increase in vacant properties from 6,397 in AR08 to 25,925. However the anomaly is not reflected in foul sewerage and surface drainage numbers. Further details are included in the methodology section above.

Lines 11, 22, 35: Numbers of new connections are taken from the WAMS/Ellipse database. This includes connections made by both Scottish Water and by developers carrying out self-lay connections. There were 18,681 new water connections during 2008/09 and 18,307 (21,583) sewer connections of which about 3.9% were non-household connections in each category. For the purpose of reporting and billing Scottish Water assumes that each new foul connection also entails a surface water connection unless the customer proves otherwise. The number of new connections during 2008/09 was 21.5% lower than in the previous reporting year.

Lines 13, 18, 24, 31: The numbers of measured household drainage properties are taken from the CMA Central Systems database. There is no material change in the reported numbers from AR08 except in the number of properties connected to surface drainage. The CMA database migration process identified a number of domestic properties with surface water drainage only which were previously included in the non-household numbers. The inclusion of these reclassified properties results in an increase to line 31 of 591 to 754 properties.

Lines 15, 20, 26, 33: Measured non-household drainage properties are taken from the CMA Central Systems database. There has been significant movement in the reported number for all but line 15 which has decreased by 405 (0.7%).

The increases in the other lines result from numbers generated from the Central Systems data and the migration exercise.

Line 23 Property drainage is included in the sewerage tariff. Therefore the return against line 23 is zero.

Line 36: The reported data is the number of properties billed for trade effluent derived from the CMA Central Systems database and as aligned with the 2nd draft business plan. Some properties billed in the report year will have been occupied by more than one customer. Data cleansing continued to removed and reclassify low risk discharge points from the TE charging programme, but part of the reduction of connected properties (138) resulted from the economic downturn affecting Scotland.

Line 37: Connected properties have reduced by 167 to 3386 since 2008. The number of connected properties includes all properties for which there is trade effluent consent. Many of these agreements are for small discharges where it would be uneconomic to bill for the discharge as trade effluent. Bills are raised under the un-measured or measured non-household categories. Scottish Water data indicates that 670 premises holding consents are either closed or no longer require a consent. Therefore this reduction is included in the forecast for 2009/10.

Lines 38 &39: The numbers reported against these lines is derived from the CMA Central Systems database. There is an apparent 6.5% reduction in BOD loading and 7.3% increase in COD loading. Scottish Water does not have the data to validate the figures. See also the commentary above

Comments on Confidence Grade

For AR08, Scottish Water almost universally assigned A2 confidence grades to all line items. For this reporting year there has been a substantial reduction in confidence grades primarily related to the source of much of the data, the CMA Central Systems database.

All data abstracted from Scottish Water databases or WIC4 returns for household numbers are graded A2. This applies to lines 1, 2, 6, 7, 11 - 13, 17, 18, 22 - 24, 27, 30, 31 and 35. We consider the grading reasonable.

The majority of data abstracted from the CMA databases for non household and metered numbers are graded B2. This applies to lines 3, 4, 8, 9, 14, 15, 19, 20, 25, 26, 28, 29, 32, 33, 38 and 39. In the main we consider the grading reasonable where the CMA data has not highlighted potential anomalies. However as discussed in general above part of the significant changes in lines 3 (+11%), 9 (+16%), 19 (+25%), 20 (+15%) and 33 (42%) may result from the data migration into the CMA Central Systems database and need investigating by Scottish Water, the CMA and LPs to understand whether the changes are real or data anomalies that will reduce through cleansing investigations. For these specific lines we suggest that a lower accuracy grade may be more appropriate. However Scottish Water has taken the decision that despite the accuracy issues surrounding some of the data supplied by the CMA, to keep the B2 grade because they consider that "2" is consistent with change in approach rather than any inaccuracy of the data base.

Lines, 36 and 37 are graded B3 to reflect the change from Scottish Water databases to the CMA. The accuracy remains as previously reported. Although there has been considerable work to improve the quality of the data related to trade effluent connections and loads, the estimated loads are still based on records that require some degree of extrapolation from sample data and estimated volumes at year end but now with the lack of transparency (CMA data) and hence lower confidence in quantities and hence loadings.

Confidence grades for calculation lines 5, 10, 16, 21, 29 and 34 follow the lowest grade of the lines included in the calculation. This approach is reasonable.

The confidence grades for Report Year +1 Forecast are reasonable; each forecast item follows the source classification for the line, but the accuracy has been reduced by one level to reflect that it is a forecast.

4.3 Table A2: Population, volumes and loads

Commentary by REPORTER

Introduction

Table A1 and A2 (and Tables P1, P5 and P9) are derived from the same sources of data using the same methodology and the commentary detailed in the previous section.

The key points for Table A2 are:

- Winter population data is calculated from the GROS 2006 base Scotland total projections and a methodology for assessing household size (occupancy ratio), numbers of population in households and numbers not in households. Connection rates are derived from the WIC4 2008 return to calculate populations connected to water and wastewater services.
- Household occupancy ratios have fallen from 2.15 to 2.14.
- The projection of future populations is calculated using the population projections from the GAD figures and Scottish Government projections.
- Scottish Water gives a detailed narrative of the elements making up its water balance. Subject to any comments below, we believe that it is an accurate account of Scottish Water's methodology. Subject to any comments below we believe that the results in the table give a good indication of Scottish Water's water balance.
- For the 2008/09 OPA report the estimated PCC is 146.56 l/h/d excluding supply pipe leakage and plumbing losses. The PCC including plumbing losses is 152.36 l/h/d (with void properties). Plumbing losses are estimated to add about 5.8 l/h/d to the Per Capita Consumption. This can be compared to the WASC average for England and Wales of 145.2 l/h/d excluding supply pipe leakage in 2007/08.
- There is a discrepancy in Table A2 resulting from how the line item calculates the unmeasured household PCC including plumbing losses (153.02 l/h/d). The net effect is to slightly overestimate the value. This results from the line item using an average Underground Supply Pipe Leakage (UGSP) for both occupied and void properties rather than the assessed individual values of 56.04 l/prop/d for occupied properties and 59.97 l/prop/d for void properties.
- As commented in the previous report, we note that sewer cleaning, WWTW operations, Scottish Water depots and Scottish Water jetting have all been included in Water Taken Legally Unbilled. English and Welsh companies may include some of these categories in distribution system operational use. The lack of definition as to what should be included under any heading makes inter company comparisons difficult and we would like to see Ofwat and WICS give additional guidance as to what should be included in Distribution System Operational use and what should be included in Water Taken Legally Unbilled.
- Water Taken Legally Unbilled now includes 13,599 animal trough connections billed as a fixed charge. However sample surveys in rural DMAs concluded that

there are an estimated 6,146 unrecorded animal troughs within Scotland. The estimated usage is therefore based on an assumed 19,745 troughs.

- The number of trough connections is not included in the reported number of non-household connections. Although leakage from the underground supply pipes has been estimated using the assumptions used for measured and unmeasured connections, when considering the unrecorded locations of the majority of the connections in this category and the potential lack of maintenance, the resultant UGSP leakage of 0.96 Ml/d may be underestimated.

- Distribution losses have reduced to 727.854 Ml/d from 808.538 Ml/d in the previous year. Total reported leakage has reduced by 56 Ml/d to 868.134 Ml/d. Scottish Water has also estimated leakage using an MLE analysis for this return. This is discussed in the Reporters Report titled *Scottish Water's OPA Score 2008-09, May* 2009 and is not repeated here.

- The leakage reduction is comparable with the combined reduction in DI and reductions in reported usage.

- The overall balancing error, to reconcile distribution input with the water balance components was 93.18 Ml/d (4.3%).

- We question the ongoing assumption that 95% of water consumed is returned to sewers. However, we note that SW has correctly applied the figure set down in WICS reporting requirements.

Comments on Methodology

The sources of data and methodology used to develop household numbers and measured consumption are described in Section 4.2.

Unmeasured and measured domestic per capita water consumption is assumed to be flat over for the Year +1 forecast. The forecast for non-household demands is based on the conclusions from the Experian report that demand will reduce between 2008/09 and 2011/12, reflecting the current economic conditions. In addition un-measured non-household consumption is estimated to reduce once the cross subsidy is completely removed in 2011/12, from which date the actual consumption will be measured. Year +1 reduction is in line with the Experian reports forecasts.

During the audit, Scottish Water provided additional summary sheets for the population Methodology and the Water Balance calculations that provided detailed narrative of the elements making up the water balance. This additional documentation, explaining the methodologies and calculations, contributed significantly to being able to understand the detailed calculation necessary to derive individual line numbers. Subject to any comments below we believe that Scottish Water has adopted a comprehensive methodology and that the reported numbers in table A2 give a reasonable indication of Scottish Water's water balance.

<u>Line A2.1: Winter Population Estimates.</u>

The winter population is calculated from the GROS and WIC4 data sources detailed above. Calculations are based on Mid Year Estimates. The underlying methodology has not changed.

Scottish Water continues to report the winter population for water and wastewater equal to

the population in households with water (unmeasured)

\+ the population not in households with water

\+ the measured household population.

The estimated winter population connected to the water service (A2.1) comprises the following: Line A2.3 + Line A2.4 + population not in households with water. The population not in households with water is 89,799, an increase of 2,675 since 2007/08.

Population Projections for "Report Year + 1 Forecast"

Projected Total Populations and Households are derived from the GROS 2006 data using growth rates 2007 to 2017.

Population in unmeasured households with water

The occupied household population number is calculated from *(2006 GROS Projected Total Population times the ratio of Private Household population to total population times the ratio of Water Households to total Dwellings).* The derivation of the "Report Year +1 Forecast" number is described above.

As stated in Section 4.2 above for the table A1 commentary, the number of SW connected occupied households is known.

The same is method is followed for wastewater.

Population not in households with water

The population not in households with water is calculated from *([2006 GROS Projected Total Population less the Private Household Population] times the ratio of Water Households to total Dwellings)*. The derivation of the "Report Year +1 Forecast" number is described above.

The same is method is followed for wastewater

Vacant households with water are calculated from the 2008 WIC4 report *([2008 Total Dwellings – 2008 Occupied Dwellings] times the ration of Water Households to total Dwellings)*. The derivation of the "Report Year +1 Forecast" number is described above.

The same is method is followed for wastewater

Occupancy Ratio

Occupancy ratio for occupied dwellings has fallen from 2.16 to 2.15 and is predicted to fall to 2.14 in 2009/10. Domestic and household growth is derived from WIC4 data as the baseline property data and GROS data to forecast growth. There is a general consensus that future growth patterns will highlight a trend towards lower occupancy dwelling units and changes in the banding profile towards the higher banding. Scottish Water has therefore developed a growth model to reflect these two trends. The projection of future populations is calculated using the GROS population projections.

The calculation allocates the GROS estimated increase in households for future years to the WIC4 (AR09 reported) base household data by RV Band. The GROS data is apportioned to the Council Tax Bands using a split derived from a comparison of Bands from WIC4 data for AR06 and AR09. The Band apportioned GROS household growth numbers are then added to the AR09 WIC4 data to project household by bands for Year +1and beyond. The same methodology was used in previous years.

Source data and random lines and calculations were audited. We consider that the approach is thorough and provides a consistent approach for future returns where no alternative external data are available.

Line A2.2: Summer Population estimates

The summer population is the winter population plus the tourist population. The methodology to assess the additional summer population has not changed apart from this return is based on a new data set on accommodation for visitors abstracted from Yell.com. The methodology is:

- Visit Scotland information on average bed space per type of holiday accommodation.
- Visit Scotland information on the monthly occupancy rate for different types of holiday accommodation.
- Allocation of holiday accommodation properties to water supply and drainage area boundaries using the spatially referenced "Yellow Point" data set of business properties referenced on the corporate GIS. The tourist categories considered by SW from "Yellow Point" data were Hotels & Inns, Guest Houses, Caravan Parks – Holiday, Holiday Accommodation & Parks, Camping Sites, Bed & Breakfast, Hostels and Self Catering Accommodation.

The tourist population was calculated from the number of bed spaces per property type and the monthly occupancy figures from Visit Scotland. The total number of bed spaces per property type is calculated, and allocated to the water and sewerage operational areas. For all of Scotland the number of occupied bed space nights is calculated from monthly occupancy times the number of bed spaces. The monthly totals are summed over the 12 month period, to calculate the average and the peak month is used to calculate the summer population. A bed space night is the number of days in the month times the number of bed spaces times the occupancy rate. The difference in summer and winter populations is the highest tourist population in any one month in the year.

The growth rate for the Report Year +1 forecast is less than in the reporting year at about 0.20%.

We consider the approach to be a reasonable use of the data available to Scottish Water.

Water balance

Introduction

Associated with this return SW has prepared three analyses:

1. An analysis for the OPA calculation consistent with previous year's figures and assumptions. This used the "Integrated Flow Method" where leakage is the balancing item between top down "Distribution Input" figures and a "bottom up" sum of other components of the water balance.

2. A similar analysis for Table A2 but using some revised figures.

3. An analysis using the same figures as 2 but measuring leakage from its new DMAs and applying an MLE adjustment.

The preferred method is to measure all inputs including leakage and compare them with DI. Leakage is usually measured using District Meter Areas (DMA) (Method 3 above). While not used for the final figures in Table A2 SW has had adequate data to enable it to use the method. We give some further details of the method and results below:

The closing error, the reconciliation between top down (from DI meters) and bottom up (from other component estimates including leakage gives an indication of the accuracy of the inputs that make up the overall water balance. A closing error of < 5% is usually taken as an indicator of robust procedures. Provided that the reconciliation is within 5%, the closing error can be distributed to the inputs using the "Maximum Likelihood Estimate" (MLE) method. The analysis allocates the difference between the top down and bottom up values in proportion to the assumed uncertainty in the component estimate. This method can only be used if measured leakage coverage is approximately 90% of a supply area, but ideally the whole of the water utility's area.

At our audit we reviewed the data to be included in the A2 and E6 tables as well as the Maximum Likelihood Estimate (MLE) leakage analysis. The methodologies used to prepare the top down leakage estimate were consistent with previous years but have benefited from improved data resulting from data cleansing activities and studies completed in recent years. By the end of AR08, Scottish Water had achieved about 95% DMA coverage by connected properties. Therefore for AR09, SW has been able to complete a bottom up leakage estimate using DMA derived data. The two approaches were then reconciled using an MLE statistical analysis. Our overall impression is that the Water Balance analysis and related methodologies is a consistent and thorough analysis based on auditable data sources.

The reported closing error is 4.3% equivalent to 93.18 Ml/d between top down and bottom up water balance calculation. For the MLE calculation Scottish Water used the mid-point of the confidence grading range assigned to the individual components of the water balance. There is an argument that the upper-limit for the CG range for each component could have been used, but a sensitivity analysis confirmed that it made only a marginal difference.

Further commentary on the water balance and leakage is given in the Reporters Report titled Scottish Water's OPA Score 2008-09, May 2009 and in the commentary for individual lines below. As stated in the OPA report while we believe that the calculation for the OPA, based on last year's methodology, is the correct approach to demonstrate changes in the report year we recommend that for the future SW should adopt the methodology based on the AR09/MLE approach using the value of 814.2 Ml/d as the starting point. New targets, based on this starting point should be set. If this is not done future annual returns will be subject to increasing uncertainty as data diverges from the 2008 base and especially where leakage achieved is close to the WICS target.

Continuous Area PCC Monitor

For this return Scottish Water has used it's Continuous Area PCC Monitor (Household Consumption Survey) of about 6,200 domestic properties in 100 survey areas to estimate the unmeasured per-capita domestic consumption. Area selection was based on ten ACORN socio economic classification groups with the requirement that the Monitor grouping mirrored the overall Scotland stratification. By the end of the reporting period, over 90 areas were regularly providing data for the monthly analysis.

The design and implementation of the Monitor has been based on the UKWIR report, "Best Practice for Unmeasured Per Capita Consumption Monitors". The methodology adopted by Scottish Water is outlined in "*Unmeasured Domestic Per Capita Consumption, 2008/09 Methodology Statement, April 2009*".

The Monitor areas are geographically spread throughout Scotland but the spread is not statistically significant for Water Resource Zones. Fourteen additional areas are being established to obtain a better representation of a combination of population density and the Water Resource Zones. The SR10 Business Plan includes funding for an additional 20 areas intended to improve the rural spread representation.

Each area has been selected to be a homogeneous socio-economic grouping with no metered domestic users as well as single feeds and minimum leakage. The full set of Monitor areas are the same socio economic mix as the overall Scottish Water customer base. We audited 5 areas at random and confirm that the socio-economic groups had been correctly identified.

We reviewed the socio economic mix of the 52 areas available at the start of 2008/09 and at the end of the reporting period and compared them with the Scotland wide mix. We believe that the overall socio-economic mix of the monitor reflects the overall mix of SW's customers. Although the monitor is reflective of SW's customer base and in theory SW does not need to make any adjustments for differences between regional or socio economic mix of the monitor and of Scottish Water's customers, in practice SW calculates the PCC for each area and hence socio economic group. It then calculates an overall PCC as a weighted average of the PCCs for each socio economic group. This is done to allow for some monitor areas being unavailable in any month. .

As stated above, Scottish Water plans to add another 20 areas to the monitor, to assist it in estimating PCC at a water resource zone level based on using five discrete population density bands to further stratify the 230 WRZs. We discussed the reasons for the additional areas with Scottish Water and agree with its arguments that the additional areas are required to obtain a better representation of a combination of population density and the Water Resource Zones. The additional areas have not been identified pending an agreement to additional funding and assessment of the initial results from the current areas.

SW has not attempted to estimate PCC at an operational area or water resource zone level for the reporting year. SW has not attempted to estimate PCC for different household sizes for the reporting year.

Electromagnetic flow meters have been installed in all Monitor areas. Meters were sized to measure the estimated flow ranges in each area: sizes ranging between 15mm and 80mm, with the majority being 25mm. For this reporting year the data has not been adjusted for meter error / under registration. Scottish Water states that meters will be regularly monitored and assessed for performance and will be subject to a 5 year planned verification and replacement programme.

All households within an area were asked to complete a survey form to be returned by post. Scottish Water then visited those households that did not return the form. Responses from both approaches varied between zones but overall about 70% response was achieved. Lack of response could have been for a variety of reasons including that the dwelling was vacant.

Scottish Water has assumed that the vacancy level in each Monitor area is the same as the average reported vacancy level across Scotland. We accept that it may be impossible for SW to assess this parameter individually, particularly in those areas with a high percentage of rented accommodation. Nevertheless SW might like to investigate in one or two sample areas whether regular contacts with local authorities, the land registry or housing trusts could be used to obtain more accurate vacancy information at reasonable cost.

The survey form included questions to estimate household occupancy and thereby the area occupancy ratio. The occupancy ratio for each Monitor area is assumed to be equal to the ratio derived from the returned forms adjusted for the national average vacancy rate. Scottish Water plans to resurvey households in the Monitor areas every 4 years. A further adjustment is made for the national average percentage of institutionalised household occupants. The effect of both adjustments will be to proportionally reduce the Monitor area population and thereby proportionally increase the PCC. Both assumptions are therefore fundamental to the accuracy of the calculated PCC.

Data are screened manually to identify gaps and anomalous data. Validated data are used to calculate the monthly average daily consumption for legitimate data within the month. Gaps in the data are not in-filled.

Using the minimum night flow data SW infers a legitimate night use (LNU), up to a maximum of 2.2 l/p/hr, assuming that leakage is zero. Any minimum night flow above this figure is assumed to be leakage which is deducted from measured inflows to derive consumption. The figure of 2.2 l/p/h assumes 1.7 l/p/h legitimate use and 0.5 l/p/h plumbing losses; both based on UKWIR "Measuring Leakage, Best Practice". SW reports that this method currently results in an inferred composite LNU for the monitor of 1.55 l/p/hr. PCC zone leakage monitoring and reporting is based on the identification and separation of the LNU at the minimum 15 minute flow each night which typically occurs between 3:00 and 4:00 hrs.

As well as SW's experience in reviewing its minimum nightlines we have evidence from elsewhere that legitimate night use can vary significantly from the default values used as caps above (both higher and lower). We understand that SW has been undertaking pilot studies using 1 minute data to better calculate leakage. We applaud SW in undertaking this work and encourage SW to consider how this approach could economically be extended to form the basis of leakage estimation throughout the monitor.

The analysis includes applying an hour day factor derived from the continuously measured Monitor area pressure.

The audit included inspecting the data and the analysis for 3 Monitor areas.

Scottish Water has completed initial analyses of the 10 ACORN classification groups. Although the results are currently too preliminary to publish, they do suggest interesting variations between and within the groups as well as anomalies to be followed up, for example to establish whether high consumption is legitimate or disguising leakage and waste.

In April 2008 there were 52 established survey areas returning data for monthly analysis. In July 2008, an additional 20 areas were included in the monthly analysis and thereafter the available areas increased to 100 by March 2009. Initially Scottish Water intended to only use data from the Monitor from September 2008 when it was considered that representative data were being returned; from the 90 operational survey areas, with data for the first 5 months being derived from the historic PCC profile developed from historic monitoring surveys and generic assumptions used in previous years. However in late April 2009 Scottish Water:

- Calculated the ACORN stratification for the 52 areas available in April 2008, and
- Analysed the April 2009 data.

Scottish Water concluded that because the stratification of the partial set was representative of the 100 areas and thereby of Scotland and that the April 2009 monthly PCC was more representative of the April 2008 value than of the equivalent historic PCC profile value that the full year data from the Monitor would be used for the water balance giving a reduced value of 146.56 l/h/d. We consider that this was the correct decision.

The AR09 reported PCC is 146.56 l/h/d excluding plumbing losses. This is lower than the previous year reported figure of 146.98 l/h/d derived using a less precise methodology.

Based on the brief audit of the Monitor and discussion with Scottish Water we believe that the work to derive the domestic per-capita consumption is thorough and competent. We recommend that Scottish Water:

- Considers how to assess meter error / under registration in the longer term.
- Considers resurveying households more frequently than every 4 years (for example on change of ownership) in order to be able to reassess occupancy ratios more frequently and fill in missing data from the household surveys. Recent AR analyses imply that there is an annual reduction.
- Consider extending current surveys of LNU and leakage in the Monitor areas to form the basis of leakage estimates throughout the Monitor.
- Analyses variations in PCC by Region and by the different ACORN socio economic groups. However we suggest that more detailed analyse would require better understanding of area specific occupancy ratios.
- Analyses daily and seasonal variations by regions, zone and ACORN grouping.

Below we describe SW's calculations that went into Table A2.

<u>Line A2.26: Unmeasured per-capita domestic consumption</u>

Table A2, line 26 is a calculated number generated from other data in the Table.

Line A2.12: Total unmeasured domestic consumption

Total unmeasured domestic consumption includes void properties. The volume is calculated by multiplying the PCC by the estimated population and adding allowances for internal plumbing losses and underground supply pipe leakage. For void properties only losses and leakage are included in the volume.

The unmeasured consumption figure includes for exempted properties. These are properties that consume water but are billed at a zero rate. Scottish Water allocates them to this category on the basis that they are billed. Alternatively such properties could be allocated to water taken legally unbilled, Line A2.27.

The population reported in this table and used in the calculations for Tables B9 and the water balance are consistent and derived from the population and household calculations commented on in Section 4.2.

Plumbing losses

Scottish Water has made no change to its method of calculation of plumbing losses this year.

Plumbing losses are based on a "Managing Leakage" default, corrected for pressure, diurnal pressure variations (hour/day factor) and an infrastructure correction factor (ICF). The latter is built into the consultant's software and follows the "Managing Leakage" methodology. Average internal plumbing losses are estimated at 11.93l/p/d based on an analysis of DMA data using Scottish Water's analysis tool "Perform Spatial Plus" (PSP). The tool assumes that plumbing losses vary as the pressure in the DMA varies. Given that most properties have break pressure tanks in the roof and many plumbing losses will be on the low pressure system it is unlikely that the relationship will be as direct as that built into PSP. However, we accept that any inaccuracy is hardly material both in absolute terms and in relation to the likely inaccuracy of the original "Managing Leakage" figure. The difference between this figure and the Managing Leakage default is difficult to explain but the higher figure has not been used.

For this reporting period plumbing losses are estimated to add about 5.8 l/h/d to the Per Capita Consumption (including voids and excluding Underground Supply Pipe Losses) of 152.36 l/h/d. This is a reduction of about 0.8 l/h/d from the pervious reporting period. Plumbing losses are added to the base unmeasured PCC. We accept that this is correct as plumbing losses were measured in the minimum nightlines (and hence subtracted) in base PCC calculations.

Line A2.13: Measured household consumption

There are 604 measured household connected properties (see commentary for Table A1 above). Consumption is recorded by meter and, subject to meter under-registration, should be accurate. Measured consumption, at approximately 180 l/h/d, has increased by about 3 l/h/d from the reported consumption in 2007/08. It is higher than unmeasured consumption. We understand that a number of these properties are farms and other higher-occupancy properties such as holiday cottage complexes which could well provide the explanation.

Line A2.14: Unmeasured non-household consumption

For previous annual returns, Scottish Water estimated unmeasured non-household consumption by interpolation using consumption figures from measured non-household consumers using industrial WICS sector codes (e.g. hotels, banks) and rateable value as the variables. A core assumption was that two properties with the same industry sub-sector code and rateable value would consume the same volume regardless of whether they were metered or not. Full business metering (FBM) is being phased in over the next few years so that by 2012 the majority of unmeasured customers will have volumetric billing.

For the 2nd Draft Business Plan (2DBP), Scottish Water used sample meter readings to derive a simple average unit and hence total FBM consumption.

The programme for full business metering (FBM) has allowed Scottish Water to read and analyse about 13,000 of the newly installed meters and reassess the assumptions. Scottish Water concluded that the consumption from the FBM set was consistently lower than that of historically metered customers and that the two variables used in the two interpolation assumptions were incorrect. An analysis of a data set that included the measured non-household consumer data showed a statistically significant correlation between consumption and rateable value (*Estimating Unmeasured Non-household Consumption, Strategic Analysis, 6 May 2009*). This relationship was used to derive the estimate for this return. The effective changes in reported consumption for Line A2.14 are:

Unmeasured Non-household		**AR08**	**2DBP**	**AR09**
Property numbers				
Billed properties **Line A1.3**	No.	48,759	48,759 **	53,920
Void unmeasured properties	No.	6,397	6,397 **	25,925
Connected properties **Line A1.8**	No.	55,156	55,156 **	79,845
Water Delivered				
Billed properties	Ml/d	64.31	29.99	33.61
Vacant properties	Ml/d	0.37	0.37	1.65
Line A2.14	**Ml/d**	**64.68**	**30.36**	**35.26**

*Note: ** Pre CMA data migration*

Unmeasured water troughs are not included in either the number of connections or the estimated consumption in this line.

For this year there is a significant reduction in the estimated unmeasured non-household consumption. Scottish Water has assigned Confidence Grade C5 to reflect the uncertainty of the CMA reported data source and analysis process. The new methodology is considered more logical than that used previously and with increased availability of properties with meter readings, the quality of the statistical analysis will improve. By 2012, the majority of this category of non-household consumers will be reassigned to the measured category.

Line A2.15: Measured non-household consumption

Consumption is recorded by meter and, subject to meter under-registration, should be accurate. However measured non-household meter readings are now supplied by CMA from its Central Systems database and held in Scottish Water's Ellipse system. Scottish Water reports that 85% of measured consumption was calculated from actual meter readings. The remaining 15% was calculated from CMA derived data of yearly estimates where valid sets of actual meter readings do not exist. The potential uncertainties with the data are discussed in Section 4.2 above.

The quantity of measured non-household consumption in the report year is calculated from meter readings which are extrapolated or interpolated to estimate a quantity from 1st April to 31st March as follows:

- The quantity from the 1st April to the first meter reading in the year is interpolated from the meter reading immediately before and after the 1st April on the basis of calendar days.

- The quantity from the last meter reading in the report year to the 31st March is extrapolated from the last meter readings available over a period as close as possible to 365 days.

This has been confirmed by audit in previous years. While the method is logical the latter extrapolation may slightly over-estimate consumption if, as is likely, consumption is higher in the summer period than the winter period over which the extrapolation is used.

The metering project for unmeasured non-households has not made a material difference to the number of installed meters used for billing measured usage during the period, primarily due to the policy to install meters free of charge from 2010 and therefore there is no financial incentive for potential meter optants to apply beforehand.

Line A2.20: Measured non-household (non-potable)

The reported volume of non-potable water is 13.694 Ml/d which is made up of 5 metered supplies (9.19 Ml/d) and one licence volume (capped agreement) of 4.5 Ml/d. The total volume has increased by 5.9% from the previous return. The meter data was provided by the CMA.

We suggest that for Scottish Water to better understand the licence volume the supply to this consumer be metered even if the method of billing remains unaltered.

Line A2.37 and A2.38: Meter under-registration

Scottish Water does not undertake routine calibration of its domestic meters. As for previous years it has applied an average meter under-registration figure reported by Ofwat for England and Wales water and sewerage companies which, for 2007/08, was 4.1%. While this is a generally accepted figure our experience is that this may be high. As Scottish Water only has 604 domestic meters the figure is immaterial. Irrespective of the number installed, it is still good practice to establish and maintain a programme of meter calibration and maintenance.

Scottish Water has not calibrated its non-domestic meters. As in previous year's it has applied a meter under-registration figure based on Ofwat published information which is 4.8%, the same as for AR08. This figure is consistent with our knowledge where calibration has been done and so we believe that the resulting estimate is acceptable.

A2.32 to A2.36 Underground supply pipe leakage

Underground supply pipe leakage is added to consumption to calculate water delivered. The methodology for the calculation of underground supply pipe leakage is as for previous years.

Underground supply pipe leakage is difficult to measure and many water companies continue to use the "Managing Leakage" default of 50 l/prop/day, possibly modified by the development of free supply pipe replacement programmes. For previous returns, Scottish Water investigated 100 supply pipe leaks to establish flow rates. The analysis suggested a flow rate of 0.79 m^3/hr/burst. Burst rates are currently about 2.82 per 1000 properties overall (1.59 for swept DMAs and based on the results from swept DMAs, 3.83 for unswept DMAs). This is higher than the 2007/08 reported burst rate (2.1 per 1000 properties) but is based on data from the equivalent of 45% of connected properties.

For the Water Balance, Underground Supply Pipe Losses are estimated to be 141.237 Ml/d which is 24.537 Ml/d higher than in 2007/08 and closer to the reported figure in 2006/07. The increase is reflected in the individual estimates for household and non-household connections all of which are reported to be higher than in the previous return; unmeasured domestic excluding voids are assessed at 56.04 l/prop/d (compared with 47.05 l/prop/day for 2007/08). This is significantly higher than comparable average in England and Wales for 2007/08 at 33.8 l/prop/d (range 7.4 to 55.3).

Scottish Water has used published data for England and Wales to calculate supply pipe losses for different property types and whether the meter is external or internal. The general view in the industry is that leakage on externally metered properties is 50% of un-metered properties as the customer will pick up the fact that he has a leak when his bill is increased for additional usage. Scottish Water has assumed that USP Losses are about 40% of their unmeasured equivalent.

We conclude that:

1. All estimates of supply pipe leakage are uncertain.
2. The figures are higher than those typically used in England and Wales. We recommend therefore that Scottish Water extends its studies and investigations to challenge or validate current assumptions.
3. Scottish Water should record awareness and repair times and use the data to benchmark itself against other company performances. This statistic will allow us to judge whether supply pipe leakage is indeed likely to be higher than in England and Wales.
4. Even though the current figure is uncertain we accept that it is a reasonable figure to use in this return.

Lines A2.18 and A2.30 Leakage

The prime tool used in Scottish Water's active leakage control (ALC) strategy is to measure flows at night when consumption is low in district meter areas (DMAs). There are now 2,773 operational DMAs, representing 95.1% of properties supplied; a slight increase from last year (94.4%). DMA operability is reported to be currently at over 80%. Programmes for implementing pressure management within DMAs and auditing PRVs (maintenance and optimizing performance) have continued through 2008/09 as part of the overall ALC strategy.

- Distribution losses have reduced to 727.854 Ml/d from 808.538 Ml/d in the previous year. The commentary relates to the figures in the Water Balance Spreadsheet, the detail of the source data for which is discussed above.

- Total reported leakage has reduced by 55 Ml/d to 868.134.(869.091 including USPL) A detailed leakage management discussion is included in the Reporters Report titled Scottish Water's OPA Score 2008-09, May 2009 and is not repeated here.

- The leakage reduction is comparable with the combined reduction in DI and reductions in reported usage. The following table summarizes the net changes in the major components of the water balance. The material changes in the reported lines are summarized below. Commentary on individual lines in the table is included in their relevant sections.

Ref	Description	Unit	2007-08	2008-09	Diff'n
A2.11	DI	Mld	2271	2144	-127
	Unmeasured domestic (PCC)	lcd	146.98	146.56	-2 (Ml/d)
A2.14	Unmeasured non-household consumed	Ml/d	65	35	-30
A2.15	Meter non-household water consumed	Ml/d	464	431	-33
A2.27	Water taken legally unbilled	Ml/d	63	60	-3
A2.30	Leakage	Ml/d	924	869	-55

- All the changes result from measured bill records and studies completed during 2008/09. All estimated figures remain uncertain.

- The overall balancing error, to reconcile distribution input with the water balance components was 93.18 Ml/d (4.3%). This compares with the 26 Ml/d (1.2%) error in 2007/08.

- Scottish Water estimates service reservoir leakage at 9.24 Ml/d (11.79 Ml/d in 2007/08), based on "Managing Leakage" default value of 0.333% per day of storage capacity. The calculation uses the reported storage capacity from the WAMS database. There were no known overflows during the period. It is best practice for utilities to routinely undertake service reservoir leakage tests as part of periodic inspections. Conversely measuring service reservoir leakage can be difficult where control is in poor condition /not maintained or the valve configuration prevents reservoir or cell isolation. Scottish Water should be able to undertake some leakage measurements on a sample and opportunistic basis to check the current default value. This will become increasingly important as Scottish Water moves towards its ELL and relies on the bottom up leakage estimate.

Line A2 -17: Water taken legally unbilled

In the previous return, Scottish Water has reported a significant increase in water taken legally unbilled, primarily resulting from reassessments of Waste Water Treatment Works usage and the inclusion of unmeasured and unbilled cattle troughs. For this return, Scottish Water has continued to investigate individual line item components and has concluded that there has been a small overall reported reduction of 3 Ml/d to 60.19 Ml/d.

The comparative component quantities are detailed in the table below:

A2.27 Water taken legally	Unit	2006-07	2007-08	2008-09	Comments
Fire fighting	Ml/d	13.12	14.97	13.23	Flow rates as 07/08. Based on SG reported data.
Standpipe volumes	Ml/d	16.01	12.41	13.99	Recorded licences have increased
WWTW use	Ml/d	3.79	15.73	16.62	Based on site specific readings at 70 sites
SW Offices and depots	Ml/d	0.40	0.32	0.18	SG usage statistics applied to SW staff only
SW Jetting	Ml/d	0.99	1.08	1.01	Events recorded on Corporate system
Animal troughs	Ml/d	0	16.35	13.96	Average usage obtained from metered troughs including UGSP
Temporary building connections	Ml/d	0	2.31	2.17	New methodology based on new connected properties.
Total A2.27	Ml/d	34.49	63.18	60.19	Difference = - 2.99 Ml/d

Water Troughs: The billing system includes water trough connections billed as a fixed charge. In 2007/08 an analysis of 1200 metered troughs concluded that the average trough usage was 558l/trough/day. Sample surveys in 8 rural DMAs in 2007/08 concluded that there were 21,468 unrecorded troughs and 7,828 billed troughs, a ratio of 2.7 unbilled troughs to each billed connection. Further surveys of 54 DMAs in 2008/09 found that the ratio to be 0.8 unbilled troughs to each billed trough. Based on the results of both surveys, and being informed by the current metered volumes SW used a revised figure for the field trough numbers and volumes as shown below:

	Fixed charge Troughs Unit	Unbilled Troughs	Known and Unbilled Troughs
No of troughs	13,599	6,146	19,745
Ratio		0.45	
Daily Volume (Ml/d) (based on 658.22 l/trough/day	**8.95**	**4.05**	**13.00**

- The methodology is considered reasonable, but we suggest that more work may be required to improve the quality of the unbilled trough data and to ensure that all feeds to multiple troughs are metered.

- Leakage from water trough underground supply pipes has been estimated using the assumptions used for measured and unmeasured connections. When considering the unrecorded locations of the majority of the connections in this category and the potential lack of maintenance, the resultant UGSP leakage of 0.96 Ml/d may be underestimated.

Waste Water Treatment Works: For this return the metered usage at 70 WWTWs, representing 31% of the population equivalent (PE) was used to derive water usage by treatment type (Primary, Secondary and Tertiary) and PE banding.

Standpipe licences demand: Standpipe demand is estimated from a consumption volume based on usage categories and an assumed 9m3/day for licensed standpipes without a consumption volume. The number of full period equivalent standpipe users is 1,588, of which 1,257 are licensed with estimated consumption rates based on the standpipe usage category; the remainder are not. This is an increase of 232 in the year (17%). The standpipe volume is estimated to be 13.99Ml/d (12% increase). The estimate assumes that the licensee will use the licence quantity. We acknowledge that estimates under this category will always be uncertain compared to some other categories and that any error will be relatively small compared with other categories. However we recommend that Scottish Water should extend to metered usage surveys where appropriate to improve the accuracy of the unlicensed volume estimate and confirm to the validity of the assumption that licensed users draw their allocation. Until validation checks are initiated, this section of the water balance will remain very uncertain.

Fire Service demand: The methodology for Fire Service demand is unchanged from last year. Current usage has been assessed based on the National Fire Statistics (Scottish Government); reported two years in arrears, interviews with the Fire Service and by measuring hose flow rates. Fire demand represents 9.93 Ml/d, operational demand for training, 1.36 Ml/d, appliance testing 0.05 Ml/d and vehicle washing, 1.89 Ml/d of the total of 13.23 Ml/d. This is a reduction of 1.74 Ml/d primarily attributable to fewer fires in the year.

As discussed in our report last year, the majority of Fire Service demand is for emergency fire fighting. Different fire brigades have different policies on water use, some using water and others foam. We accept that Scottish Water has significantly improved the data quality and thereby the estimates. However, until water used per incident can be better estimated (correlation between distribution system metering and specific incident flow rates and duration) the figure will be subject to significant error.

Scottish Water Depots and offices demand: There is a significant reduction in this item. The estimate is based on Scottish Government official statistical usage per office worker for different categories of facilities. For the pervious return, Scottish Water had double counted contractor staff. For this return, only Scottish Water offices and direct staff numbers have been used. Recognising that the total quantity (0.18Ml/d) is not significant in the overall water balance, we question why Scottish Water do not meter their offices and thereby quantify usage more accurately.

Scottish Water jetting demand: There is a marginal reduction in this item. The quantity is estimated from the number of events in the year identified from the WAMS system for works orders for jetting and the previously assumed flow rate (10 l/s) and duration (15 mins).

Temporary building connections: The methodology has been modified for this year. The number of properties constructed during the year is based on the number of connected properties in the year multiplied by the ration of builds to connection from the previous year. This modification has been necessary because Scottish Water now only has visibility of the number of new connections and the number of temporary building connections. The estimated average water demand per new build is derived from Scottish Government Construction Statistics, 2007.

Conclusions

As previously noted, sewer cleaning, WWTW operations, Scottish Water depots and Scottish Water jetting have all been included in this heading. Elsewhere these may be included in distribution system operational use. The lack of definition as to what should be included under any heading makes inter company comparisons difficult and we would like to see Ofwat and WICS give additional guidance as to what should be included in Distribution System Operational use and what should be included in Water Taken Legally Unbilled.

Our overall conclusion is that Scottish Water has demonstrated ongoing progress towards improving the estimates of water taken legally unbilled. However there is uncertainty due to the numerous assumptions and where forecasting is based on relatively small sample sets. The Scottish Water reported volume is 4.4% of the water delivered. While generally water taken legally unbilled has been increasing in England and Wales as companies have been investigating their actual figures, the Scottish Water volume is double the percentage usage of the English and Welsh water and sewerage companies in 2007/08. We acknowledge that it is difficult to estimate the figure with any accuracy and different companies may put different items in the categories of distribution system operational use and water taken legally unbilled. We believe that the work on sample surveys should be extended and where appropriate meters be installed to measure actual demand (for example all WwTWs, temporary building connections, supply metered standpipes for billing quantity used, animal troughs to monitor usage). Using actual metered usage will enable Scottish Water to significantly improve the confidence in its estimate.

<u>Line A2-28: Water taken illegally unbilled</u>

As for last year Scottish Water has estimated illegal use under three categories as shown in the table below:

Item	**Estimated Consumption**	
	2007/08 (Ml/d)	**2008/09 (Ml/d)**
Occupied voids	0.80	0.83
Illegal standpipes	1.76	2.16
Fire hydrant misuse	0.51	0.48

Item	Estimated Consumption	
	2007/08 (Ml/d)	2008/09 (Ml/d)
Total	3.07	3.47

Overall consumption has increased by 0.4Ml/d and for two of the three categories.

Scottish Water has assumed that 5% of void properties will be occupied. Domestic voids in Scotland are reported as 2.5% of total domestic properties, a similar figure to England and Wales where voids are closely monitored. We believe that Scottish Water has made a reasonable assumption. There is a volume 3% increase from last year in a very small consumption quantity where the void number has increased by about 7%.

Illegal standpipe numbers are based on reports from operational staff, who receive a bonus for every one that is detected and subsequently registered and paid for by the user. While the estimated numbers of illegal standpipes are now more accurate the volume used per standpipe is the same as last year and remains very uncertain. Reported illegal standpipe numbers increased by about 12% in the year

The estimate for fire hydrant misuse is based on recorded numbers of vandalised fire hydrants with assumed flow rates and run times estimated from PSP. The number of incidents was lower than in the previous year. The figure is hardly material but should be regarded as uncertain.

<u>Line A2.29 - Distribution system operational use (DSOU)</u>

This year Scottish Water has assessed this volume at 3.58 Ml/d a reduction of 1.31 Ml/d over last year's figure of 4.89 Ml/d. A comparison of the two figures is shown in the table below:

Item	2007/08 (Ml/d)	2008/09 (Ml/d)
Reservoir cleaning	0.62	0.32
Planned flushing and swabbing	1.77	0.67
Burst repairs	0.50	0.52
Water quality (customers)	0.89	0.83
Water quality sampling	0.12	0.11
Mains rehabilitation and new mains	0.99	1.12
Total	4.89	3.58

DSOU is made up of the same 6 categories as last year. Expressed as a percentage of distribution input (0.16%) the quantity is generally less than half that of water and sewerage companies in England and Wales (2007/08). This can be partially explained by Scottish Water's high levels of leakage. However due to the high level leakage levels and uncertainty in the estimate because of the method used to calculate leakage, we suggest that the overall volume for DSOU is likely to be comparable to other companies.

The methodologies and assumptions used for estimating reservoir cleaning, mains rehabilitation and programmed flushing exercises are the same as for the previous year and are based on site surveys, interviews with operations personnel, shadowing exercises, data collection and using historic event records. Numbers of events are derived from operational records. Scottish Water continued their shadowing exercises during the year to improve some of their assumptions of flow rates and duration

Overall the volume has reduced mainly because reservoir cleaning and planned flushing and swabbing volumes reduced by 48% and 62% respectively, albeit the total volumes being hardly material. Scottish Water cleaned 51 reservoirs during the period, one more than in 2007/08, because the methodology and assumed usage are based on the storage capacity, the cleaning volume reduced.

As noted previously we suggest that Scottish Water implements a process for systematically recording event, duration and flow rate in order to increase the number of events with actual data to increase the reliability and thereby confidence in the reported usage – for example routinely using a standpipe flow meter for flushing exercises through fire hydrants. Scottish Water has also made a number of assumptions when estimating water used for flushing following customer complaints of water quality. We would like to see these assumptions better substantiated by surveys of actual practice.

From our work in England and Wales we note that Scottish Water has generally included similar items to those estimated elsewhere. However, a number of items included under water taken legally unbilled may be included in this heading by other companies, which makes inter company comparisons difficult.

Summing water taken legally, illegally and distribution system operational use and comparing it to water delivered indicates that the former is approximately 5.0% of the latter. The average for all WASCS in England and Wales is approximately 2.9%

Lines A2.10 and A2.11: Distribution input

Scottish Water only supplies water to customers within Scotland. There are no exports to or imports from third parties. There are some interregional transfers with the Scottish Water supply area, but the net effect is zero within the water balance.

For AR09, Distribution input (DI) has been calculated from measured flows recorded on data loggers linked to DI meters that are routinely downloaded (68%), telemetry flows (19%), manually read meters (9%) and estimated data (6%). In practice there is monthly variation in the percentage split between the different sources of data depending on flow meter or equipment availability.

Scottish Water has implemented a Best Practice Strategy for data collection and processing that includes a protocol for managing data gaps. The monthly data validation reviews include reporting monthly DI. The data is accessible on the Scottish Water website (Z-one). The progress in improving the quality of data from flow meters that started in 2007/08 has continued during 2008/09. Of the 299 operational works (reduced from 318), 25 works account for approximately 75% of the DI.

The meter replacement programme is driven by the conclusion of the site surveys and meter accuracy verification programme. The meter verification programme, covering all DI meters, includes independent flow monitoring to calibrate the meter and output signals for telemetry. Meter error assessments are also being undertaken using point to point direct comparison, secondary measurements and sub system balancing techniques. Indications are that individual meter error is in the order of 5% to 10% with an overall error band of about 5.3%.

Flow data audit trails were followed for a number of meters and data for different months up to the monthly reported DI calculation.

Overall there has been considerable progress in improving the measurement of DI. However Scottish Water needs to maintain the effort to increase meter coverage, improve meter reliability and to consolidate a long term meter maintenance and verification process.

Line A2.39 to A2.45 Sewage volumes

Scottish Water has applied a rate of 95% of water supplied as return flow to the sewers as set out in the WIC definition.

The audit identified that where measured water volumes were used to calculate the total sewage volumes, they excluded supply pipe leakage.

Scottish Water has undertaken a further review of WwTW drainage areas in AR09, to improve boundary lines with respect to sewered properties. Revised area boundaries are prepared centrally and sent for checking by operational planners in the regions. This is an ongoing process.

During the audit we examined a small number of individual WwTW drainage areas to confirm that boundaries are drawn to include all sewered properties, domestic and non-domestic, and that possible outliers are included or excluded as appropriate.

Line A2.46 to 60: Sewage Loads

The total load reported in line A2.55 includes loads discharged to PPP works (identified separately in line A2.60).

Scottish Water has undertaken a further review of sewage loads for individual WwTW drainage areas in the report year taking account of changes to population, trade effluent and other discharges in the report year. The methodology adopted by the company is a refinement of that used in previous years. The key components of the load analysis are as follows:

- Resident population data are derived from the total connected domestic population. The connected population is distributed to individual works by address point count within drainage area boundaries, which have been expanded for the year's developments. Population is distributed on the basis of occupancy levels estimated for each council area and the estimated populations adjusted to reconcile with the estimated connected population in each council area.

- Non resident population is assessed from visitor numbers produced by Visit Scotland. The visitor population was distributed over visitor accommodation identified by mapping Yellow Point data to drainage area boundaries. Mapped drainage area boundaries have now been drawn for each WwTW and should be overlaid with of the size of an individual WwTW, the bed space at an individual property could be significantly different from the average. While the quality of the allocation to individual works may be uncertain, the overall assessment remains reasonable.

- Measured and unmeasured non-domestic loads are calculated from the measured or estimated volume of wastewater discharged assuming a BOD concentration of 300 mg/l. Scottish Water has spatially referenced each discharge and mapped the volumes to individual catchments. Where the spatial referencing of individual discharges results in discharges being mapped outside the catchment boundaries, these are identified and allocated individually. The accuracy of the allocation of loads to individual works might be poor because drainage areas are small and so vulnerable to extremes of customer variability. However, in aggregate the use of averages provides reasonable assurance in return figures

- Inaccuracies in estimating individual loads to particular WwTW drainage areas may produce inaccuracies for those works figures but, in aggregate, the loads assessed for the return are reasonable. The rate of return of water to sewerage from non-domestic properties is 95%. The strength of this sewage is assumed to be the same as domestic (300 mg/litre).

- Trade effluent loads have been taken from Scottish Water's 2DBP methodology. The main reason for using Scottish Water's own data sources rather than CMA data is that the latter has data gaps in it. These are such that the total volume of trade effluent reported in the CMA for 2008-2009 was 33Mm3. As there have been no major closures since 2DBP (or since AR08) Scottish Water consider the CMA figure to be too low to be meaningful. Scottish Water has worked with the LPs to identify where the discrepancies have arisen, and believes that the volume is indeed around 38Mm3. The data for this return is therefore prepared (following that for the 2DBP) in accordance with the methodology for AR08, with DPIDs being allocated to the appropriate table according to whether they were paying Scheme of Charges (P17), on Agreements (P28), or receiving capping either due to transitional arrangements or treatment type adjustments (P29). Separate assessments are made of BOD load and COD load based on sample test results. The reported quantities are based on settled COD measurements taken from detailed records of individual customers that form the basis of trade effluent charges Scottish Water has carried out some sampling and from the results it has determined a conversion factor of 1.482 to convert settled BOD and settled COD to unsettled concentrations. The daily trade effluent load is the annual load averaged over 365 days. In some catchments trade effluent may be discharged over a working week or be subject to seasonal peaks, resulting in a higher daily load on individual treatment works than the reported average implies. Trade effluent represents an estimated 20% of the total load discharged to sewer (including PPP works). Trade effluent loads are based on the measured volumes in the 2DBP, and measured concentrations in the prior calendar year. This differs from the approach used for trade effluent billing where the billed load is based on the measured volume in the report year and the average concentrations in the prior calendar year.

- Tanker loads have been included under the following categories

    - Imported private septic tanks.
    - Imported public septic tanks.
    - Imported other tanker loads.
    - Imported WTW sludge.

  - Sludge liquors arising from imported sludge.

- Total tanker and other loads represent an estimated 0.25% of the total load in tonnes BOD discharged to sewer (including PPP works).

- Volumes are based on specific records of imports and a combination of logged volumes or nominal volumes where discharge loggers are not available. Septic tank volumes have been converted to a load by applying a standard concentration of 6000 mg/l BOD based on previous measurements.

- During AR09 Scottish Water introduced remote electronic devices to control tanker movements. Consequently data from January 2009 onwards is directly entered to the Scottish Water database. The proprietary software package used to control tanker load movements, Gemini, is now integrated with IMS for handheld devices.

- Records for tanker loads are downloaded to a spreadsheet from Gemini. For the return, null values are filled from tanker averages; depending on the operational area these are 5 to 10% of all values, but this proportion should decrease with IMS usage. We examined the records for Perth, where all loads are received at Friarton SPS where there is a data logger which downloads to Gemini and drivers have a card or fob to activate the system. Volumes and dry solids are recorded per load. We also examined the spreadsheet calculation for private septic tank emptying.

Scottish Water has compiled a spreadsheet that holds data on all treated and untreated continuous discharges. It also contains data for operational and non-operational assets and PFI works. Data on discharges were initially compiled from legacy systems of the three predecessor authorities. The list of works and discharges is continually reviewed by asset planners to ensure that it is updated to correct errors in historic data and take account of improvements in the year. The works reported in Table E8 are those in operation at the end of the report year and do not include PFI works.

The sewage loads reported in this table are generally the same as those used for tables E8, E9 and E10.

Line A2.61 to 62 Sewage sludge disposal

The reported sludge quantity is the total quantity disposed of including the sludge disposed from PPP works which is reported separately in Table E3.

Note that the quantity of sludge and sludge disposal costs reported in table E10 are limited to the Scottish Water's direct sludge disposal and excludes disposal from PPP works. The quantities in table E10 are consistent with quantities in table A2.

The reported sludge quantity is an estimate of the quantity produced prior to treatment. The quantity of sludge disposed of may be significantly less due to the conversion of organic solids to gas in the treatment process. This is done to maintain consistency with reporting requirements for June Returns in England and Wales (see Ofwat June Return Reporting Requirements definition for table 17g line 2).

The main treatment processes adopted in Scotland (including PFI works) are digestion, enhanced digestion and drying. Scottish Water has assumed that the loss or conversions of solids in these processes are 35%, 55% and 5% respectively. These quantities have not been justified by measurement. We believe that they are at the upper range of likely values.

In the report year the company has relied almost exclusively on measured sludge data. The measurements maintained by Scottish Water are detailed records of individual loads, and the whole data set is derived from Gemini by SW and from TDS which is operated by the contract sludge transport company. Sample checks are carried out against waste transfer notes where possible to confirm that complete data is being captured. Either all or sample loads are subject to weighbridge checks to confirm the tankered volume. Sludge thickness is measured on a sample basis, varying from three times daily to occasional. Where sludge loads have to be calculated averages are used; it should be possible to verify lime additions from lime delivery data.

The equivalent sludge quantities reported in England and Wales (June Return table 15 and 17g) may include grit and screenings. Companies are required to provide an explanation of their approach to Ofwat. Scottish Water has not included grit and screenings in the sludge quantities reported in table A2 or E10. We note the need to consider this difference of approach in any econometric analysis based on reported data from England and Wales.

Scottish Water controls and records all sludge movements it has responsibility for through its own Gemini system and through its sludge transport contractor's TDS system. The TDS also records sludge use in agriculture for loading applications and repeat periods.

We believe that the records maintained and checks undertaken by Scottish Water are adequate to report 100% satisfactory sludge disposal.

Comments by Line

Populations

Lines 1: The total winter water population is 5,001,656, an increase of 23,012 since the previous return (0.46%), a comparable growth rate with the previous year.

Line 2: The summer population is the winter population plus the tourist population from the peak month for properties connected to the water service. For 2008/09, summer population was estimated to be 5,252,039 (5,240,500 in 2007/08), an increase of about 11,500 (0.22% compared with the winter population increase of 0.46%). The Report Year +1 Forecast is predicting a higher growth for next year, 16,790 (0.24%).

Line 3: The population of unmeasured household properties is calculated by multiplying the number of households with water by the SW calculated occupancy rate and is reported as 4,910,538 which is an increase of 0.41% from the previous return.

Line 4: The population of measured households is calculated from the number of measured domestic properties from the CMA Central Systems multiplied by the occupancy rate. The figure reported this year is 1319 which is an increase of 15% from the previous return. This is primarily due to the CMA migration and other data cleansing exercise that have identified additional customers in this category.

Line 5: This is the sum of lines 3 and 4.

Line 6 and 7: These are returned as the same as Lines 1 and 2.

Line 8: Household population connected to the wastewater service (measured and unmeasured) is reported as 4,726,750 which is an increase of 18,072 (0.4%) from the previous return.

Line 9: The assumed percentage returned to sewer is 95%, which Scottish Water has stated as the industry standard and is supported by the WIC definitions.

Water balance

Lines 10 & 11 Scottish Water does not have any bulk imports or exports. Distribution input is measured by Scottish Water's bulk meters. Subject to meter under-registration it should be fairly accurate, although findings from the verification project indicate errors in the range 5% to 10%. Meter replacement, calibration and reporting projects and procedures have improved the reporting of Distribution Input. DI is reported at 2,143.70 2,271.17 Ml/d reduced from 2007/08 by 127.47 Ml/d (-5.5%). The projected DI for next year assumes a further reduction of about 96 Ml/d derived from reduced leakage.

Lines 12 & 25: Unmeasured household water delivered is 882.26 Ml/d, an increase of 19 Ml/d from AR08 resulting from an increase in Underground Supply Pipe Leakage (from 47.05 l/prop/day to 56.04 l/prop/day equivalent to 21 Ml/d). The reduction in PCC described above represents the 2 Ml/d difference

Lines 13 & 26: The domestic metered population is commented on in Line 4 above and in the commentary for Table A1. We note that estimated per capita consumption is higher than the unmeasured PCC but understand that properties in this group are often farms or cottage complexes.

The volume delivered has increased during the period reflecting the increased number of connections. The PCC for metered domestic consumption to 180.23 l/h/d including plumbing losses but excluding supply pipe losses, an increase of 2.85 l/h/d (1.6%).

Lines 14 & 23: There is a significant reduction in the consumption of unmeasured non-domestic properties since the previous year (29.4 Ml/d or 45%). A full commentary on this line item is included in the description of the methodology above.

Scottish Water forecasts an insignificant reduction for Report Year +1. As stated above, the policy to meter all non-domestic customers by 2012 has effectively stopped the applications from non-domestic consumers for metered connections. Numbers will change from 2010.

Line15 & 24:	Measured non-domestic consumption comes from the CMA Central System and should be accurate subject to a possible small bias due to estimating consumption to the year end from the last meter reading. Meter under-registration is based on the average of other companies published figures. While probably reasonable these may not fully reflect the situation in Scottish Water. Average consumptions have reduced by 33.61 Ml/d (7.2%) to 430.83 Ml/d since last year. Scottish Water forecasts an insignificant reduction for Report Year +1.
Line 16:	This is the sum of lines 12 to 15.
Lines 17 & 27-29:	A full commentary on this line item is included in the description of the methodology above. Scottish Water forecasts that there will be a no further reductions in Report Year +1 forecast.
Line 18 & 30:	Total reported leakage has reduced by 56 Ml/d to 868.134. A full commentary on this line item is included in the description of the methodology above together with a breakdown of more significant changes in the water balance, and also in the Reporters Report titled Scottish Water's OPA Score 2008-09, May 2009.
Line 20:	The reported volume of non-potable water delivered is 13.694 Ml/d. which is made up of 5 metered supplies (9.19 Ml/d) and one licence volume (capped agreement) of 4.5 Ml/d. The total volume has increased by 5.9% from the previous return.
Lines 31 - 36:	Underground Supply Pipe Losses are estimated to be 141.237 Ml/d which is 24.537 Ml/d higher than in 2007/08 and closer to the reported figure in 2006/07. The increase is reflected in the individual estimates for household and non-household connections, all of which are reported higher than in the previous return. Unmeasured domestic excluding voids is 56.04 l/prop/d (compared with 47.05 l/prop/day for 2007/08). This significantly higher than comparable average in England and Wales for 2007/08 at 33.8 l/prop/d (range 7.4 to 55.3).
Lines 37 & 38:	The estimated figures are based on industry averages.

Sewage volumes

Line 39	The unmeasured household volume includes or excludes the Supply Pipe leakage allowance. The 95% water supplied return to sewer is applied.
Line 42:	In AR08, this figure reduced by 6.1% in line with the water supplied to measured non-household customers in Line 2.15. In AR09 the figure has risen by 8.4%, but it is not comparable to the water equivalent, and may be a reflection of the better definition of drainage area boundaries.
Line 43:	The reduction is in line with the decrease in the properties connected.

Line 44: A reduction of 2.6% compares with a reduction of 3.2% in Line A2.16 for water supplied.

Sewage Loads

Lines 46 to 59: The reported data refers to all loads discharged to sewer including that treated in PPP plant.

Lines 46: This is an estimate of the loads for resident domestic population. It is calculated from the connected population in line A2.8 less measured household population. It excludes non-resident population loads. Resident population is converted to load assuming a per capita discharge of 60 g.BOD/day.

Line 47: This is an estimate of the loads for resident population in properties with a measured water supply. The population is materially less than that in line A2.4. The company's records indicate that only 37% of properties with a measured water supply are connected to the sewerage service. The low connection rate reflects the type of larger remote properties which might opt for a measured water supply.

Line 48: The unmeasured non-household load is calculated from the estimated volume of water from this type of supply (line A2.41) multiplied by 300 mg.BOD/l.

Line 49: The measured non-household load is calculated from the estimate volume of water from this type of supply (line A2.42) multiplied by 300 mg.BOD/l.

Line 50: The trade effluent load is derived from individual consent monitoring records which are linked to treatment works. Scottish Water expect to use CMA data in AR10..

Line 51: The total discharged from primary services is calculated from lines 46 to 50 above. On this basis, the reported figure excludes load from non-resident population (see line 46).

Line 52 to 54: Taken from SW's Gemini records applying 6.543 to the volumes removed from private and public septic tanks respectively.

Line 55: This is the sum of lines 51 to 54. It excludes loads from non-resident population which are not included in line 46. It excludes load from sludge imports which are not included in lines 52 to 54.

Lines 56 & 57: The average COD and suspended solid figures are reported as 350mg/l and 250mg/l respectively. They are the nominal values used for determining wholesale trade effluent changes. These are unchanged from the previous return.

Line 58 & 59: Calculated from the total load divided by 60g. The reported equivalent population at works with numerical consents includes works with single and two tier consents and works with a descriptive consent with a numeric backstop parameter values.

Line 60:	Loads from PFI works, the figure is taken from the works loads spreadsheet. The loads reflect Scottish Water's estimate and are not subject to the errors or exclusions identified for line 55.
Lines 61-62:	The methodology for estimating sludge quantities, the reduction in reported sludge quantity from the previous year and the management of sludge disposal are described in the section on methodology above. All figures are from the Gemini system.

Comments by Confidence Grade

Subject to the comments below we accept Scottish Water's confidence grades.

Lines 1, 3-6 & 8:	The CG for the lines is unchanged from the previous return, A2, and reflects the use of the latest sources of data.
Lines 2 and 7:	Grade B2, unchanged from the previous return, is reasonable. The data are estimated derived from third party statistics and sources using a consistent methodology.
Line 9:	The grade is unchanged from the previous return. Confidence grade A2 for an assumed industry norm which has not been validated for Scotland and could be high. However, we accept that the 95% figure is a requirement of WICS reporting requirements.
Lines 10 and 11:	Scottish Water reports an improved confidence grade of B3 based on the improving availability and quality of data and the implementation of a corporate database and the metering programme (see also commentary above). We accept the change of grades from the previous year.
Lines 12, 25:	The CG has risen to B2 to reflect use of the Monitor to assess PCC derive. We accept the grades for the lines. Line 25, calculated from previous lines, does not agree with the measured PCC. We recommend that the line should report the PCC used in the Water Balance calculation. A B3 CG is appropriate.
Lines 13 – 15, 24:	The CMA Central System is the source of the data for these lines. There has been no change in calculation methodology, but there are issues with the accuracy of the data. The CGs for all lines has reduced to B to reflect the change in data source. Line 14 has been reduced to C5 to reflect the additional uncertainty in the data which we believe to be reasonable.
Line 16:	This is a calculation line. The grades for the lines are unchanged from the previous return.
Line 17, 27-29:	Line 17 is the sum of lines 27-29. The grade for Line 17 reflects the grade for largest of the summed lines. Measured data has been used for

this return to revise and validate assumptions used. The CGs are as for the previous return.

Line 18, 31-36: WIC guidance indicates that a reliability grade B is appropriate where total leakage is estimated using either the Integrated Flow Method or the Minimum Night Flow Method. The basis of this return is the former, but the partial DMA coverage enables Scottish Water to implement Active Leakage Control which encompasses principles of the latter. In addition the closing error for this year is 4.3%. Scottish Water has assigned CG of B3 as last year. Given the closing error we accept the grade. As commented previously, the same grade assigned for Line 18 for the Report Year +1 can only reflect an intention by Scottish Water.

Line 19: The overall accuracy component for the Water Balance has improved to B3 from C4 in the previous year. There has been a significant improvement in a number of the larger previously uncertain components of the Water Balance (DI and PCC) for this return. For the reasons detailed in line 18 and in the water balance commentary above we accept the grade proposed.

Lines 20: The grade for the line is unchanged from the previous return.

Line 23: This is a calculation line. The grades for the line are unchanged from the previous return.

Line 26: This line is linked to Line 15 with confidence grade C5. We accept the reduction in grade proposed.

Line 30: In previous returns this was a calculation line. For this year the calculated volume from the Water Balance has been reported and the grade follows that for line A2.18. We accept the grade proposed

Lines 31 to 36: The CG for these lines is unchanged from AR08, C3. We accept the grade proposed

Lines 37 and 38: The grades for the lines are unchanged from the previous return

Lines 39 to 60: Further to the comment for line 9, all calculations using the 95% assumed value are subject to the error grading appropriate to the accuracy assigned to line 9.

Lines 39 and 41: We accept the grade proposed.

Lines 40 and 43: The grade for the line is unchanged from the previous return.

Line 42: Measured non-household foul volume is derived from Scottish Water corporate data bases and estimates of consumption, and not on CMA data, which is less reliable. The proposed confidence grade B3 is reasonable.

Line 44: This is a calculation line. We accept the grade proposed.

Lines 46 to 60: We believe that the confidence grades associated with sewage loads are reasonable.

Line 61: We believe that the reported confidence grade for sludge disposal is reasonable

Line 62: We believe that the confidence grade for percent unsatisfactory sludge disposal is reasonable.

The confidence grades for Report Year +1 Forecast are reasonable; each forecast item follows the source classification for the line, but the accuracy has been reduced by one level to reflect that it is a forecast.

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5. SECTION B: OUTPUTS TO CUSTOMERS

5.1 Overview

Section B gives information on customer services including low pressure, interruptions, customer contacts and other service information. Our responses in each table give full information, including key points.

5.2 Table B1: Restrictions on Water Use

Commentary by REPORTER

Scottish Water reports that it has not imposed any restrictions on water use in the reporting year. This is accepted.

5.3 Table B2: Pressure and Interruptions

Commentary by REPORTER

Lines B2.1 to B2.10 – Properties receiving pressure/flow below reference level

Introduction

Key Points

- We have audited data and the methodology for assessing properties at risk of receiving low pressure, the checks carried out before properties are added to the register, investment projects carried out to improve pressure and the checks carried out to prove that properties receive and continue to receive adequate pressure after improvement work is carried out.

- The number of properties at risk of low pressure has decreased in the report year from 5907 to 2974. The main movements are additions due to better information (837) and removals due to better information (1648). 1522 were removed due to operational changes and 817 due to asset improvement. 217 properties were added due to operational changes or asset deterioration.

- Scottish Water has transferred information on properties receiving low pressure onto its corporate data repository (CDR), supported by its customer contact system PROMISE. All property numbers contained on the CDR are address-specific and have been subject to data cleansing and checking by pressure logging.

- New pressure problems are identified from customer complaints and investigations in connection with investment projects and operational changes and added to the CDR after investigation and pressure logging.

- Scottish Water has continued to reduce its reliance on spreadsheets. 322 cases remain on the spreadsheets, all of which are without a known property addresses. In the course of analysing these numbers Scottish Water has now carried out pressure logging in all WSZs with address-specific pressure problems.

- SW has used the term "data cleansing" to describe the process of confirming low pressure properties. However, the process is based on direct pressure monitoring on networks, zone by zone. We believe that the CDR is therefore a realistic statement of SW's position for its low pressure properties, recognising that there will continue to be a low incidence of new discoveries and that a small number of property numbers remain where no address is known.

- The surrogate reference level of 15m at the distribution main has been used to check for low pressure. No allowance has been made for properties with longer service pipes, or for multiple properties served from a common service pipe.

- Scottish Water records 987 properties within 10.5m head of service reservoirs where the required service level cannot be met. These have been stated in its commentary, as is the practice in England and Wales.

- Scottish Water continues to improve both processes and the quality of the data held on properties receiving low pressure, although site data are still collected using paper formats and not by hand-held devices.

Audit Process

During the audit we reviewed:

- Sources of data on properties receiving pressure or flow below the reference level
- The methodology for compiling the table, including rules for adding or removing properties
- Scottish Water's progress on transferring data from the tactical to the strategic application
- Progress on identifying the addresses of inherited non address-specific low-pressure properties
- Progress on data-cleansing the register
- The situation concerning long and shared communication pipes
- The assessment of the number of properties affected
- The methodology for carrying out pressure logging investigations
- Changes in numbers reported from the AR08

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Comments on Methodology

Comparing the current audit with the situation at AR08, the following improvements have been made: Greater rigour is applied to pressure investigations to substantiate low pressure. Property numbers held on spreadsheet with unknown addresses have been reduced (but not eliminated) and the previous tactical application has now been transferred to the corporate data repository.

Data on low-pressure properties is held in two places. The majority is held in the corporate data repository (CDR) and a small amount in a standalone Excel spreadsheet. Information in the corporate database consists of data transferred from the previous tactical application. This was originally compiled from the information held by the three predecessor water authorities, subsequently cleansed and checked by pressure-logging. These data are entirely address-specific.

The standalone spreadsheet holds property numbers also inherited from the predecessor organisations in specified water supply zones, but without property addresses. It also holds numbers and addresses of properties which form part of clusters held in the CDR where the entire cluster has not been removed. This is because it is not currently possible to remove part-clusters of properties from the CDR, an issue which is being addressed by Scottish Water. The spreadsheet holds 322 property numbers with unknown addresses, down from 671 last year and around 13000 when the spreadsheet was originally compiled. 349 property numbers have been removed from this list in the last year following pressure logging. Scottish Water has now completed pressure logging in every water supply zone where address-specific low-pressure properties are known as well as in some where there are no address-specific low-pressure problems. The remaining 322 property numbers are spread across 125 water supply zones, some of which have as few as one property number within them.

Scottish Water's objective is that only the CDR will be used in future. It has a well–established flow-charted methodology and systems in place to capture, identify and analyse newly-reported low-pressure incidents and takes the view that over time all of the non address-specific properties will either be substantiated by means of customer complaints or pressure investigations, or accepted as data errors, enabling the use of the spreadsheet to be discontinued.

Additions to the register arise from customer contacts, after verification, as a result of pressure-logging checks and checks made during investigations for proposed projects and due to operational logging. Customer contacts are sifted by the call handler using a question-tree. During the course of calls, operators have access to records of known work in the relevant DMA. All low-pressure complaints are recorded on the customer-contact system PROMISE and those that are quickly dealt with by operational action or further investigation are flagged to exclude them from the register. Many complaints of low-pressure result from blocked service pipes.

If warranted, following the customer's call, an inspector visits the location and collects information on a paper form. SW intends to move towards the collection of information on hand-held recorders for this application. The inspector measures pressure at the customer's tap and collects information on other properties affected. If this investigation confirms low pressure, the Network Analyst will carry out pressure logging and pressure contouring to determine pressures and the number of properties likely to be affected. Pressure modelling is not used as available models are not sufficiently reliable or up-to-date and do not offer adequate coverage. If warranted, properties are added to the register at this stage.

To resolve the problem, operational changes or, more usually, an investment project will be carried out. Further pressure-logging will often be carried out to determine the necessary extent of the work. After the necessary work has been carried out to provide adequate pressure, further pressure-logging is carried out to confirm pressures, augmented by customer contacts. No properties are removed without a successful outcome to pressure-logging investigations.

In addition to the above process for adding, resolving and removing new pressure problems, data cleansing of the existing register of pressure problems has continued, focussing first on those water supply zones having the greatest number of identified low-pressure problems. Data cleansing was described in the AR07 audit and has continued using the same methods. Briefly these comprise the following:

For the water supply zone under investigation, pressure logging is carried out over a two week period. Corporate GIS data are used along with digital terrain mapping to determine if properties suffered low pressure during the survey period. Pressures are measured by logger, the minimum pressure is noted and a calculation is carried out using the digital terrain model to calculate the pressure at each property assigned to that logger. Any properties which have a pressure calculated as being less than 15m (at the main) are considered to have a problem. The reports from this work are used to add and remove properties from the spreadsheet register. The property tap pressures are not checked as part of the study. Any properties that are deemed to suffer low pressure are then entered onto the new corporate register with their full address details.

A surrogate reference level of 15m at the distribution main is used. No allowance is made for properties with communication pipes which are long or in poor condition. No allowance is made for multiple properties fed from a common service. It is recommended that rules on likely pressure drops in shared connections should be developed to allow these properties to be categorised as likely to be suffering low pressure or not.

The register does not identify whether a property has a long communication pipe or is one of a number of properties served from a common service. It is estimated that up to 50% of properties in Scotland could have shared service pipes. Scottish Water's approach is to target water supply zones with low pressures and property-types likely to have shared services to establish the mains pressures needed to give adequate tap pressures. In Scottish Water's view the guidance given by WIC on pressures needed at the main to counter for large numbers of shared services are unrealistic and unsustainable in view of the need to manage pressures and reduce leakage. In situations where low pressure is substantiated and found to be as a result of, or contributed to by, a long communication pipe, Scottish Water would relay the communication pipe to provide 15m head at the boundary box.

Scottish Water has not claimed any exemptions for properties within 10.5m vertically of the BWL of a service reservoir. There are 987 of these at AR09, compared with 1225 at AR08, the number being reduced due to investment projects. Nor are exemptions claimed for abnormal demand or for short-duration incidents, as Scottish Water does not have in place the permanent pressure-logging infrastructure to be able to substantiate these. Exemptions are however claimed for planned maintenance and one-off incidents, these being identified either by the call-centre or by the inspector following investigation. 2086 reported low-pressure properties were not added to the register during 2008-9, for the following reasons; planned maintenance 569, one-off incidents 301, not SW-responsibility (i.e. private) 1216.

Review of Sample Data

During the audit we asked to review three examples of supporting information which led to changes to the register. In each case the methodology was seen to have been followed.

In the Jedburgh WSZ customer complaints led to investigation and pressure-logging resulting in 124 properties being added to the register on 19.11.08. Rezoning and the removal of pipe tuberculation were carried out. At the time of the audit pressure-logging work had recently been carried out and was expected to result in the removal of the properties from the register in the near future.

In the Clackmannan WSZ property numbers were listed, without addresses. Following initial pressure logging it was estimated that 15 properties received low pressure and these were added to the register on 25.11.08. Subsequent more detailed investigation and customer contact did not substantiate all of these problems and some have been transferred to the spreadsheet for removal from the register as the CDR cannot currently accommodate the removal of part-clusters of problems. The remaining low-pressure problems are currently awaiting a project solution.

In the Oban North WSZ 10 properties were listed as receiving low pressure, without addresses. Following logging, this number was revised to 5 and the properties added to the register on CDR. It was noted from the report on pressure logging and contouring that some properties had inferred pressures which were negative, presumably due to discrepancies in level data. These will be subject to further investigation.

During the audit we also reviewed the results of pressure-logging exercises carried out approximately three months after the removal of properties from the register. These were carried out to confirm that removed properties continue to receive adequate pressure after removal, at times of high demand. In each case pressures were seen to have remained above the reference level. In one case (Bonnycraig WSZ) this exercise highlighted a system leak which was subsequently repaired. A small number of properties had long communication pipes and logging at the boundary box was used to demonstrate that over 10m pressure was being provided at that point before the properties were removed from the register. This assumes that pressure at the tap was the same as that at the boundary box.

During the audit we also reviewed a sample of 6 pressure improvement projects and concluded that procedures had been correctly followed.

We have concluded from our audit that the methods used by Scottish Water are as described to us at the audit and in their Commentary and that all assumptions have been disclosed. Scottish Water has not used sampling techniques to establish property numbers experiencing low pressure, although it has used extrapolation from measured pressures at points in the network by pressure-contouring to estimate the number of properties affected. This ignores the effect of pipe head-losses but sufficient logging points appear to be used to minimise this effect. Apart from a small and reducing number which do not have property addresses, properties listed are all address-specific. The checks we have made on the data and methodology are covered above. Comments by line and on confidence grades are given below.

Comments by Line

Line 1: Brought forward from Line A1.10. Comments on this figure are given elsewhere in our report

Line 2: 5907 properties below reference level, carried forward from last year's return

Line 3: Comprises additions due to better information from customer complaints, the OPA Action plan logging studies, operational logging, DOMS investigations, corporate low pressure register and projects promoted by Asset Planners. Properties were added in 41 WSZs. This year's figure of 837 is significantly reduced from last year's figure of 2445.

Lines 4 & 5: A total of 217 additions were made to the corporate register, due to OPA logging and operations information. This figure is significantly greater than last year's figure of 64, with the bulk of the increase being accounted for by asset deterioration in 4 zones, comprising pipe tuberculation and pumping station under-performance.

Line 6: 1648 properties removed due to better information have been identified from the OPA action plan logging, the corporate low pressure register, capital projects, SWS investigations, DOMS investigations and information from Operations. This compares with 2738 properties removed last year.

Lines 7 & 8: Comprises removals because of asset investment (817) and operational changes (1522, resulting from 24 projects). These figures represent an increase upon last year.

Line 9: This is a calculated field showing the balance of 2974 properties at the year end.

Line 10: These are properties receiving low pressure but omitted from the numbers reported in Line B2.9 as required by the WIC definitions. The 2086 figure reported is significantly up on last year's figure of 104, due to improvements in the process and the adoption of new resolution codes, resulting in more accurate recording of causes.

Comments on Confidence Grades

We believe that the continuing work carried out by Scottish Water is resulting in continuing improvements in its DG2 register. Given that data cleansing has covered the majority of previously identified low-pressure areas and that a comprehensive system is in place to identify, analyse and record low–pressure problems we believe that B3 is an appropriate confidence grade for the data. Elimination of the remaining property numbers which are not address-specific should allow the claiming of a higher confidence grade

Lines B2.11 to B2.46 – Planned and unplanned interruptions

Introduction

Key points:

- We have audited data and the methodology for recording properties subject to supply interruptions, the checks carried out before properties are added to the register, measures carried out restore supply and the methods used to confirm the duration of the interruption and the number of properties affected. We have checked and reconciled sample data with the base data.

- The IMS process where operatives enter data on handheld devices is used across the whole of Scotland. This includes "forced validation" to ensure completion of required data on handhelds for reporting purposes. This reduces the incidence of missing data and data are automatically downloaded onto the corporate data repository (CDR), reducing the possibility of human error.

- The CDR is now the sole source of data held on interruptions, the former use of spreadsheets having been discontinued. The addresses of properties affected are not retained.

- Data on 46% of interruptions was provided using paper forms rather than handheld devices. This proportion is larger than would be accounted for by handheld down-time or a lack of mobile signal. Scottish Water has indicated that it is working to increase the acceptance of handheld devices among its mobile gangs.

- The start of an incident is when the operator turns a valve to cut of flow for a planned interruption and the time when a customer phones in to report a lack of water for an unplanned interruption, provided that the interruption is subsequently confirmed as being valid and Scottish Water's responsibility. The end of the interruption is when Scottish Water turns a valve to restore supply. This is not necessarily the time at which supply will be restored at the tap. This approach is consistent with our experience in England but this may not be universal.

- The number of properties affected by planned interruptions has decreased since last year due to a reduction in rehabilitation work in the network. The number of properties affected by interruptions exceeding 12 hours was significantly increased due to three incidents affecting large numbers of properties. The number of interruptions caused by third-party damage was also significantly up from last year due to a small number of incidents affecting large numbers of properties. Hardly any properties were affected by overrunning planned interruptions.

- Scottish Water continues to improve both processes and the quality of the data held on properties affected by supply interruptions and has introduced further checking routines to improve the quality of data on interruptions. For all interruptions lasting over 6 hours an unplanned interruption to supply (UITS) validation report is produced to verify data. For all interruptions exceeding 5 hours or affecting more than 100 properties a root cause analysis is carried out to determine causes and trends and identify potential process improvements.

Audit Process

During the audit we reviewed:

- Sources of data on properties receiving interruptions to supply
- The capture of data on interruptions from customer contacts
- The investigation and resolution of incidents on site, including data capture
- The assessment of water on and off times and the number of properties affected
- The methodology for compiling the table, including rules for adding or removing properties
- Checks carried out by Scottish Water to ensure data quality
- Changes in numbers reported from the AR08

We also reviewed a number of data returns from site investigation of incidents, data validation reports and root cause analyses for interruption incidents. We audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water's staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Comments on Methodology

General

Procedures and data collection are the same for both planned and unplanned interruptions. Planned incidents are those where at least 48 hours notice of the interruption is given to the customer. Any interruption where less than 48 hours notice is given is counted as unplanned, even if it was scheduled. In addition any planned incident which overruns the warned duration is also counted as unplanned. Hand-held devices used by operators record the time and duration warned, but paper records do not. Planned incidents begin when the network system operator turns the valve to cut the supply and the time is recorded by the operator, either on a hand-held device or a paper form. Planned incidents end when the operator turns the valve to restore the supply and the time is recorded either on the hand-held device or on a paper form. This time is not necessarily the time at which supply returns to the tap. At the margins of the network or where a service reservoir needs to refill after a lengthy incident there may be some delay before the customer receives a full supply. However this appears to be the only practicable measure for the end of the incident.

For planned interruptions, customers are notified by letter distributed either by post, a Scottish Water operative or a distribution company. The addresses of the properties are therefore known, but are not recorded on the register. Scottish Water may wish to consider whether the CDR should record this information.

Unplanned incidents begin when a customer phones in to complain of a lack of supply, provided that the incident is subsequently verified by Scottish Water as being genuine and their responsibility. The telephone operator has access to information on work going on in the network and also to GIS and records details, including the time, on the PROMISE system. A work order is then raised in Ellipse. In the first instance a Network Service Operator (NSO) will go out and determine what the problem is and what needs to be done. They will also determine if the customer has lost water supply due to the actions of Scottish Water or due to a third party. He will phone back to the Operations Management Centre (OMC) where a further work order will be raised in Ellipse. The jobs are assigned automatically to operatives from the OMC through the handheld device. They are also prioritised by the NSO.

When the squad goes to investigate they are required to complete a Distribution Operational Maintenance Strategy (DOMS) impact assessment. This is a safeguarding process for water quality before the operative can shut the water off. The process states that the interruption sheet cannot be opened until this form has been completed.

It will usually be necessary to turn a valve and interrupt the supply completely to effect a repair, which may extend the number of properties affected beyond the original number. When the repair is complete the supply is restored. The end of an unplanned incident is recorded as for a planned incident above. In some cases the interruption may be found to be restricted to a problem on private pipework, for example a service pipe blockage affecting a single property. If it is necessary to turn off supplies to effect a repair, the interruption is still counted for the purposes of the table, even if the cause of the interruption was not Scottish Water's responsibility. Where repairs can be done under pressure and the supply is not cut off this is not considered to be an interruption. If a second interruption occurs just after one in the same area has been closed this is counted as a new interruption for reporting purposes.

Data Capture and Storage

The Integrated Mobile Solution (IMS) process, which uses handheld devices to directly enter data, is operational across the whole of Scotland for Scottish Water staff. IMS data are entered into the corporate data repository (CDR) by automatic daily electronic download. Use of the IMS system is not universal. Standard queries are used to extract management information monthly and for the year end reports and returns. Data still come into the database from SW contractors using handwritten forms and paper forms are also used in some locations where there are signal and connectivity issues. In the report year data on 46% of incidents was provided by manual data entry from operators on site.

Considering the different Scottish Water operating areas, the percentage of manual entries was comparatively low in Ness, which is a remote mountainous region, and higher in other, more populous regions. In addition, where there is no signal, hand-held recorders hold data until such time as a signal is available for an automatic download. In our opinion the percentage of manual entries is higher than would be accounted for by hand-held down-time or a lack of mobile signal and the use of hand-helds could be further extended. Scottish Water has informed us that they are working to increase the acceptance of hand-held technology by operators.

Data from hand-held recorders is inherently more reliable. It is entered on site where site information is readily available. Certain data fields are mandatory and jobs cannot be closed, or staff move onto their next job until certain sections are completed ('forced validation'). They provide access to GIS and data are automatically downloaded without manual intervention. Manually-entered data are potentially less reliable than IMS data because they may be entered later away from the site, some data may be missing and data are manually entered into the corporate data repository. The paper forms are generally of the same format as those used historically although an attempt has been made to align them with the format of the IMS handheld system.

Use of Handheld Devices

For planned work, the interruptions sheet on the handheld device contains data regarding what is planned, including:

- A description of the planned work
- Planned start date and time and priority
- A health and safety risk assessment which must be completed before the operatives can move onto the next stage of the work.
- A labour tab which is essentially a time sheet to log staff hours

- A further sheet showing forms which can be selected if required. For example, operatives can fill in another form if they see other work of low priority which needs to be done in the future

- The DOMS assessment, which must be completed. Once this is complete a decision is made as to whether an interruption has occurred or not. If so the interruptions sheet is opened.

In the handheld device, the interruptions sheet can be opened to record the water-off time. Later the sheet can be re-opened to complete the water-on time. A second water-on time can be specified if the supply can be returned to a proportion of the properties by redirecting flows within the network. The second water-on time is for the actual repair when the remaining properties have supply returned. Times are entered in two lines in the interruptions spreadsheet so the correct restoration times are logged. In the handheld device, the number of properties affected and then restored must be the same, otherwise the operator cannot move to the next stage.

Squad laptops have GIS, which can be used to determine the number of properties affected. For planned interruptions a desktop study is carried out using live GIS and the polygon-select tool to determine the number of properties affected. An actual house count on the ground is not undertaken, which we believe is reasonable. AddressPoint data are used to determine the numbers of properties and sensitive customers, such as hospitals are highlighted. For unplanned interruptions the operators will make an estimate of the number of properties affected if this is small. Where larger numbers are affected, these will be checked by a desktop study, as above.

Data in the Corporate Data Repository

Approximately 4000 data returns are made annually regarding interruptions and stored on the CDR. The data are currently presented monthly for OPA purposes to highlight exceptions and anomalies (such as planned interruptions which overrun). The OPA report for March 2009 was seen and in each case an explanation was provided for inconsistencies. The figures reported in lines B2.11 to B2.25 are reported from the CDR which contains information on both planned and unplanned interruptions. Sample data were reviewed for 10 interruptions chosen at random and relating to between one and 3884 properties. We noted the following:

- Data returns confirm the incident type, time off, time on (first) time on (second) and number of properties affected. The time off records the time that supply was reported to be lost by the customer, provided that this is confirmed by the Scottish Water NSO.

- A number of times-off and times-on for more recent incidents were seen to be recorded to the nearest minute, rather than to the nearest quarter-hour. Scottish Water reports that has directed operators to use precise times rather than approximations to the nearest quarter-hour, as used when booking time to jobs.

- The number of properties affected is determined by Scottish Water staff and is an assessment generally using the GIS rather than an actual house count for larger numbers affected.

Data Analysis and Checking

Where data mismatches are seen, exception reports are run and the data investigated to remove these. For all interruptions lasting over 6 hours an unplanned interruption to supply (UITS) validation report is produced. 10-15 of these are produced each month and a sample of 10 was reviewed. Durations and property numbers affected are checked by reference to DMA flow meters, customer contacts, pressure loggers, operator information and telemetry.

In all cases where an interruption exceeds 5 hours or affects more than 100 properties, Strategic Networks and CID carry out a root cause analysis (RCA). The purpose of the reports is to establish any patterns or trends, identify any changes needed to operational practice, to identify training and investment needs, or needs for further investigation. Three example reports were seen, including the Helensburgh incident which affected 3884 properties. The reports summarised the burst history, established reasons for long interruptions and any delays to the restoration of supply and in some cases made recommendations for future action, including capital investment. Property numbers were checked and reconciled with meter records. An RCA summary report is produced annually to identify potential improvements in practice. Scottish Water state that it is their intention to improve future performance by the increasing use of DMA meters with alarms, service reservoir level alarms and trunk main flow alarms.

Review of Sample Data

At the audit the data were examined and in each case the data in the table lines were reconciled with the base data in the CDR. The data are complete as submitted and the reported figures are confirmed.

We have concluded from our audit that the methods used by Scottish Water are as described to us at the audit and in their Commentary and that all assumptions have been disclosed. Scottish Water has not used sampling techniques to establish property numbers experiencing interruptions, and although the numbers of properties affected is established by analysis of the network rather than by checking from house to house, there is no reason to believe that this will lead to any significant error. The checks we have made on the data and methodology are covered above. Comments by line and on confidence grades are given below.

Comments by Line

Lines 11-14: Numbers of planned interruptions have decreased since last year as a result of reduced rehabilitation work on the system.

Lines 15-18: The number of short unplanned interruptions and the property numbers affected are broadly similar to last year. There has been a significant increase in the number of properties affected by interruptions of over 12 hours. This is due to a small number of incidents affecting large numbers of properties at Ballieston, Kirkintilloch and Helensburgh.

Lines 19-22: The number of interruptions caused by third parties is greatly increased from last year. SW reports that this is due to only 14 incidents, but that these incidents affected a considerable number of properties. Two sample data returns were seen and verified. However Scottish Water reports that the numbers of properties affected by third party incidents (which do not count towards OPA scores) are not as well verified as incidents which are Scottish Water's responsibility.

Lines 23 to 25: The number of overruns of planned interruptions is greatly reduced compared with last year, which was adversely affected by an incident at Kilwinning affecting 3,585 properties.

Comments by Confidence Grades

Scottish Water ascribes a confidence grade of A3 to all data on interruptions. This is the same as last year. This appears reasonable given that all information is now held in corporate systems.

We believe that the IMS and CDR systems have led to improvements in data records. It will always be possible for an operative to omit to enter site date, although this should not be a major problem as following a customer complaint the job is logged onto Ellipse and discrepancies are investigated. An increased use of handheld reporting and a reduction in reliance on paper reporting, together with other changes described above, and could lead to a further improvement in confidence grade in the future.

5.4 Table B3: Sewage Flooding

Commentary by REPORTER

Lines B3.1 to B3.12 – Annual Flooding

Introduction

Key Points

- We have audited data and the methodology for recording properties subject to internal flooding, the checks carried out before properties are recorded as suffering from internal flooding, measures taken during site checks and the methods used to confirm the location, sewer type and cause of flooding and the number of properties affected. We have checked and reconciled sample data with the base data.

- The PROMISE customer contact system, with the associated choke sheets and site checking by SW Performance Analysts, is the sole source of data on sewer flooding incidents. 85% of incidents are identified through customer complaints, the remainder by SW staff.

- All incidents are investigated on site and operators record their conclusions on sewer type, the effect on the customer, cause, number of properties affected and whether exceptional weather is a factor. Various data sources are used in the assessment of exceptional weather, including Met Office, the Centre for Ecology and Hydrology and data from SW consultants. Where a group of properties is affected, the addresses of properties affected are not retained, other than that of the first contact. All incidents where hydraulic overloading is thought to be the cause are further investigated, using hydraulic modelling where appropriate.

- The IMS process where operatives enter data on handheld devices is now widespread. This includes "forced validation" to ensure completion of required data on handhelds for reporting purposes. This reduces the incidence of missing data and data are automatically downloaded onto corporate systems, reducing the possibility of human error.

- Scottish Water has introduced weekly checking routines using the FMAP process and monthly management reporting on sewer flooding incidents to improve its analysis and reporting of sewer flooding incidents. Scottish Water has concentrated its efforts on the reporting and analysis of internal flooding.

- Only incidents caused by overloading of, or incidents affecting, public sewers are recorded. Laterals are not included and we recommend that WICS confirms whether this is their intention.

- For the current year the proportion of missing data on sewer flooding incidents is greatly reduced and for the first time Scottish Water has not applied an uplift for missing data to the reported figures.

- With the elimination of uplift and improved checking routines, we support the claimed improved confidence grade of B2.

Audit Process

During the audit we reviewed:

- Sources of data on properties affected by flooding
- The capture of data on flooding from customer contacts
- The investigation and resolution of incidents on site, including data capture
- The assessment of the cause of flooding, sewer type, the number of properties affected and whether flooding was internal or external
- The methodology for compiling the table
- Checks carried out by Scottish Water to ensure data quality
- Changes in numbers reported from the AR08

We also audited the numbers of investigations and choke forms and the decision process for determining flooding type, sewer type and cause. We audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Comments on Methodology

The principal source of data on flooding incidents is customer contacts recorded on PROMISE and the subsequent investigation and resolution of complaints and incidents on site. 85% of incidents are initially identified by customers, while a further 15% are identified by Scottish Water staff. Customer contact staff use a question tree to identify flooding incidents and clarify information regarding the incident.

The PROMISE system is a centralised customer contact system covering a wide range of customer contacts. The contacts are coded in a structured way which allows particular contact types to be recorded and the system to be interrogated. The contact time and the time Scottish Water attended and left the site are recorded and the customers' perception of the problem is recorded at the customer contact stage.

All flooding reports automatically generate a clear choke task. The incident is investigated and field staff record their conclusions by means of a resolution code, confirming details. These include the type of sewer where the seat of the problem lay (which may be public, private or a lateral) and the effect on the customer (including internal or external flooding and backing up). The weather at the time is also recorded and an initial assessment is made of the cause. The number of properties affected is also assessed by customer interviews. Data are principally recorded on handheld recorders, although some returns from contractors are made on paper forms. PROMISE is updated with this information, which may result in a revision to the assessed sewer type, customer effect or cause.

Where the initial assessment of the flooding cause is overloading, this will be further investigated by Strategic Networks to verify this conclusion, including the use of hydraulic modelling, if appropriate. Where hydraulic inadequacy of a public sewer is confirmed an investment project will be raised and a potential solution defined.

During the last year a weekly routine has been introduced, whereby a list of that week's incidents is produced and reviewed on spreadsheet using the FMAP process, with the outcomes being fed back into PROMISE. Data are downloaded from PROMISE monthly, using Business Objects to produce reports from the corporate data. Monthly reports are made to senior SW management and used to review and improve the process for handling incidents and recording data. The same process is used for the production of reports used in the compilation of the tables in the Annual Return.

In previous years it was found that significant numbers of records were missing and Scottish Water performed a data uplift, by which it augmented the recorded number of flooding incidents and affected properties to reflect non-compliance with some of the processes for gathering data from the field. Uplift was made by assuming that numbers, types and causes for incidents with missing data were in the same proportions as for incidents with available data. For the report year the incidence of missing data has been very much reduced. This is due to increased use of handheld recorders, which include a discipline where jobs cannot be closed until defined data fields have been completed, and also due to the application of improved discipline to checking processes. For the AR08 report an uplift of 7% was applied to assessed numbers of internal floodings due to hydraulic inadequacy and 8% to internal flooding due to other causes. For AR09 Scottish Water decided that no uplift should be applied to internal flooding.

To check on the validity of this decision, numbers of resolution codes, sewer types and flooding causes were reviewed. Of 2024 flooding incidents reported, all were found to have resolution codes. 720 were found to relate to internal flooding. Of these, all had an assessed flooding cause and only 3 did not have the sewer type defined. In our opinion, this justifies the discontinuance of uplift and brings the data accuracy within the claimed confidence grade.

Extreme rainfall is identified from customer perceptions initially by the call centre and later by site staff, supported by a desk study. Checks are made with Met Office rainfall measurements but these are sometimes found to be insufficiently detailed.. Only incidents caused by overloading of, or incidents affecting, public sewers are recorded. Laterals are not included and we recommend that WICS confirms whether this is their intention.

Review of Sample Data

At the audit the data were examined and in each case the data in the table lines were reconciled with the base data in the CDR. The data are complete as submitted and the reported figures are confirmed.

We have concluded from our audit that the methods used by Scottish Water are appropriate to meet WICS reporting requirements and that all material assumptions have been disclosed. Scottish Water has not used sampling techniques to establish property numbers experiencing flooding and the numbers of properties affected are established by checking from house to house. The checks we have made on the data and methodology are covered above. Comments by line and on confidence grades are given below.

Comments by Line

Line 1: The number of properties connected to the sewerage system is taken from Table A1, line 21.

Lines 2 to 5: The number of flooding incidents due to overloaded sewers is reported from SW's monthly Internal Flooding due to Overloaded Sewers (IFOS) report, generated by interrogating PROMISE, and listing cause, location and type. It was noted that, although the addresses of affected properties must be known to staff carrying out field investigations, these are not recorded, other than the address of the first contact; only property numbers being retained. Figures for AR09 show a rise from the previous year. 109 properties were flooded in 56 incidents, including 14 incidents assessed as being due to extreme weather. The latter were assessed by local observations of the weather, rather than Met Office rainfall measurements. The numbers of both incidents and properties flooded have increased from last year due to a number of incidents resulting from thunderstorms during July and August 2008.

Line 4: Scottish Water reports 14 incidents attributed to severe weather during the report year. This contrasts with none in AR08. Scottish Water uses local assessments of weather, including the weather at the time of the incident, local knowledge and subsequent desktop assessment to determine whether severe weather is a factor. It is Scottish Water's view that rainfall measurements available from the Met. Office are often insufficiently detailed and locally specific to be useful for this purpose. In our view this is likely to be the case for small incidents resulting from very localised rainfall. However for larger incidents there may be cases when Met Office data could be relevant and we recommend that Scottish Water reviews on a case-by-case basis whether to apply Met Office data checks.

Lines 6 to 12: The number of flooding incidents due to other causes is reported from SW's monthly Internal Flooding due to Other Causes (IFOC) report, generated by interrogating PROMISE, which again lists cause, location and type. Numbers of incidents and properties area broadly similar to last year with 206 properties flooded in 175 incidents. The figures exclude causes resulting from laterals.

Line 7: The number of properties flooded more than once in ten years due to other causes is reported as 17. Scottish Water accepts that there will be some properties in this category, but takes the view that due to numerous changes in the process for collecting information, comparisons year-on-year are difficult. In addition, as the database does not hold property addresses, it is difficult to know whether individual properties have been repeat-flooded. It is recommended that addresses should also be retained in the database.

Comments by Confidence Grade

For its report on AR08, Scottish Water assigned a confidence grade of B3. This was supported, given that a percentage uplift had been applied to property numbers. For the current Annual Return Scottish Water has claimed a confidence grade of B2. This recognises a number of factors:

the proportion of missing data on incidents is greatly reduced

increased use has been made of handheld recorders which, as well as ensuring that all defined data are provided, also give a greater confidence that data are correct as they are completed on site and at the time of investigation.

data are held in and reported from a corporate database, rather than on a standalone database or spreadsheet.

It is clear that Scottish Water has achieved a further improvement in the quality of data provided, which are used as part of OPA assessment, and the confidence grade of B2 is supported.

Lines B3.13 to B3.28 – Properties on the "At Risk" Register

Introduction

Key points:

There have been no changes to the methodology, data sources or data-holding systems used for the at-risk register during the last year.

- The sewer flooding register is a Tactical Application deriving from PROMISE data. It is a property-specific list of properties at risk of flooding due to hydraulic overload of public sewers only. No extrapolation of property numbers has been used. The register includes information on flooded properties migrated from historic data as well as new information obtained from PROMISE. This is the register used to produce the figures for the Annual Return. Flooding caused by lateral sewers is not included.

- We recommend that WIC confirms whether flooding incidents and number of properties flooding due to defects on laterals should or should not be included in future Annual Returns.

- Significant improvements have been made to the process for identifying and confirming properties newly affected.

- No properties are removed from the register simply because flooding has not recurred for some time. Properties are only removed following an investment project or due to better information. Scottish Water has added some properties to the register which did not flood in the year, due to the completion of investigations.

- The principal cause of removals is now authority action (139). The number of removals due to better information (77) has reduced as the quality of data on the register improves.

- In previous years Scottish Water applied an uplift to the numbers of incidents to account for missing data. This year missing data have been greatly reduced, so no uplift has been applied to numbers of incidents and there is increasing confidence in the completeness of the at-risk register.

- Scottish Water has not used Met Office rainfall measurements to substantiate cases due to exceptional weather in all cases. We recommend that this should be done for cases affecting large numbers of properties and for those where the unit cost of investment solutions is high.

- The average cost of investment solutions has been calculated by dividing the cost of the flooding programme by the number of properties receiving alleviation, rather than on a project-by-project basis.

Audit Process

During the audit we reviewed:

- Sources of data on properties affected by flooding

- The capture of data on flooding from customer contacts

- The investigation and resolution of incidents on site, including data capture

- The assessment of the cause of flooding, sewer type, the number of properties affected and whether flooding was internal or external

- Progress on cleansing inherited historical data

- The assessment of flooding frequency

- The methodology for compiling the table

- Checks carried out by Scottish Water to ensure data quality

- Changes in numbers reported from the AR08

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on the Scottish Water network.

Comments on Methodology

The register of properties at risk of flooding, put in place in the 2005/06 report year, remains in use this year with no changes to the format of the database. It is kept in a Tactical Application as an Oracle database. The at-risk register includes only properties at risk of flooding due to hydraulic overloading, in accordance with the Reporting Requirements.

No change has taken place in the methodology for assessing at-risk properties. Only flooding arising from hydraulic inadequacy of public sewers is recorded. Laterals are not included and we recommend that WICS confirms whether this is their intention.

The Tactical Application is a database which was originally populated with data from the predecessor authorities at the time of the formation of Scottish Water. Data from West of Scotland Water consisted of its at-risk register. That from East of Scotland Water had been derived from drainage area study modelling previous register and information in the North of Scotland area was largely derived from records of GMS payments. However since its original compilation the original register has been substantially cleansed. Properties have also been added as a result of new incidents identified through the PROMISE system and by operational staff (as described in our comments on lines B3.2-12 above) together with properties identified as a result of design checks carried out for temporary and permanent investment projects and as a result of drainage area studies. This information is provided by operations or asset planners.

Further properties have been removed from the register as a result of completed investment projects and better information following hydraulic modelling and arising from design checks carried out for temporary and permanent investment projects. The Tactical Application does not however record where a hydraulic check has been carried out on a property.

The register is entirely property-specific. It contains no property numbers derived by extrapolation. The current at-risk numbers are based on pre-existing numbers for properties where no alleviation has been carried out, plus new reported flooding incidents occurring in the year. The information added to the flooding register is limited to flooding caused by overloaded sewers. This includes flooding during exceptional weather, the numbers of which are recorded in the table.

The Reporting Requirements now call for Scottish Water to maintain both internal and external at-risk registers which should form a database of all properties which experience internal or external sewer flooding caused by hydraulic inadequacy. The registers must clearly identify those properties below the reference level, distinguish them from those which have flooded but are not below the reference level and provide a verifiable reason for the exclusion. Incidents can cover more than one address and the incident table can detail the properties affected in an incident. The at-risk register does not include any properties affected by flooding arising from hydraulic overloading of a private drain or lateral, although this is thought to be very uncommon.

Updates to the table arising from new incidents are carried out using the FMAP process. In this process information on flooding frequencies and whether flooding was internal or external is derived from customer contact interviews, backed up by modelling for internal flooding. Scottish Water state that around 80% of properties on the internal flooding at-risk register have been subject to hydraulic checks. In addition around 6000 door to door surveys were carried out during 2006 to determine whether properties on the register had ever suffered from internal flooding, the date of the flooding and to confirm exact addresses, although there was a significant level of non-response to these due to occupiers not being at home. This information was used to amend the information on the register and was the main reason for the rapidly reducing property numbers on the register in recent years.

Wherever investment projects are planned, customer interviews are carried out and this is also done for all incidents covered by the FMAP process. This results in the greatest cause of removals from the internal at-risk register, which is reclassification of flooding from internal to external.

When a property is first reported as being flooded by a customer and it has never been recorded as flooding before it is flagged in a holding category. Following the completion of an initial investigation which confirms the property has actually flooded it is put on the 1 in 10 year category. Only if it is flooded a second time in 10 years is it moved to the 2 in 10 year category. When a property is first added to the 1 in 10 year category Scottish Water does not currently review storm frequencies, undertake additional customer surveys or undertake hydraulic modelling to confirm that it has been correctly allocated. The situation in England and Wales generally is that on first flooding properties are put in the 1:20 year register unless they are assessed as requiring to be put into another category.

The flooding register identifies whether a property is in the 1 in 10 or 2 in 10 at risk categories. In principle, a property with a single recorded flooding incident is included in the 1 in 10 at risk category and a property with two or more reported incidents of flooding is included in the 2 in 10 year at risk category.

No properties are 'timed-out' from the register, that is to say, removed because flooding has not recurred. Properties are only removed from the register because of better information, or after an investment solution has been implemented. The design storm return period used for investment projects is 30 years.

Scottish Water has added to the at-risk register in the year some properties which did not flood in the year. This was as a result of the conclusion of investigations into known flooding incidents, often resulting in the addition of further properties to known clusters. The register also includes a small number of properties where flooding has not been confirmed by the customer, due to their unavailability. This may include a small number of cases where information was inherited from one of the predecessor authorities. No properties have been removed from the register as a result of a review of the impact of investment projects carried out in previous years.

Costs in lines B3.24 to B3.27 have been calculated by dividing the total cost of work carried out to alleviate flooding, by the total number of properties benefiting. This is not strictly in accordance with the Reporting Requirements, which imply that costs should be calculated on a case-by-case basis and then aggregated. In addition, Scottish Water informed us that for problems permanently removed by capital projects, the whole cost of the projects has been used, although a small number of flood-relief projects include other drivers. The net effect of these discrepancies is likely to be small.

To produce the Annual Return tables, at-risk numbers are generated by queries on the flooding register and manually checked and compared with data from last year. The database is then frozen and a copy retained for record.

We noted in our report on AR08 that Scottish Water appears to be approaching a steady state situation, where properties will be added to the flooding register at a similar rate to those removed as a result of sewerage investment. It is likely that the unit cost of alleviating flooding will rise. We therefore continue to recommend that Scottish Water reviews its methods for recording both internal and external flooding, so that the register is accurately maintained. The basis for each categorisation should be clearly supported.

Review of Sample Data

At the audit the data were examined and in each case the data in the table lines were reconciled with the base data in the Tactical Application. The data are complete as submitted and the reported figures are confirmed. A sample of register entries was audited and found to be consistent with the reported information.

We have concluded from our audit that the methods used by Scottish Water are appropriate to meet WICS reporting requirements and that all material assumptions have been disclosed. Scottish Water has not used sampling techniques to establish property numbers experiencing flooding and the numbers of properties affected are established by checking from house to house.

In our view, the at-risk register has been greatly improved in recent years. However, the base records continue to include some properties from the inherited records of the three predecessor authorities, which may not be complete or accurate. We recommend that Scottish Water continues to review these cases by customer contact and hydraulic modelling.

The process for identifying new flooded properties from PROMISE and confirming type, cause and extent has been improved, as described in the commentary on lines B3.2-3.12 above, and the proportion of incidents with missing data has been greatly reduced, giving improved confidence in the information which forms the basis of the at-risk register.

We recommend that Scottish Water develops a procedure for checking total numbers of properties (including surrounding properties) for newly flooded properties, including consideration of the 1 in 20 year category.

The checks we have made on the data and methodology are covered above. Comments by line and on confidence grades are given below.

Comments by Line

Numbers of properties in both the 2 in 10 and 1 in 10 categories have reduced in the report year. 139 properties were removed following investment projects and 77 due to better information. 36 properties were added because of better information arising from customer contacts or investigations in connection with drainage area studies and investment projects.

Line 13: This line identifies the number of properties in the register that have had 2 or more reported flooding incidents in the last 10 years. The reduction from the previous years return reflects both the refining of the information on the flooding register following investigations and the capital schemes carried out.

Line 14: This line identifies the number of properties in the register that have had 1 reported flooding incident in the last 10 years. This is also reduced since last year. This decrease reflects the refining of the information on the flooding register following investigations.

Line 15: This is the sum of lines 3.13 and 3.14

Line 16: Previously Scottish Water has reported this figure as zero. However this year 2 properties are reported which suffered flooding for the first time.

Line 17: This line identifies properties where there has been no incident in the last 10 years. These are generally long-standing entries where there has been no reoccurrence but there is no justification for removal. The number reported (14) is the same as last year, but these are not the same properties as reported last year. These properties are being reviewed. It is believed that they include some properties where the cause of the flooding has been removed by an investment project carried out some time ago, before the present procedures for removal were in place. They may also include flooding where the cause was exceptional weather. Scottish Water stated that it does not believe that the Meteorological Office can provide sufficiently detailed information for localised storm events to determine if they are exceptional. It does provide sufficient information for less localised or nationwide exceptional weather.

Line 18: Scottish Water has undertaken a programme of "spend to save" initiatives in order to offer temporary solutions to some of their flooding problems. These generally entail the use of isolating valves with pumping. 157 are reported, the same number as last year. This number was derived from the Tactical Application, but it was not possible to substantiate any case from the sample data seen.

Line 19: This line consists of the balance remaining to be solved, deducting line 3.18 from line 3.15. The number reported has reduced from last year.

Line 20: This figure represents the outputs from Scottish Water's capital investment schemes reported as reaching their beneficial use state. The register does not record what the action was in each case. The number reported has increased from the last reporting year.

Line 21: This line reflects continuing cleansing of the historic data. The reduction in the figure reported from last year reflects the generally improving state of the information making up the register.

Line 22: Properties added due to better information includes all new flooding, however discovered. They include incidents from PROMISE and properties associated with investigations for investment projects and drainage area studies.

Line 23: No properties are reported as flooding due to increased demand. This is because Scottish Water takes the view that it is funded to cater for demand arising from new development and that capacity is provided in advance of connection being allowed. From other audit work it is clear that hydraulic capacity is checked before connection is authorised, so this is unlikely to occur. Changes in population and water use are generally small but this does not preclude the possibility of flooding incidents occurring for this reason in future.

Line 24: This line gives the average costs of all capital works identified as coming into beneficial use in the previous twelve months, measured as total outturn costs divided by the number of properties removed. The figure has risen from the previous year, reflecting a general trend of increasing unit cost. Cost has been calculated in line with Reporting Requirements. The large majority of flooding projects are single-purpose and proportional allocation is not required.

Line 25: Scottish Water has not identified any opex costs relating to the permanent solutions installed in the year. It is likely that there are such costs, for example increases in pumping costs, and we recommend that SW takes steps to identify these from CAPEX submissions.

Line 26: This line gives the average costs relating to all temporary solutions in place. It is derived by dividing the total costs allocated to the schemes by the number of properties relating to each scheme. The quoted unit cost is derived from the cost charged to the single job code used for this type of work and may be slightly understated as it does not appear to include the addition of Scottish Water overhead (2.5%) to Scottish Water Solutions costs. The unit cost has risen significantly from to last years return.

Line 27: Scottish Water has not identified any opex costs relating to the temporary works. The most common such works are pumped non-return valves fitted to house connections, but in such cases the householder meets the cost of electricity.

Line 28: Scottish Water has stated this value as 100. This figure has not been audited.

Comments by Confidence Grade

Lines 13 to 27: Scottish Water has claimed a confidence grade of B2 for these lines. Given the method of data-holding – in a Tactical Application with significant manual interpretation of data - and the uncertainties in data accuracy listed by line above, we support this grade.

5.5 Table B3a: Sewage – External Flooding

Commentary by REPORTER

Introduction

Key points:

- We have audited data and the methodology for recording properties subject to external flooding, the checks carried out before properties are recorded as suffering from internal flooding, measures taken during site checks and the methods used to confirm the location, sewer type and cause of flooding and the number of properties affected. We have checked and reconciled sample data with the base data.

- The methodology and data sources for external flooding incidents are the same as for internal flooding incidents. The PROMISE customer contact system is the key source of data on sewer flooding incidents, backed up by field investigations.

- The validation carried out for internal flooding is not carried for external flooding and there is a significant level of missing data. Confidence in the answers is therefore lower. As a result a very significant uplift is applied to the numbers of external flooding incidents reported due to both overloaded sewers and other causes. It follows that a significant proportion of the numbers reported are not location-specific. Confidence in the number of external flooding incidents is lower than that in internal flooding incidents.

- We recommend that WICS confirms whether flooding incidents and number of properties flooding due to defects on laterals should or should not be included in future Annual Returns. SW reports that it will continue to report on the assumption that laterals are not included until it is informed otherwise.

Audit Process

During the audit we reviewed:

- Sources of data on properties affected by flooding

- The capture of data on flooding from customer contacts

- The investigation and resolution of incidents on site, including data capture

- The assessment of the cause of flooding, sewer type, the number of properties affected and whether flooding was internal or external

- Progress on cleansing inherited historical data

- The assessment of flooding frequency

- The methodology for compiling the table

- Checks carried out by Scottish Water to ensure data quality

- Changes in numbers reported from the AR08

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Lines B3a.1 to B3.10 – Annual Flooding Summary (i) Overloaded Sewers (ii) Other Causes

Comments on Methodology

Scottish Water's methodology for recording external flooding incidents is the same as that used for internal flooding and reference should be made to our commentary on Table B3, lines 1-12, above. Confirmation of whether flooding is internal or external is carried out as part of the process for investigating flooding incidents.

However the annual number of external flooding incidents is much greater than the number of internal flooding incidents and resource implications prevent these being investigated in the same way as internal incidents. External flooding is not considered in the calculation of OPA scores and no funding is available for the resolution of external flooding. For these reasons the level of validation carried out for internal flooding is not repeated for external flooding and confidence in the figures is therefore lower.

In the report year a total of 33320 customer contacts were received which customers related to sewer flooding. Of these 18689 proved to relate to external flooding from public sewers and 5067 had no resolution code. 18146 clear-choke requests were issued and of these 4138 had missing or incomplete flooding cause and 882 had incomplete sewer type recorded after investigation.

This is a significant level of missing data and as in previous years, Scottish Water has applied an uplift to the numbers of incidents reported. The uplift is applied on the basis of the assumption that missing data falls into the cause, effect and sewer type categories in the same proportions as the known data. Uplifts of +77.11% and + 77.25% were applied to external flooding from overloaded sewers and from other causes, respectively.

In order to improve the quality and completeness of data on external flooding incidents, Scottish Water believes that the completion of choke forms should be made mandatory for external flooding and the procedures extended to cover contractors with the same rigour as its own staff.

In our opinion the data collection methods used are appropriate to meet WICS reporting requirements and clearly set out in the methodology statement. However these are only sufficient to justify a comparatively low accuracy grade.

Scottish Water has disclosed all assumptions used in the calculation of reported figures. The uplift percentages applied make a very material difference to reported totals.

The assessment of severe weather for external flooding is based solely on the assessment made on site at the time of the incident and is not checked either by a desk study of by reference to Met Office rainfall records. However it is doubtful that the Met Office could provide information which is sufficiently local and detailed to allow successful analysis of most relevant rainfall events.

In the report year, the number of incidents is reported as being the same as the number of areas. However some inconsistency was noted in samples reviewed. In one incident relating to a previous year external flooding affected the common garden of 18 flats. This was reported at the time as one area but 18 incidents. It is recommended that guidance is agreed between SW and WICS on how such incidents should be reported, including the agreement of cases where the number of incidents and areas should be separately counted.

Investment projects are not promoted to resolve only external flooding. However some external flooding is alleviated by virtue of projects designed to alleviate internal flooding. Such projects are designed using a one in 30 year return period storm.

At the audit the data were examined and in each case the data in the table lines were reconciled with the base data in the CDR. The data are complete as submitted and the reported figures are confirmed.

We have concluded from our audit that the methods used by Scottish Water are appropriate to meet WICS reporting requirements and that all material assumptions have been disclosed. The checks we have made on the data and methodology are covered above. Comments by line and on confidence grades are given below.

Comments by Line

Lines 1 to 6: A total of 712 flooding incidents due to overloaded sewers are reported this year, significantly up from last year, due principally to thunderstorms in July and August 2008, as reflected in line 6, where 142 incidents are attributed to severe weather. A number of incidents were reviewed, covering curtilege, highway and other flooding. All were incident-specific, before the application of uplift.

Lines 7 to 10: It was noted that the numbers of incidents (lines 8-10) totals 6534, while the number of areas (line 7) is 6511. This is inconsistent with Scottish Waters stated policy of reporting the same number of incidents and areas. It has arisen because lines 8-10 count the number of service requests (choke forms) in the year and a small number of incidents have more than one choke form generated.

These figures are determined as for flooding due to overloaded sewers, with the cause being determined from the choke form. A sample of incidents was reviewed. All were incident-specific, before the application of uplift.

Comments by Confidence Grade

Lines 1-12: Given the level of missing data and the high level of uplift applied, we consider that the confidence grade of B4 proposed by Scottish Water is reasonable.

Lines B3.11 to B3.25 – Properties on the "At Risk" Register

Comments on Methodology

Scottish Water's methodology for compiling the at-risk register for external flooding is the same as that used for internal flooding and reference should be made to our commentary on Table B3, lines 13-27, above. Confirmation of whether flooding is internal or external is carried out as part of the process for investigating flooding incidents. Our comments on the recording of external flooding incidents in the section above (lines B3a.1-10) are also relevant to the compilation of the register.

The external flooding at-risk register contains many more areas than the internal register contains properties and a significant proportion of these are areas inherited from the predecessor authorities. Owing to resource demands these have not been checked and reviewed in the same way as the internal at-risk register and there is lower confidence in their accuracy. No hydraulic checks or door-to-door surveys have been carried out and these are only done for external areas where these are incidental to investigations for internal flooding.

Owing to known missing data on external flooding, as described in our comments on lines B3a.1-10 above, an uplift is applied to numbers of external flooding incidents. No such uplift is applied to the at-risk register for external flooding and this may indicate that the register understates the number of areas at risk.

There appears to be some lack of clarity in the definition of an 'area' for the purposes of the external at-risk register. We were informed that one sewer restriction causing flooding in three distinct areas along a highway would be recorded as one area. Sample checks also showed that in one incident relating to a previous year external flooding affected the common garden of 18 flats. This was reported at the time as one area but 18 incidents. It is recommended that guidance is agreed between SW and WICS on how such incidents should be reported, including the agreement of cases where the number of incidents and areas should be separately counted.

At the audit the data were examined and in each case the data in the table lines were reconciled with the base data in the CDR. The data are complete as submitted and the reported figures are confirmed.

We have concluded from our audit that the methods used by Scottish Water are appropriate to meet WICS reporting requirements and that all material assumptions have been disclosed. The checks we have made on the data and methodology are covered above. Comments by line and on confidence grades are given below.

Comments by Line

Lines 11-14: Numbers reported are broadly the same as last year.

Line 11: This line identifies the number of properties in the register that have had two or more reported external flooding incidents in the last ten years. In the register, properties can have a default 2 in 10 description which implies two records of flooding but incident dates are not necessarily recorded.

Line 12:	This line identifies the number of properties in the register that have had one reported external flooding incident in the last ten years. In the register, properties can have a default 1 in 10 description which implies one record of flooding but incident dates are not necessarily recorded.
Line 13:	No areas have been identified in this category, due to a lack of reliable supporting data.
Line 14:	Sum of 11 and 12.
Line 15:	Areas listed in this line are those where action to alleviate internal flooding have also resulted in the alleviation of external flooding.
Line 16:	No action is planned to resolve areas in this category, so this number remains similar to last year.
Line 17:	The number of properties removed by company action represents the incidental outputs from capital investment schemes promoted to remove internal flooding.
Line 18:	This reflects external flooding removed as a result of investigations and better information from work directed at the analysis of internal flooding.
Line 19:	This line comprises additions due to new incidents and additions arising from work directed at the analysis of internal flooding.
Line 20:	No areas are reported as flooding due to increased demand. This is because Scottish Water takes the view that it is funded to cater for demand arising from new development and that capacity is provided in advance of connection being allowed. From other audit work it is clear that hydraulic capacity is checked before connection is authorised, so this is unlikely to occur. Changes in population and water use are generally small but this does not preclude the possibility of flooding incidents occurring for this reason in future.
Line 21:	This line comprises reductions arising from work directed at the analysis of internal flooding.
Lines 22-25:	No schemes were undertaken last year solely for the alleviation of external flooding, so no cost is reported against these lines.

Comments by Confidence Grade

Lines 11 to 25:	Given the current difficulty of assessing the true numbers of properties at risk and the fact that checks have not been carried as for internal flooding we consider that a confidence grade of B4 suggested by Scottish Water is reasonable

5.6 Table B4: Customer Service

Commentary by REPORTER

Introduction

Since April 2008 Scottish Water has been split into two parts: Scottish Water and Business Stream. Along with other companies Business Stream (BS) is a separate company operating under license responsible for providing retail services to business customers, including billing business customers. This year the figures in tables B4 and B7 relate to SW's responsibilities only.

Scottish Water retains a small billing section to bill for such items as trade waste. The remainder of the information on written complaints are generated from the "Promise" customer contact system, which is used for all SW operational contacts.

While SW and BS still use a common telephone system this has been split by telephone lines and there is no need for SW to allocate data between the two organisations.

Key points:

We believe that methods used this year are similar to those used last year.

Subject to any detailed points described in the sections below we believe that the information in Table B4 is accurate, reflecting the confidence grades applied.

As for last year SW now has a much improved system of dealing with GSS payments.

There have been no changes this year concerning how Scottish Water responds to complaints.

Complaints are either dealt with immediately by the Adviser on the telephone or escalated to a Team Leader. Finally, if the matter cannot be dealt with then and there (possibly needing a written response or further investigation) it is finally escalated to a small dedicated team (Customer Relations). Scottish Water's philosophy is that all complaints are dealt with at the time. The specialised Customer Relations section gives confidence that complaints are dealt with efficiently. The Customer Relations department will nearly always respond in writing, but in some cases a telephone call or visit from a Field Customer Adviser is considered to be more appropriate.

Scottish Water does have procedures in place to re-direct complaints received directly by its contractors.

Initial screening of letters for complaints is done in the post room but Advisers also direct any letters that they believe to be complaints to Customer Relations. While any system can miss a few complaints we believe that Scottish Water's systems and procedures should deal with complaints properly.

As WIC carries out its own audits of the customer complaints system we have not undertaken any audits of the quality of Scottish Water's responses.

This year, as required, all telephone complaints have been included in Line B4.29.

The total number of written complaint correspondence has been obtained by reporting both the original contact and any later "linked" contacts. These later contacts can relate to either a further written contact or a telephone conversation with the customer relations person dealing with the matter. Any initial written response to the customer gives a personal contact number should the customer want further information. While we believe that the return is a practical interpretation of the requirements of Line B4.15a it is not necessarily a literal interpretation of the line definition

Scottish Water tries to log all contacts onto Promise (Customer contact System). A significant number of incoming calls were transferred. Transfer calls relate to calls to other departments within SW. The telephone system is unable to identify easily the destination of these calls but discussions with customer representatives at the time indicated that many were transferred to Developer Services (new connections), whose calls go through the call centre.

Septic tank emptying is recorded on a dedicated commercial database called Gemini, which is well known for recording tanker movements.

Scope of the audit

We held 3 meetings with personnel in Customer Services, covering:

- Customer contacts
- Customer Relations (complaints)
- Customer billings
- Telephone contacts
- GSS payments

For each dataset we:

- asked SW to run the query that produced the entry; and
- chose a small sample of records at random and audited them back to the detailed record or supporting documentation.

We did not audit the quality of items such as written responses. .

Comments on Methodology

General

Following the major changes over the last two years resulting from the wholesale – retail split, this year has been a period of consolidation in Customer services.

In previous years we have described Scottish Water's systems and methodology in this section. For completeness we repeat this with some amendments below.

The department has two customer contact corporate systems:

1. "Promise", a customer management system based on an Oracle database, which deals with all customer contacts other than billings, and

2. "Peoplesoft", a billings database, which is a module of SW's Peoplesoft financial accounting system.

Together with the main module of Peoplesoft, these two databases generate the greater part of the information reported in tables B4 and B7.

Unlike a water company in England and Wales, Scottish Water does not directly bill its domestic customers. Therefore non-billings contacts form the greater part of Customer Services' work.

Customer Services is organised into two main sections, with sub-sections and more minor sections as follows:

1. Customer Resolution: the call centre

2. Customer Relations and Household Billing
   a. Household billing via local councils
   b. Field Customer relations comprising field based staff who visit customers (Usually following a request by the customer but possibly pro-actively following serious complaints involving property damage from bursting mains or sewer flooding).
   c. Customer Relations, who deal with complaints.
   d. Business support (including Sundry Billing)
   e. Quality and performance
   f. Processes
3. Other departments
   a. Trade effluent
   b. Customer marketing
   c. Work planning
   d. Telemetry

The Customer Resolution is manned 24 hours per day for 7 days a week. Sundry Billing is manned Monday to Friday between 9 am and 5 pm.

Promise contact management system

Promise is a commercially available package that has not needed to be adapted in any significant way for Scottish Water. It has two advantages over other systems that we have seen:

1. Working from an initial definition of the contact type it prompts the Advisers to ask a structured series of questions such that the problem can be more efficiently

addressed by Scottish Water's operational staff, who frequently have to respond to a contact.

2. It enables the Adviser to view an operator's diary and schedule a visit immediately while the customer is still on the phone using dedicated teams. Promise is used to schedule work resulting from customer contacts, including such items as investigating sewer flooding.

Promise has a full set of contact codes, which we believe should allow effective reporting of WICS information, without additional work outside the database. Additional contact types can easily be added should the need arise. Scottish Water has developed a set of sub-codes for use in its business that supports the high level WICS codes. Promise allows complaints to be recorded.

We have reviewed how contacts are opened and closed on Promise. Contacts are opened when the customer's call is answered. Contacts are closed in one of two ways:

1. Within the department the contact is closed by the Adviser or by the person completing the action (for example after sending out an application form).
2. When a field operative completes the visit or action he flags the action as completed on his laptop. This is usually synchronised with Promise immediately. That night promise automatically closes all contacts which have action completed flags.

We noted that this means that all contacts are closed, even if the action has not solved the problem. However, we accept that the action (i.e. a visit) will have been substantive, which we believe meets the reporting requirements (as mentioned above any follow up action scheduled by the operative is managed on Promise and so is available should the customer ring again).

Since the "promise to resolution" initiative all calls relevant to the department have been logged onto Promise. This was not the case in prior years (pre 2006/7) when trivial contacts were not logged (as many domestic customers are not known before a contact occurs, the person's name and address has to be set up on the system; they were deemed to be "1st time resolution"). Trivial calls have always been captured as part of the difference between the total of calls logged by the telephone system and those logged on Hi Affinity and Promise.

In 2005/6 we noted a large discrepancy between the total number of calls answered and logged on the telephone system and those logged on Hi Affinity (now BS) and Promise. Given the current reduction in data requirements following the wholesale-retail separation and the fact that most calls are now logged onto Promise this fact is less obvious. Without further programming of the telephone system it is not possible to get a breakdown of the destination of these unlogged calls. However, discussions with those who take the calls indicated that many of them relate to providing new connections (dealt with by the Developer Service department).

We have not audited the detailed query routines that generate the information for WICS. However, in prior years we discussed the user testing that is undertaken when queries are written. We believe that the procedure is sound. Subject to the queries having been properly structured we believe that Promise is capable of delivering accurate information to WIC on all logged calls.

Peoplesoft billings system

SW retains a small sundry billing department which bills for:

- Septic tanks
- Trade effluent
- Standpipes
- Laboratory
- Metered domestic customers
- Rechargeable Works

The department is based in Balmore Road office and so is completely independent of the main customer services section based at Fairmilehead.

The department has opted to use the billing module of its "Peoplesoft" financial accounting system for its work.

Unlike Hi Affinity Peoplesoft cannot "link" contacts. When a letter is sent in response to a contact the contact is closed. SW reports that holding responses are not sent, billings queries can be responded to in full in the allotted time.

We reviewed the codings available to the operators and confirm that they are sufficient to prepare the statistics needed for the Annual Return in full.

Voids are not recorded on Peoplesoft. The only voids that affect Peoplesoft are on domestic metered supplies, of which there are very few. As bills are raised on the basis of meter readings this is not an important consideration.

In previous years we had concerns that Hi Affinity was used as a work scheduling system, with the possibility of codes being muddled. We confirm that Peoplesoft is not used for this purpose.

First time resolution contacts are not logged onto Peoplesoft, which therefore does not keep a record of all contacts in the department.

SW reports that over the year procedures have been improved and direct debits can now be processed. A further improvement is that bills are now dispatched daily.

Receipt of mail

Mail is received in the relevant post room and it is immediately sent to the relevant section who records it on Promise or Peoplesoft. We accept that mail is logged on to the system on the day that it arrives subject to our comments elsewhere on mail arriving after 2.00pm.

Unlike last year SW now has a separate postroom to Business Stream and so there is no possibility of post being mis-directed.

Complaints

Many complaints are dealt with on the phone by the Adviser and are logged as complaints under the relevant code. While there is a code on Promise for a complaint these are not necessarily recorded as complaints by the Adviser taking the initial call. Where an Adviser cannot resolve the issue at the time, the complaint is escalated first to a team leader. If the team leader believes that the complaint requires a written response then it is escalated to the Customer Relations Section. This is a small department of experienced staff whose sole job is to resolve complaints. The Customer Relations department will nearly always respond in writing, but in some cases a telephone call or visit from a Field Customer Adviser is considered to be more appropriate.

Any phone calls received at non Customer Service numbers are redirected to Customer Service immediately; the customer is not asked to ring another number. The fact that Customer Service is manned 24 hours per day facilitates this.

Written complaints come direct to the Customer Relations Department. Scottish Water has a specific post office box for complaints. However, the post room scans all incoming mail and if they believe that it is a complaint they direct it immediately to Customer Relations. If an Adviser receives a letter and they believe that the letter constitutes a complaint then they scan it and send to Customer Relations.

We noted that written complaint that arrived after 2.00pm was recorded as arriving the next day. Customer Relations aims to respond within 5 working days.

Should the response to the complaint not be considered sufficient and a further complaint on the same topic is received it is "linked" to the original complaint on Promise. This mechanism is used to complete Line B4.15a.

Scottish Water tries to divert complaints away from contractors by prominently displaying its Customer Service telephone numbers on all signboards and so on. Where, complaints or other communication does get through to the contractor the contractor is instructed to divert the call to Scottish Water. Mail is also re-directed. The contractor is required to note the day that the letter was received and it is this date that is logged onto the system. In discussion with the Contractor's Liaison Adviser in Customer Services it was stated that the complaints that go to contractors are minimal. This is accepted.

Customer Relations uses Promise to manage its contacts in the same way as all other advisers. Where holding letters are sent Customer Relations record this in the memo field and keep the contact open on the system. There is some manual intervention which results in the confidence grade of B2.

Many complaints take time to respond to as investigations have to be made which can include engineering works such as digging up a main. Therefore most responses that generate the statistics are letters that inform the customer of future action and not the action itself. However, SW informs us that the letter always describes the work that SW is doing to resolve the problem.

We note that the Reporting Requirements state that an allowable response is one that *"informs the customer of when action to resolve his/her complaint will be taken if action cannot be taken immediately: for example 'programmed capital works are not scheduled* *until(month and year) and should be completed by (month and year)"* whereas a reply which advises the customer "*of the need to undertake additional research or other actions before being able to respond to the customer's complaint"* is defined as a holding reply and does not fulfil the definition of a response. While in some cases we believe that SW's responses do refer to further investigations these will normally refer to engineering investigations that depend on external influences as to their timing (e.g. roadworks) that are outside the control of Scottish Water. We therefore believe that SW's statistics do meet the reporting requirements, although the definitions of a holding letter are slightly ambiguous.

We understand that Waterwatch Scotland now carries out audits of Scottish Water's customer service system. Therefore, we have not audited either the tone of the incoming letters nor the quality of the letters sent out by the Customer Relations department. We have not audited either the number or the effectiveness of the system for re-directing calls or letters received elsewhere in the business. However, from our discussions with Customer Relations staff, we believe that the use of a specialised group of experienced staff, the use of Promise as the contact management system, and the procedures described to us mean that Scottish Water does manage its customer complaints effectively.

Telephone calls

Telephone calls are logged on the "Contact Centre 6" (previously Symposium) telephone system. In addition BT records all calls by site and date.

Scottish Water currently has 105 domestic incoming customer service lines which impose no restrictions on the system.

Nearly all the information reported by Scottish Water in the telephone contacts section of Table B4 comes direct from the system and, subject to any detailed comments below, should be robust.

Scottish Water tries to log all contacts onto Promise (Customer contact System) but does not do so on Peoplesoft. In 2005/6 we noted that a significant number of incoming calls were transferred. Transfer calls relate to calls to other departments within SW. The telephone system is unable to identify easily the destination of these calls but discussions with customer representatives at the time indicated that many were transferred to Developer Services (new connections), whose calls go through the call centre.

Scottish Water uses BT's Message Link system during incidents, of which there are several every month. During our audit we noted that these amount to a very significant percentage of all calls (159203 out of 535000 this year). These are correctly included in the return based on information provided by BT.

SW has previously assumed that all calls logged onto Message Link are successful. WICS guidance states that calls that are not answered within 40 seconds should be considered to be abandoned (assuming that it takes 20 seconds to answer). Last year we reviewed a small sample of the statistics from the BT download and noted that Message Link responded almost instantaneously (on average in 2.3 seconds). We also noted that there were one or two calls that had not been answered in 20 seconds. We therefore concluded that there were a few calls which should have been recorded as "calls abandoned" but that they were probably not material. For this reporting year SW considered our comments and reviewed the situation again with us. We listened to the message and concluded that the salient part of the message was reached in 3 seconds and agreed with SW that calls terminated within 3 seconds should be defined as calls abandoned. These only amounted to 531, a non material number. These were not subtracted from the reported total but from 1st April 2009 SW will remove them to calls abandoned.

The Sundry Billing Department, which is located at Balmore Road in Glasgow and not with the other customer services departments in Fairmilehead, has its own telephone number and uses the system at Balmore Road. SW reports that the system in Balmore Road is unable to provide the information required in Table B4 and so they have not been included in the statistics.

Septic tank emptying

Septic tank emptying is administered by a small Operations Management Centre (OMC) team which operates separately from the main customer service section. For the audit we met the team leader and examined the Gemini records on-line to see how data is transferred to the monthly reports.

Scottish Water operates 3 levels of service with differing charge rates:

1. Contract emptying to an agreed programme. Here the team identifies the programme for the month and contacts the customer with a provisional date.

2. Unscheduled emptying, which has a response time of "endeavour to respond within 28 days".

3. Urgent emptying with a 48 hour response time.

The team regularly accesses Promise to see if any new requests have been received. These are then recorded on the Gemini database, a commercial tool used for controlling tanker movements. Until 2008 the team printed a job sheet and faxed it to the tanker driver. When the job was complete the tanker drivers completed the sheet and either faxed it or posted it back to the team who update Gemini. From November 2008 all tanker movements have been controlled using IMS in the tankers, and drivers have reported job completion in the same way.

The team prepares the statistics for lines B4.30 to B4.40 monthly.

We believe that the reported figures are therefore likely to be reasonably accurate.

Comments by Line

Lines 1-7: Initial telephone contacts that are dealt with at the time are not included in the figures.

As for previous years enquiries about new connections are not recorded in these lines as they are diverted to developer services. We believe that this is correct as they do not relate to metered accounts.

Debt recovery calls are excluded.

The figures are marginally lower than last year. Enquiries are tracked daily and SW answered all but one query within 5 days. We audited a small number of enquiries and found that that they were consistent with the report.

Lines 8-14: Scottish Water has made a zero return for these lines. Last year Peoplesoft did not have the ability to offer customers alternative methods of payment. This year SW was able to accept direct debits and was proactive early in the year in contacting those customers for which a direct debit is appropriate to ask them whether they wanted to set up such an arrangement. Many of SW's billings are now reactive in nature and so different payment methods are not appropriate.

Given that immediate responses are not recorded on the system it is likely that some change of payment enquiries may have been received but not recorded.

Lines 15-21: Written complaints have increased by 26% over last year. SW reports that it believes that there are a number of reasons for the increase:

- SW had numerous sewer floodings in August as a result of the very high rainfall.
- Formally complaints forwarded by MSPs were dealt with by the Public Affairs department. Now the letters are included in the statistics (326 this year).
- The biggest increase is in claims for damage. SW believes that in the economic downturn people are more willing to claim, but some are as a result of August's rainfall.
- People are increasingly using e-mails instead letters. These are easier and may result in complaints that would not have been made in the past. Also if people do not get an instant response then they e-mail again, resulting in another complaint.

The response is generated from linked contacts as described above. Additional correspondence that arrives while the initial contact is still open will not be recorded.

Numbers include complaints received by the licence providers. These come via SW's Wholesale Service Desk.

Lines 22-29: The information in these lines comes from 2 sources:

- Information directly generated by the telephone system.
- Information from BT's Message Link system.

We believe that both figures are now accurate.

Calls to the Sundry Billing Department, located at Balmore Road, are excluded.

The numbers include for calls diverted elsewhere in the business.

Line 28, abandoned calls, includes when the person phoning realises that he has called the wrong number and hangs up.

The number of calls received has reduced by 4%, a relatively small amount.

Calls abandoned expressed as a % of total calls received is little changed from last year.

Total telephone complaints are recorded directly on Promise by the Adviser who has the relevant code to hand.

Lines 30-40: The return indicates that there has been a noticeable increase in septic tank requests but actual emptyings have decreased. We are unsure as to the reason for this change.

We note that SW's management of septic tank emptyings has improved this year.

Comments by Confidence Grade

Scottish Water has assigned A1 grades to "Billing/Charging/Metering enquiries. We see no reason why the contact information should not be accurate, as reflected in the A1 grade.

For new written complaints Scottish Water has kept its confidence grade at B2. SW reports this reflects a manual intervention early in the year when it was discovered that input from the Wholesale Service Desk, that records complaints forwarded from licence providers were being wrongly recorded as telephone complaints. This has been rectified by means of a manual intervention. SW hopes to report a confidence grade of A1 next year. We believe that the confidence grade of B2 is reasonable.

We accept the confidence grade of A1 for the information on telephone contacts.

We believe that the confidence grade assigned by Scottish Water to septic tank emptying is generally reasonable.

5.7 Table B7: Customer Care – GMS Performance

Commentary by REPORTER

Introduction

Key points:

- As for last year SW manages its GSS payments through a dedicated GSS team and data are reported from the team's monitoring spreadsheets (one for each type of payment) leading to much higher levels of certainty in the allocations.
- Methods in relation to recording GSS payments are little changed from last year. This year we audited entries back to base records and found them to be consistent.
- GSS payments are generated by a mixture of the responsible department and the GSS Department monitoring corporate systems. It is possible that some GSS payments can be missed due to human error but we think that it is unlikely.

Comments on Methodology

For the reporting year, GSS payments have been managed by a small dedicated team. The team generally obtains its information from access to Peoplesoft, Promise and other corporate systems. GSS payments relating to Customer Relations comes from information provided by Customer Relations. Most ex-gratia payments are public liability claims and are managed by Scottish Water's Claim Team, who inform the GSS team of their payments.

The GSS team manages its work using control spreadsheets, one for each claim type. Data from these spreadsheets are used to enter the information for Table B7. The GSS team manages the process, including dispatch of cheques. On the issuing of a GSS or Ex-Gratia payment the GSS Team or Claims Team include a copy letter to allow the customer to confirm receipt of the payment. It is the customer's choice to send back the receipt but in the majority of cases this copy letter is returned with signature and date to confirm receipt of payment. SW's bank account is also monitored to check if the cheque has been cashed. We note that Scottish Water doesn't telephone a customer to confirm receipt but the customer has 6 months to cash the cheque from date of issue. If the cheque hasn't been cashed it will automatically be put on hold with the Bank. If a customer tries to cash the cheque later than 6 months it will not be allowed by the Bank but this will not stop Scottish Water cancelling the cheque and issuing a replacement cheque.

Records relate to payments made in the year. Items that may have occurred in past years are included. Where there have been protracted negotiations these can go back two years or more. Ex-Gratia payments generally relate to public liability claims which can take some time to resolve.

Hard copy records, including completed cheque received forms are kept. This year we audited a sample of records of different types back to hard copies and found them to be consistent. We were impressed by the standard of records kept by the department.

We believe that the new system is a significant improvement on the system before the GSS and Claims team was set up in April 2007. Given the relatively few numbers of payments we believe that the use of spreadsheets is acceptable. However, if increasingly payments become automatic, such as happens for sewer flooding, we believe that SW should consider the use of corporate systems to control payments. Information on payments is currently captured in the Promise System but this is via a free text area in the workbench.

Comments by Line

Planned interruptions have decreased by 35% following last year's increase of 14% over the previous year. The number of claims for planned interruptions as a percentage of planned interruptions is very similar to last year.

Unplanned interruptions have increased by 14% since last year. The number of GSS failures claimed for unplanned interruptions as a percentage of the number of interruptions has reduced by 40%, a good result for SW.

Despite the serious flooding in August, sewer flooding incidents are similar to last year with the number of payments increasing for domestic customers and reducing for non-domestic customers.

Payments for failures to deal with billings contacts and customer complaints are very small, reflecting the reduced number of contacts. All responses are targeted on a 5 day response.

The number of appointments made has increased by 13% this year following last year's 14% reduction. Failures are slightly up on last year but still very low.

The most significant GSS payments were ex gratia payments and numbers are equal to last years (ex gratia payments are not GSS payment but are included within the B7 GMS table). We queried this with SW who confirmed that the numbers were correct and coincidental. SW attributes the majority of the remaining payments to vehicle incidents.

Comments by Confidence Grade

SW has generally assigned an A1 grade to the GSS payments lines. Given the quality of SW's records we accept this confidence grade.

5.8 Table B8: Outputs to Customers – Other Serviceability Indicators – Water and Sewerage Service

Lines B8.1 to B8.9 – Water Service –distribution and water treatment works performance

Introduction

Key Points

- "Mains bursts per 1000km" is calculated from the total bursts reported against line E6.19 divided by the total length of mains reported in Line E6.16.
- Water quality compliance sampling and testing is undertaken by Scottish Water Scientific Services to the Drinking Water Quality Regulator's requirements (DWQR) and to ISO9001. .
- Relevant sections of the water quality report reconcile with the Annual Water Quality Report prepared by Scottish Water.
- The reported data on turbidity is taken from the results of regulatory water quality sampling and testing undertaken by Scottish Water and reported to DWQR. The volume of water supplied with turbidity less than 0.5NTU has increased by 45% in 2008.

Comments on Methodology

Mains bursts per 1000 km Line B8.1

In this audit we reviewed the Technical Approach, a spreadsheet of the works order data analysed by SW for the lines and summaries of these. We reviewed the data quality in WAMS and as part of the review interviewed site staff about entering data on their hand held devices.

The methodology used for reporting mains bursts is the same as for AR08. The data for the report year comes from WAMS, the burst repair work orders entered into WAMS coming from two sources. Most arise from customer reports of leakage but the proportion from active leakage control has risen to 23% in AR09. In both cases the work is carried out by both SW's staff and external contractors managed by Scottish Water.

WAMS jobs are raised for all burst repairs carried out by Scottish Water. This is done from a hand-held device in the field after investigation. 8 WAMS work order codes, with 4 descriptions, relate to mains bursts. The descriptions are as follows:

- repair burst <150mm
- repair burst 150 to 300mm
- repair burst 300 to 600mm
- repair burst >600mm

At this stage the work has not yet been carried out and in some cases it is found that the pre-selected work order code does not correspond to the work which actually needs to be done. Previously feedback on work actually done was by free text entered onto the hand-held device which could be difficult to relate to work order codes. Scottish Water has yet to implement mandatory resolution codes for fieldwork which will improve the accuracy of work order codes. For reporting purposes work order codes with the above descriptions are selected from WAMS. The data is then cleansed to remove duplications and coding errors.

In AR08 we saw the entire spreadsheet of burst data. We noted that there was no specifically required entry to confirm that the original Work Order, which may have come from a customer contact had been confirmed as a burst. The "Standard Work Order Description" carried a comment but confirmation was often only implied e.g. "Repair 3in main" or "repair leak on 4" main". We believe that the absence of a site identified direct confirmation of a burst the data reduces confidence in the data.

Because of our observations about closing service requests and works orders in AR08 we asked to see how the site staff were able to carry out accurate closure on their hand held devices. This is reported below. The general accuracy of information available for the AR09 figures is the same as in AR08.

Burst or fault location is related to property address code for the complaining customer or the nearest property. This may not identify the correct pipe in the street. Site staff do have the ability to enter a revised grid reference but this is not mandatory and is frequently omitted.

Where bursts are repaired on an emergency basis work order codes are raised retrospectively when the work is complete.

Bursts are allocated to areas by use of address-point co-ordinates, reconciled to DMAs using GIS.

For reporting purposes relevant work order codes are selected from WAMS. The data is then manually inspected by the IDR group without reference to operations and cleansed to remove duplications and coding errors.

We believe that the methodology could be improved by using mandatory resolution codes for field work in order to improve the accuracy of the data, and automating the current manual to a spreadsheet process.

The length of main used in this line is taken from Table D line 5.8.

We conclude that the data extraction has been well done but, in common with some other data sets that are taken from WAMS, suffers from inconsistent data entry at job closure.

Site entry of data (affects all lines with data extracted from WAMS).

We were able to see how SW's site staff use their hand held devices (IMS or robust computers) to react with the service request and works order systems, Promise and WAMS. We especially noted how jobs are closed and the data available to the IDR (now GIV) department.

These comments are relevant to water mains bursts, sewer collapses and blockages and equipment failures. We also comment on non-captured data when discussing the water mains and sewerage network records.

Service enquiries are raised in Promise and sent via hand held devices to one of the SW network operators or inspectors who will attend the site. If possible the operator will clear the problem; if not a works order will be requested for sewerage or a water distribution squad to attend. The operator can change the problem location by Ordnance Grid Reference at this or a later stage to more closely relate to the affected asset. He or she will normally provide more information for the squad such as diameter and depth to allow more efficient site work.

Some small sewers and almost all lateral sewers are unrecorded by SW. When such an asset is discovered through SW's attendance on a problem, the sewer will usually be investigated so that the operator is fully knowledgeable about the line, level, material etc. However, the information is then lost (the reason given for not recording the data was pressure of time in the face of needing to move to the next distressed customer). We noted that it was relatively easy for operators to draw a reasonably accurate line on the asset plan shown on their device screens.

The operators interviewed stated that they did complete resolution codes and freeform text fields when closing their works orders down. Such records as we have examined in the course of the audits show that such completion is inconsistent across SW.

Water Treatment Works Turbidity Lines 8.2 to 9

In this audit we reviewed the imported data set from Scottish Water's corporate Laboratory Information Management System (LIMS) and the spreadsheet analysis deriving the numbers in the return. We were able to follow how a small sample of WTW data was used and verified that this data was properly included in the return.

Water quality sampling and testing is regulated under the Water Supply (Water Quality) (Scotland) Regulations 2001. These establish a sampling regime by calendar year. The Annual Return reports data for the 2008 calendar year.

Water quality compliance sampling and testing is undertaken by Scottish Water to a regulatory sampling schedule agreed with the DWQR. Sampling, testing and data storage is undertaken by Scottish Water's Scientific Services, whose quality assurance is audited and accredited to ISO9001 by UKAS, a recognised UK accreditation body. The sample information and test results are recorded on LIMS. The regime is carried out under DWQR's information direction including audit and review.

The data reported in the Annual Return is generated through a query on the LIMS data and data supplied by the Water Balance Team. SW's methodology for the preparation of lines B8.2 – 8.9 was developed for the 2007 Annual Return, is well documented, and closely follows the detailed methodology defined by WIC. Data extraction processing is now within SW's Business Objects package of the corporate data system, thus removing a manual process.

The 95%ile methodology includes a significant number of WTWs (over 80%) in the "not recorded" categories (lines B6.6 & 7) because of small numbers of samples being taken in the year, consistent with the status of the WTW. These are mainly smaller sites (together supplying only 8% of water) of which SW has many (these are now the focus of investment). Similarly, the data set includes only samples taken for regulatory purposes and excludes samples taken for operational reasons. The table below indicates the build up of the results.

Line	Description	Units	Value	% of whole
B8.2	95%ile greater than or equal to 0.5NTU	nr	7	2.3
B8.3	95%ile greater than or equal to 0.5 NTU	Ml/d	160.82	7.3
B8.4	95%ile less than 0.5 NTU	nr	50	16.7
B8.5	95%ile less than 0.5 NTU	Ml/d	1854.87	84.8
B8.6	Turbidity not recorded	nr	240	80.9
B8.7	Turbidity not recorded	Ml/d	172.65	7.9
B8.8	Total	nr	297	100.0
B8.9	Total	Ml/d	2188.35	100.0

We conclude that the work has been well done with data extracted from corporate sources that are quality assured and the data is also with DWQR. The data processing accords with WICS specification.

Comments by Line

Line B8.1: The reported number of bursts per 1000km of main shows an increase compared to last year. SW is pleased with the proportion of burst repairs identified by active leakage control in AR09 of 23% which is close to the actual rate increase of 20%.

Lines B8.2 – 8.9 We note that in AR09 that there has been a much higher production of water in the medium sized works with a 95%ile less than 0.5NTU. Scottish Water reports that many of its smaller WTW are excluded from the analyses due to the small number of regulatory samples taken.

Comments by Confidence Grade

Line B8.1: The number of bursts comes from the WAMS/Ellipse database. The quality of data is unchanged from last year and the confidence grade of B3 seems reasonable.

Lines B8.2 – 8.9 The water quality information is of high quality and the assessed confidence grades of A2 for numbers and B4 for outputs are considered reasonable.

Lines B8.10 to B8.19 – Sewerage Service – sewerage and sewage treatment works performance

Introduction

Key points:

- The total sewer length used in lines 11 and 16 includes laterals.

- Scottish Water has the ability to digitally map blockages and collapses. Data is related to the property address of the problem, not the position of the asset involved. This is particularly prone to error where there is more than one sewer in the road.

- Scottish Water's PROMISE and WAMS/Ellipse work record system do not require operators to complete resolution codes enabling easy accurate analysis of the data for sewer collapses and blockages and pumping main bursts.

- Historic data has been consistently available for blockages since Scottish Water was formed, but the quality of data is variable. Blockages which cause flooding have been excluded from the figures.

- Scottish Water stated that the terminology for total number of collapses could be improved: failures, bursts, fractures and collapses would be an improvement. It is our view that pumping main failures should be reported separately from sewer collapses as sewers and rising mains exhibit very different characteristics.

- We agree with Scottish Water's statement that it would be useful for data on laterals to be included in a separate table to enable an easier comparison of its performance with those in England and Wales.

- Investigations associated with the SR06 and SR10 business planning cycle disclosed about 40 more unsatisfactory intermittent discharges in 2008-09. The negative effect on SW's clearance performance should be limited to this year only.

- Equipment failures are greatly reduced from last year, where they included failures at sewage treatment works and failures of civil engineering assets such as manhole covers. This year failures are limited to MEICA equipment at pumping stations, CSOs and storm tanks. The data includes all reactive work orders, even when it has not resulted in a physical repair. Difficulty is being experienced by regulators in defining a suitable descriptor and such is the diversity of approach to this indicator we do not believe that it should not be used for comparison purposes. Provided the definition stays constant it should be useful for detecting trends.

- The company has complied with the detailed analysis set out in the reporting requirements to calculate sewage treatment works performance.

Comments on Methodology

Sewer Collapses Line B8.10

The methodology that SW use to compile data for this line is generally the same as in AR08, the exception being that extraction of rising main data has been improved. The description of the methodology is therefore repeated here with amendments.

We inspected WAMS data analysed in this line as well as a undertaking a detailed audit on a very small sample to ensure that SW's Technical Approach was followed. We were concerned with the use of some of the WAMS data resolution codes at the end of a job and subsequently spoke with site staff about resolution codes and job closures.

Data for Scotland as a whole is obtained via the WAMS/Ellipse database. It should be noted that only collapses that cause service problems severe enough to cause a customer to contact Scottish Water are reported. This database contains work orders for sewer squads involved in sewer investigation, reactive maintenance and repair.

There are 14 standard job codes that refer to different types of collapse and these types have been used to determine the collapse figures. Additional data fields were added to WAMS to identify damage caused by third parties and cancelled jobs. Jobs may be cancelled because the problem is found to be, for example a blockage and not a collapse. None of the works orders relate directly and specifically to a collapse, although since the initial contact is likely to be from a lay person (customer complaint) this isn't necessarily available information.

The squads who carry out the work are best placed to identify whether the work is on a public sewer or not and whether the sewer has collapsed. However, this information is not necessarily captured. In our review we have seen the full data from which the number of collapses is derived by IDR. We comment on site generated data elsewhere (see commentary on Line B8.1). We are concerned that other information may show that a sewer collapse was not the problem but completion information and resolution codes are not always helpful. For instance, on WO02015574 we read "Repair to lateral (sic) sewer" in the standard job code but "work order for tanker" in the work order description.

The work orders are attached to addresses not assets. The address is generally the address of the customer reporting the problem. The system generates a location code based on the address and this code is then used to allocate problems to report areas. Any reports without location codes are spread pro-rata across the operational areas. In order to prevent double counting for different squads attending the site (for example, for inspection, repair and clean up) work orders at the same postcode within a three-week period have been counted as one collapse. Those that Scottish Water has noted are caused by third parties or relate to cancelled jobs are removed. Duplicate jobs are removed. Scottish Water considers a duplicate job to be those that appear at the same location within 21 days of each other. There is a final check on the data that the total in the WAMS database minus those removed above adds up to the number reported in the table. We believe that SW's investigations into possible duplicate jobs are sensible but may not be undertaken by others.

The codes in WAMS do not specifically identify failures on rising mains but SW uses WAMS codes related to its own assets to identify these. Although improved from AR08, we do not believe this is wholly satisfactory and cannot substitute for properly recorded on site information. We again recommend that Scottish Water reviews its coding system to improve data quality.

We recommend that recording of collapses and blockages is improved. It should not be possible to close a works order until the resolution of the job is clear and accurately recorded and the position of the problem has been amended in line with the SW asset

Sewer collapses are normally identified by a customer report to Promise from which a service request is made to an operator or inspector to attend. The operator will confirm the reported problem and call out the appropriate squad using a works order raised through WAMS. The data from these sources is placed in SW's Data Warehouse from where it may be extracted by the relevant query.

Sewer collapse data is extracted from WAMS using sewer repair standard job codes of which there are 14. The data is downloaded to a spreadsheet and sorted by postcode and date of completion. Work orders that relate to a single postcode and that are within 21 days are regarded as a single sewer collapse. We inspected the data extraction spreadsheet and were able to verify that the vast majority of works orders without a post code or with a dummy postcode were in fact SW's own assets – pumping stations and WwTWs. These were excluded from the count for gravity sewer collapses.

However, when rising mains are considered, the postcodes are ignored and the works orders are allocated to the SW asset , usually a sewage pumping station.

We conclude that the data extraction has been well done from corporate systems. However, we believe that the quality of the data in those systems could be improved. As for last year, resolution codes and inserted comments in WAMS do not have to be completed before the job is closed and data may be lost or be uncorrected from first identification.

Blockages Line B8.15

The base data used to identify the number of blockages in the year was taken from the Scottish Water's PROMISE customer contact system. Most blockages are reported by the public but problems have to be recorded in Promise to raise a service request. Service requests are passed to choke squads for investigation and action on site via hand held devices.

When the choke squads have finished their site work they use handheld devices to record the task completion according to standard resolution codes that are now mandatory. 16 of these codes relate to problems which may be caused by a blockage and their use automatically raises a non-mandatory choke form to the squad. Only choke forms completed with "Blockage/Defect" as the cause of flooding contribute to the blockage records. This year the 16 codes include those for flooding as well as for odour and backing up.

We inspected a service request which confirmed the procedure.

We conclude that the data extraction work has been well done this year and that the data quality has improved since last, with the service request system requiring choke forms to be completed before the job can be closed.

SW is recording 17604 blockages in AR09, 5298 (43%) more than in AR08. This is largely attributed to including other cause flooding as well as through hydraulic inadequacy

Total Sewer length for lines B8.11 and 16.

Scottish Water has stated that the total length of sewer is based on the total length of sewer in GIS, plus an assumed further length of 1000km of main sewer to represent those that exist but are not yet in the asset inventory, plus a further assessment of 16,403 km for lateral sewers which are assumed to exist but are not included in the asset inventory. This is the same methodology as for last year's annual return. The methodology for this is discussed in the report for Tables D7 and H4 and the figure is consistent with those Tables. Scottish Water stated that the blockages and collapses occurred on both laterals and main sewers. They also stated that most blockages occurred on laterals.

Intermittent Discharges: Lines 12 to 14

For this audit we reviewed SW's Technical Approach as well as the lists of intermittent discharges and of UIDs removed by investment. We inspected asset records for a small sample of UIDs now removed.

The intermittent discharge methodology is the same as in AR08. The number reported includes CSOs, Emergency Overflows (EO), overflows from WWTW storm tanks, surface water outfalls and dual manholes that contain both storm water and surface water sewers and so can operate as a CSO. The estimate for dual manholes is not the number of dual manholes themselves but rather the number of areas which are known to contain dual manholes and where there is a known problem. The data is derived from Ellipse. Ellipse is updated by asset planner knowledge and from DAS and UID study information.

The data harmonisation study between Ellipse and Corporate GIS to identify those IDs which do not exist, or which have been abandoned was completed in 2007-08. All the data is now contained in the Ellipse corporate system and changes should be limited to new discoveries from completing the drainage area study programme and company action.

The numbers of Intermittent Discharges have changed through 2008-09 as:

2007-08 return	3576
Net addition	60
2008-09 return	3636

In the course of investigations for SR06 and SR10 investment a net 9 UIDs were removed from the register and this is unlikely to be repeated. However, a net 109 UIDs were removed by company action and changes to the numbers of UIDs are:

2007-08 return	856
Added for better information	148
Removed by better information	-157
Net removed by company action	-109
2008-09 return	738

We reviewed the Ellipse records for 5 former UIDs. In each case we verified that the data recorded the physical changes that allowed it to be taken off the UID register.

We conclude that the work was well done with data extracted from corporate systems that are externally agreed with SEPA and using well documented procedures for changes.

Equipment failures: Line 19

Scottish Water identifies the total number of equipment failures repaired from work order information on the corporate Works Asset Management System. The methodology is the same as in AR08.

The data set which forms the basis of the reported data is limited to the following:

- Reactive maintenance work orders only. The data excludes planned maintenance tasks such as scheduled oil or parts replacement.
- Work orders closed in the report year. The task closed date is the date the work was complete as opposed to the date completion was entered on the WAMS.
- Work orders for operational tasks. Other categories of tasks associated with capital works or rechargeable tasks are identified and excluded from the return. Work on associated facilities such as the fence line around a pumping station or work on a pumping station superstructure are covered by a separate system and are not included in the return.
- Work orders which are tagged as complete on the WAMS system. Other tags are available to identified work orders deferred or cancelled.
- Failures on Scottish Water owned assets. The report excludes equipment failures on private, Aquatrine (MOD) and PPP assets.

The equipment failures reported are those which cannot be rectified by the operators on site and make it necessary to raise a work order to call out a maintenance team. The company cannot separate out works orders which result in a repair from work orders which require some minor intervention such as resetting a trip switch.

The vast majority of equipment failures reported for the sewerage system is related to pumping station failures. Blockage of the pump is counted as an equipment failure.

We were given a breakdown of the data extraction from Ellipse for completed Works Orders allocated to repair:

Ownership Description	**CSO**	**SPS**	**SST**	**Total**	
Scottish Water	235	8351	54	8640	8640 is the figure given in AR09 Table B8 Line 19.
PFI		4		4	
Private		88		88	
DE Strategic Bids		41	10	51	

Ownership Description	CSO	SPS	SST	Total	
No stated owner	5	219	1	225	Potentially all SW ownership.
				9008	

Ellipse holds records on ownership at location, function, stage and equipment levels but when extracting data at the lower, equipment level it does not automatically refer up the levels to derive the information. SW told us that ownership information is complete at location level and we feel that it is unlikely that equipment of this type is all private. Therefore, based on the ownership information it is possible that the figure could be up to 2.4% under-reported.

We examined a sample of Works Orders from WAMS. In a few cases it was difficult to determine from the data given whether there was a failure to be repaired:

We conclude that there may be some over-reporting due to the inclusion of non-repair Works Orders.

Work orders are allocated to assets, allowing failures to be categorised by asset type. The main categorisation is the by site, for example, a pumping station, a sewage treatment works or CSO. As work orders are created, asset information is selected from defined lists which can be cross referenced to the asset inventory and financial cost centres and accounts. More detailed asset information is available which could allow failures to be coded at a more granular level of asset. However, this is optional and generally not used.

There is no resolution coding to confirm that the problem as defined was the problem resolved by the work carried out and fault codes were not consistently used.

We conclude that the data in WAMS does not fully support the extraction and processing required for the WICS returns. We feel that the confidence grades that should be available because SW is using corporate data systems are unattainable because data capture of work actually carried out is incomplete.

Definitions of the equivalent data definition in England & Wales limit reported equipment failures to those which had or are likely to have a detrimental impact on service to customers or the environment.

Within the works orders records examined above and similar to AR08, we found cases where the works ordered or the work actually carried out should not have affected customer service. It may be that these tasks did affect customers, but the WAMS coding is inadequate to provide the information.

We suggest discussion between WICS and Scottish Water to agree a definition of materiality which is consistent with reports in England and Wales.

The Ofwat reporting guidelines for England and Wales is encouraging companies to develop and report on their own serviceability indicators for sewerage non-infrastructure maintenance. This accepts that companies have differing views on what is important to them and therefore the types and level of detailed information recorded. The common aim is to develop indicators which:

- can be reported consistently over a period of time;
- which informs on potential change in the likelihood of service failure; and
- closely aligns with the metrics used by the company to inform its Board on the ongoing state of its equipment.

We suggest that WICS monitors this approach and considers whether a similar approach is appropriate for Scotland.

Sewage treatment works performance: Lines 8.20 to 37

This data was a new requirement in the 2007 return; the methodology was closely set out by WICS and SW's data processing continues to comply with this requirement. There was one change in that from 2008 data is confined to SEPA regulatory and formal samples.

The company has based its analysis on all sewage treatment works where there is regulator sampling data in the last three years. This includes all PFI works.

The company has based its analysis on either the 95%-ile parameter of 2 tier consents or the consent parameters for single tier consents. The consent parameters used are those prevailing at the time the relevant sample was taken. The analysis has taken account of changes to consents over the relevant years.

The sample data used in the analysis is rolling 3-year information obtained from SEPA for regulatory sampling in 2006, 2007 and 2008: as SEPA's data is calendar year related, these lines are reported on that basis. The company has rejected annual works data sets for a parameter where there are less than six sample results in a year.

We have checked the company's calculation and believe that the analysis complies with the detailed reporting requirements. The data is publically available, is transferred to SW complete for all WwTW in bulk and the calculations are carried out from the whole data set.

A works which has events forecast in one event category may also have events in another category. However, it is only reported in the upper category (Max>0.2, then 95%ile>1, then mean>0.5). A works which moves from one category to another may provide an apparent improvement in one line but a deterioration in the other.

Overall, we note the analysis will not necessarily reflect the impact of improvements either for asset maintenance or quality enhancement. If a works at significant risk has been upgraded under the asset maintenance programme, the prediction of events will be based on historic performance and it will take three years for historic failures to be taken out of the analysis. If a works is improved to meet a new and more onerous consent, it is possible that the mean performance of the new works against consent will deteriorate. We note the need to consider these issues when using these parameters to monitor treatment works performance.

Scottish Water's WwTW performance has improved in most lines.

- The 3 year rolling data set tends to smooth out strong changes.
- SW's investment programme and operational changes should drive improvements.
- The procedure depends on long-term consistency in SEPA's sampling and WwTW licensing policies.

We conclude that SW has completed the data extraction and processing well, using publically available SEPA derived information and carrying out the procedure specified by WICS. SW's confidence grade accuracy rating is a reflection of its assessment of the effect of data selection and processing.

Comments by Line

Line 10:	The methodology for determining sewer collapses is the same as in previous years with data being obtained via the WAMS/Ellipse database. The work orders are attached to addresses not assets. The address is generally the address of the customer reporting the problem. This number is not the same as that reported in Line E7.14 as it excludes third party collapses.
Line 11:	The sewer length calculation is as per Table D6.
Lines 12, 13:	These are the numbers of unsatisfactory and total intermittent discharges and are comparable with last year's figures.
Line 14:	This is a calculated field.
Line 15:	Data includes blockages that caused flooding and therefore the number is not directly comparable to AR08.
Line 16:	Based on the number of jobs recorded on the work planning system, WAMS.
Line 17:	Scottish Water does not have the facility within WAMS to identify rising main failures. The estimate is based on site reports and comments within Promise.
Line 18:	B8.10 minus B8.17.
Line 19:	The methodology is commented on above. We identified the possibility of around 2.4% under-recording and 2.5% over-recording for unrelated reasons. These give around 6% uncertainty.
Line 20-37:	We believe that the company has analysed regulatory sample data and works consent data in accordance with the reporting requirements. We have commented on the methodology adopted by the company to analyse the data above.

Comments by Confidence Grade

Lines 10 to 19:	We agree with the confidence grade of B3.

Line 8.15 and 16:	This number is derived from SW's corporate data system. Although the choke form is not yet mandatory, data quality has improved and we feel that grade B2 may be justifiable this year.
Lines 20 – 37:	In so far that Scottish Water is reporting numbers based on an analysis of SEPA's public domain data, a confidence grade of A3 seems reasonable.

5.9 Table B9: Security of Supply Index

Commentary by REPORTER

Introduction

Key points:

- We believe that the information presented by Scottish Water in this table gives a reasonable representation of the resource situation in Scotland under current legislation. Likely future reductions in abstractions under the Water Framework Directive have been taken into account in the analysis in Scottish Water's draft 2009 Water Resource Plan. At the time of the audit the plan had not been formally approved by SEPA. SW reports that there is no particular requirement for SEPA to approve the WRP. SW further states that SEPA has stated an overall agreement with the approaches taken.

- Scottish Water has adopted a target Level of Service for a drought order of once every 40 years in any water resource zone. The change has been discussed with SEPA, who are aware that SW has adopted this LoS

- The Water Resource Plan includes an assessment of the impact of the implementation of the Birds and Habitats Directive and the Water Framework Directive, but does not take account of climate change in the analysis. SW states that it does assess the robustness of a new water resource against climate change.

- Studies have been undertaken to assess Outage allowances for works with DO greater than 1 Ml/d. where the Critical Period D.I. is the average D.I. and therefore covers all WRZ's where Outage is included in the Critical Period Analysis. This work has supplemented the work completed for AR08 and the Business Plan for 38 Water Resource Zones. The revised zone specific allowances range from 0.06% to 1.06% with the values for the two large zones being 0.05% and 0.06%. For other zones Scottish Water has assumed a 0.5% outage value for WRZs less than 1 Ml/d DO and 3.0% outage value for zones greater than 1 Ml/d DO. Benchmarking with other companies published information indicates a wide range of figures for outage allowance from a low of around 0.5% to a high of 8% or more.

- Recognising that six additional studies have been completed we believe that it remains a weakness that site specific factors have not been derived for all the larger zones and works for which an outage allowance applies; 3% may be material where zones are marginal.

- Scottish Water has no information on losses from the raw water transmission mains and continues to apply an assumed overall average leakage of 21 m^3/km/day. The data for the 2008/09 water balance implies that trunk main leakage is about 9.5 m^3/km/day and distribution pipe leakage is about 5.7 m^3/km/day.

- The raw water abstraction flow meter installation was completed during the year. Although the meters should allow much improved estimates to be made of overall raw water losses there will still be calculation uncertainty in the split between transmission and works losses. Scottish Water proposes to evaluate transmission and treatment works losses from the difference between resource and DI meter readings. However this will only be feasible if the resource meter is located at the intake. If located elsewhere, the calculation will effectively only report treatment works losses.

- Site specific treatment works losses as a percentage of Distribution Input are generally significantly lower than the generic assumed values. The relatively high generic figures could result in the DO being underestimated which could be significant, specifically for the zones supplied from the 52 larger capacity works.

- As previously commented, we suggest that Scottish Water analyses data for the range of works capacities and processes within their asset register and assesses whether the use of outliers and site or capacity specific data should be included in any calculation of average losses used in other zones. The omission of the outliers would more reasonably reconcile SW's estimation of losses with our information. We believe that further objective data and analysis is required on this important parameter.

- There is consistency between Table B9 and Table A2 and the numbers used in the water balance.

- Critical period analyses have been completed for 20 WRP08 zones in line with SEPA's guidance for 2006 and the EA's "*Water Resources Planning Guidance*", April 2007. Where the critical period has been assessed as the ADPW (35 zones in supply/demand deficit), SW has assumed that planned and unplanned outages would not occur.

- Scottish Water continues to assume a 3% increase in demand for the dry year critical period. This may be correct in Scotland but is lower than we have sometimes seen in England and Wales. SW's estimate has based its estimate on a review figures used in England and Wales. We accept that it is a difficult parameter to assess accurately..

- In calculating deployable output Scottish Water has interpreted the definition of "water resource system" to include the capacity of the WTW. Thus in some resource zones available headroom is limited by WTW capacity. As we stated in our report for the previous return, we are unsure if WIC wants WTW constraints to be included in this table. However, Scottish Water's interpretation does give a true picture of its ability to supply water to its customers.

- The Critical Period SOSI in 2008/09 is +17, implying that 25% of Scotland's population (1,250,100) are in deficit.

- For this return, Scottish Water has been able to use current measured data in the SOSI calculation. The SOSI index if calculated and reported like for like would have been lower.

- Uncertainty in the estimation of some of the inputs to the analysis (such as treatment works losses and raw water main losses) can lead to uncertainty in the deficits in some areas and hence the SOSI score. This can be material where deficits are small. SW has completed a sensitivity analysis of treatment works and trunk main losses assumptions. At the 2nd DBP we accepted that for the 31 zones analysed the supply/demand balance and proposed investments were insensitive to the assessed losses.

Scope of the audit

A meeting was held with the staff of Scottish Water's Water Resource Planning /Water Framework Directive Team to audit the calculations for Table B9. We understood the basis of the current situation with water resource planning in Scotland and confirmed that, with one exception, the methodology was the same as used for the previous return and the draft business plan submission. However there have been data improvements that have been carried through into the calculations and for the first time current year measured data have been used.

Completed tables were available during the audit although subsequently the calculations were revised resulting in slight revisions to the SOSI scores. The calculations for 3 lines were audited in detail, namely Inverness/Nain (036), Black Esk & Kettleton (237) and Torra (286).

The SOSI calculation was calculated for 'Planned level of service' (Table B9a) and for 'Critical period level of service' (Table B9c). Table B9b is titled *Security of Supply Index – Reference* level of service is blank, which for previous returns was with the agreement of WIC.

Water resource planning in Scottish Water

Since 1998 Scottish Water developed a methodology to assist in water resource planning. This involved developing Area Water Strategies and much of the information generated for Table B9 in previous years on the supply side comes from those studies and progressive data improvements over the last few years.

Since SR06, SEPA has provided guidelines for the development of water resource plans. The guidelines for the plans take account of the Water Framework Directive, the Birds and Habitats Directive and the CAR licensing system that has been implemented since the last Strategic Review. The specification is similar to that used for producing plans by English and Welsh water companies. Completed plans are submitted to SEPA for approval. The latest 'draft' comprehensive WRP, updated from the 2008 plan, was submitted to SEPA in March 2009.

Scottish Water assessed that 129 zones are currently in deficit according to supply-demand balance calculations based on Critical Period Demand and national criteria. 90 are calculated to be in deficit based on Dry Year Annual Average Demand. Roughly half of these deficits are due to water availability and half due to lack of treatment works capacity. The studies identified 48 zones with potential supply/demand balance issues where leakage reduction will be of significant benefit. The ELL calculation completed in December 2008 was used when preparing the 2nd DBP and for the current draft WRPs

The effect of climate change is not included in final supply-demand tables because SEPA wants Deployable Output (DO) to be quoted for non-climate change scenarios. In Scotland generally, climate change is predicted to result in drier than current conditions in only two months of the year (July and August). Thus only the DO of river intakes of small storages with very short critical periods will be reduced. The yield of large storages may increase. So too will groundwater recharge. Climate change is not therefore regarded as a big issue in Scotland.

Current work has been incorporated into the Security of Supply Index (SOSI) presented in tables B9a and B9c. Largely because of the difficulties in preparing yield calculations in its many water resource zones Scottish Water has not prepared SOSI to the reference levels of service as for in Table 9b. Target levels of Service are discussed in the following section. Scottish Water reports that no target reference levels of service have been adopted in Scotland; return period for either drought order or hosepipe bans, unlike in England and Wales. We understand that WIC has agreed that the reference level of service need not be completed.

Methodology

Scottish Water's levels of service

Scottish Water has used the following planned Levels of Service (LoS) in tables B9a and B9c.

- For SR10 and this return, Scottish Water adopted a target level of service for a drought order of once every 40 years in any water resource zone. This is similar to the reference level of service in England and Wales, although companies can have different levels of service. SEPA has broadly supported the change. We believe that a common level of service is equitable.

- Scottish Water has not defined a Level of Service return period for hosepipe bans, and does not intend to implement rota cuts or install standpipes since there is no historical evidence of the need for their use.

Therefore there is no target return period for either measure.

Numbers of water resource zones

Scottish Water has 230 water resource zones (WRZs) in its company area supplied by more than 500 sources. The number of zones is likely to reduce to about 227 during this year due to resource rationalisation. Some of these comprise single sources supplying just a few properties in remote areas. This is double the total number of WRZs in England and Wales and therefore makes the work of producing water resource zone plans onerous for a single company.

Deployable output and water available for use (WAFU)

<u>General</u>

'Water Available For Use' (WAFU) is defined as (*Deployable Output – Outage*)

Deployable output is constrained either by licences set by SEPA, or by hydrological considerations or by raw water infrastructure both with an allowance for raw water transmission losses and WTW losses or by WTW capacity.

The HYSIM-Aquator 'behavioural analysis' yield assessment tool, developed by Scottish Water has been used to evaluate WAFU at most major demand centres (water treatment works) served by large surface water reservoirs. SW has developed 43 HYSIM-Aquator models covering 251 sources in more than 43 Resource Zones and are said to account for approximately 80% of the Company's total output. For the other 20%, mainly small resource zones, where insufficient data are available to provide model inputs or where system complexity does not merit modelling, source yields have been estimated using the CEH Report 108 "Low Flow Estimation in the United Kingdom" as modified for Scottish catchments. There are inconsistencies between HYSIM and Low Flows 2000 and further studies will be required in due course to investigate these inconsistencies.

Yield and licence with an allowance for losses, is reviewed against available treatment capacity and the lowest figure taken. This is then further reduced for outages if the WRZ is considered to have an annual average critical period.

Given that the SOSI calculation represents the current situation possible future reductions in abstraction licences as a result of the Water Framework Directive have not been incorporated into this year's SOSI calculation. There are likely to be further changes as abstraction monitoring becomes more comprehensive and over abstraction is addressed.

The Scottish Water resource flow meter programme will provide additional monitoring network to supplement the gauges already operated by SEPA. By the end of the year, there were 521 installed meters. Further details are available in Section G8. SW reports that it has not yet obtained sufficient data from the new meters to update the deployable output.

In calculating deployable output Scottish Water has interpreted the definition of "water resource system" to include the capacity of the WTW. Thus in some resource zones available headroom is limited by WTW capacity. As commented in previous years, we are unsure if WIC wants WTW constraints to be included in this table. However, Scottish Water's interpretation does give a true picture of its ability to supply water to its customers.

Outages

Outage allowance has been applied to 43 Water Resource Zones, where the WRZ is considered to have an annual average critical period.

For the Draft Water Resource Plans, Scottish Water commissioned a contractor to analyse outage data for 38 WRZs in pilot studies across 7 geographical areas. The report, dated February 2008, concluded that 95%ile outage allowances ranged between 0 and 4.38% compared with the previously assumed values of between 5% and 10%. Of the 38 zones, 9 zones have deployable output greater than 10 Ml/d and 2 zones over 100Ml/d. The outage allowances range from 0.06% to 1.06% with the values for the two large zones being 0.05% and 0.06%. Treatment works outage for 30 works within the zones was also estimated at between 0% and 1.55%. Seven treatment works in the study have deployable output greater than 10 Ml/d, one being over 100Ml/d; the majority of which the outage allowance was between 0% and 0.23%.

For SR10 and this annual return, SW has assumed that:

- The estimated outage value will be used for zones/works included in the study
- For other zones:

  0.5% outage value for WRZs less than 1 Ml/d DO, and

  3.0% outage value for WRZs greater than 1 Ml/d DO.

Studies have been undertaken to assess Outage allowances for works with DO greater than 1 Ml/d. where the Critical Period D.I. is the average D.I. and therefore covers all WRZ's where Outage is included in the Critical Period Analysis. This work has supplemented the work completed for AR08 and the Business Plan for 38 Water Resource Zones. The revised zone specific allowances range from 0.06% to 1.06% with the values for the two large zones being 0.05% and 0.06%. For other zones Scottish Water has assumed a 0.5% outage value for WRZs less than 1 Ml/d DO and 3.0% outage value for zones greater than 1 Ml/d DO. Benchmarking with other companies published information indicates a wide range of figures for outage allowance from a low of around 0.5% to a high of 8% or more.

We commend SW for extending the works outage analyses to include larger zones and works and for implementing the full scale outage date collection trial in the Tayside/Fife zones. However, we still recommend that the programme of site specific studies be extended to all the larger sites, and that once the trial is complete a company wide outage information acquisition procedure and database be established to support future analyses.

Critical Period

There is no change to the approach to the Critical Period Analysis. SW completed critical period analyses for 20 WRP08 zones in line with SEPA's guidance for 2006 and the EA's "Water Resources Planning Guidance" April 2007. Currently, the critical period for the majority of Water Resource Zones is either the Dry Year Annual Average Demand (DYAA) or the Average Day Peak Week Demand (ADPW), the category being determined by the availability of raw or treated water storage. For three zones where SW assessed there to be sufficient storage to move away from ADPW, but not sufficient to allow use of DYAA, the Average Day Peak 3 Months was selected as the critical period.

Where the critical period has been assessed as the ADPW (35 zones in supply/demand deficit), SW has assumed that planned and unplanned outages would not occur. In the case of planned outages, we concur as maintenance would be planned around critical periods. Previously, we have commented on the application of unplanned outages occurring in the period of the peak week demand. As detailed above, SW has completed a study of outage that confirms the low incidence of unplanned events. While it is true that unplanned outages are unlikely to occur during such a short critical period, it is still possible.

Raw water transmission losses

Scottish Water has no information on losses from the raw water transmission mains for the water balance and SOSI calculations and so continues to apply an assumed overall average leakage of 21 m3/km/day; the figure having been derived historically for potable systems. The data for the water balance for AR08 implies that trunk main leakage is about 10 m3/km/day. From our experience, we would expect generic figures for trunk or transmission mains leakage to be less than from a distribution network.

The calculation includes a length factor (increase) and pipe size and works capacity factor (increase or decrease). The estimated leakage from transmission mains must be considered uncertain. The estimates imply significant leakage in relation to the Distribution Input for some smaller resource zones that may be overly pessimistic and thereby distorting the water balance.

The revised 2006-2010 Ministerial Target is for 521 flow meters fitted to water sources. At the end of March 2009, Scottish Water informed SEPA that all meter installations had been completed by the end on AR09. Scottish Water proposes to evaluate transmission and treatment works losses from:

Metered abstraction – Distribution Input = Transmission pipe + Works losses

However the only way to estimate transmission mains losses with any certainty is to meter flows at either end of the pipe. If permanent meters cannot be installed at both ends, a fitting should be provided for a temporary flow meter installation so that periodic measurements can be made. Otherwise, raw water transmission mains losses will continue to be uncertain with consequential impact on the water balance calculation.

Following the audit of the 2nd draft BP, Scottish Water reported that checks were carried to demonstrate the insensitivity of the SDB deficit to halving the raw water mains losses. The calculations have not been reviewed by ourselves.

Water treatment works losses

Water Treatment Works (WTW) losses are assessed either using a table of losses for a range of generic treatment processes, or from treatment works specific "measured" losses, or following a works visit by an asset planner for a zone plan. The generic values are similar to those used in 2007, but with losses from spiral membranes and tubular membranes reduced. Scottish Water has presented evidence to support treatment works losses for coagulated filtration of 10% (range of works DO, 0.4Ml/d to 19 Ml/d), spiral membranes of 28% (range of works DO, 0.046 Ml/d to 1.323 Ml/d) and tubular membranes of 29%.(range of works DO, 0.015 to 0.45 Ml/d), The data for the membrane losses relate to very small capacity works. Taking into account works capacity the weighted percentage losses for the three categories would be 6%, 19% and 28% respectively. All the generic figures appear high and are greater than we have observed elsewhere, although the weighted percentage losses for coagulation filtration and spiral membranes are more in line with our information.

As for outage allowances, published data is variable. For a sample of companies, losses varied between zero and 11% with most WRZ in the band zero to 3%. We accept that losses from membrane plants are high.

The asset register reports 333 treatment works of which 18 are abandoned, 114 are less than 0.2 Ml/d capacity and 52 are greater than 10 Ml/d capacity. Generic values have been used for the majority of works, based on the treatment processes on the site. For seven works, site specific losses were used and for a further 9 works the generic value was modified based on information available at the time. Twelve of the 16 adjustments reduced the assumed losses including at four works supplying Edinburgh and Lothians.

The relatively high generic figures could result in the Deployable Output being underestimated which could be significant, specifically for the zones supplied from the 52 larger capacity works.

As previously commented, given the impact of these figures on zonal deficits we recommend that Scottish Water examines the basis of the figures in Table 3-2 Water Treatment Works Losses in its report "Water Resource Plan April 2006" and the three modified figures used for SR10 (based on 2004/05 data). In particular, we suggest that Scottish Water analyses data for the range of works capacities and processes within their asset register and assesses whether the use of outliers and site or capacity specific data should be included in any calculation of average losses used in other zones. The omission of the outliers would more reasonably reconcile SW's estimation of outage with our information.

SW has completed a sensitivity analysis of treatment works and trunk main losses assumptions. At the 2nd DBP we accepted that for the 31 zones analysed the supply/demand balance and proposed investments were insensitive to the assessed losses. Nevertheless we remain of the view that further objective data and analysis is required on this important parameter.

Dry year distribution input

Average daily distribution input (DI) is used as the denominator in the headroom calculation. As for previous returns Scottish Water has taken the DI increased by 3% for a dry year. This is consistent with the water resource plans. The dry year average day peak week is calculated by applying a peak factor to the dry year average DI. The peak factor has been calculated from DI flow records for each zone using the output from DI meter records for the reporting year. At the time of our audit the data had not been reviewed to remove known incidents during an Average Day Peak Week. SW reports that for the final submission the peak week factor was based on the 2007/08 factor which had had the high values removed.

In our experience the resulting figure could be low in some cases and we suggest that Scottish Water reviews its DI records to check that this figure is appropriate. We would like to see an analysis of DI over a number of years to confirm the 3% currently assumed.

Target headroom

For the 2008 Water Resource Plan, Scottish Water commissioned a contractor to report on headroom uncertainty for 20 water resource zones. The zone studies adopted the 2003 UKWIR Methodology (An Improved Methodology for Assessing Headroom). 2010 Target headroom uncertainty including and excluding supply side climate change both vary between 4% and 12% of WAFU. The higher factors tend to be for the smaller and rural zones.

Target headroom for the remaining zones has not been reassessed and the factors derived using the 1998 UKWIR methodology at the megazone level have been used. The megazone analysis results in a 2010 target headroom range of between 6% of WAFU for the larger water resource zones of the Central Belt to 9% for the rural and smaller zones. These factors are generally slightly lower than those calculated by the 2003 methodology.

As we have previously commented, from our experience these factors are not unusual, although we would not expect all small zones necessarily to have high headroom factors. Overall, we believe that the chosen headroom allowances are acceptable for the current calculations.

The UKWIR 1998 methodology incorporates an allowance for climate change. However, apart from where the sensitivity of supply side climate change has been considered for the 2003 factors, SW has stated that the supply and demand calculations do not include a specific allowance for climate change. This is not an issue for this year's SOSI but in England and Wales this has significantly increased the target headroom allowance for later years.

Population

The total average resident population in the water resource zones is consistent with the population in Table A2 and used in the water balance.

Water operational areas, which are consistent with water resource zones, are delineated on the GIS system. Properties within a water operational area are abstracted from the GIS system and multiplied by the average occupancy rate to give the population details in the tables. Unitary Authority occupancy rates were used but they were then given an overall adjustment to match the total population in households with water. We believe that the resulting estimates are acceptable for the SOSI analysis. Further detail on the population calculation is given in the commentary for Table A.

The SOSI analysis

The Scottish Water methodology for calculating the Security of Supply Index (SOSI) is similar to that used in previous years. We have reviewed the calculations of SOSI and believe them to be consistent with industry best practice and with Ofwat's letter RD03/02. The Critical Period SOSI in 20087/09 is +17, an improvement of 43 points from 2007/08. The Dry Year Annual Average Index is +26 compared with -19 in AR08. These indices imply that about 25% of Scotland's population (1,250,100) are in deficit based on the critical period. However it needs to be recognised that the improvements in the AR09 figures also reflect the impact of using current year data. The SOSI index if calculated and reported like for like would be lower.

Uncertainty in the estimation of some of the inputs to the analysis (such as treatment works losses and raw water main losses) lead to uncertainty in the deficits in some areas and hence the SOSI score. This can be material where deficits are small.

Conclusions

We conclude that:

- Scottish Water has generally been developing its resource strategy in a well planned way, using industry standard methods for calculating deployable output. The HYSIM-Aquator 'behavioural analysis' yield assessment tool in particular is a powerful tool for system modelling.

- The SOSI calculation gives a reasonable indication of the current resource situation, but further development is required to improve the quality of some data sets and to validate the assumptions used.

- Scottish Water has used a 3% increase in demand for the dry year critical period. This is based on an average of the adjustments used in England and Wales. We recommend that Scottish Water checks further to ensure that this parameter has been assessed as accurately as possible for Scotland, although we accept that it is a difficult parameter to assess.

- In some zones deficits are small and it is important that raw water losses and WTW losses are accurately calculated as they may be material to any investment decision. We consider that some of the estimates of losses are high. Although Scottish Water has installed flow measurement on many of its intakes, it is still important to understand the components of the water losses. Monitoring the difference between these meters and DI meters alone may not be sufficient to understand the source of losses particularly where the meter has been installed at the downstream end of the pipe and where generic production losses and transmission main losses are used.

We accept that SW has undertaken a sensitivity analysis in some areas and where done the need for additional resources was not found to be sensitive to the parameters.

Table B9 will continue to be subject to volatility as SEPA's revised abstraction licences address the implications of the Water Framework and the Habitats Directives on abstraction rates and provides guidance on how to deal with climate change.

6. SECTION D – ASSET INFORMATION

6.1 Overview

Tables D1 – D3 summarise commissioned assets for water, wastewater and management and general categories, by number and value.

Tables D5 and D6 give physical asset data for water and wastewater projects (including resource planning and drainage studies) reaching commissioning in the year.

Tables D7 and D8 summarise the value of capital maintenance expenditure for projects commissioned in the year for water and wastewater, by Scottish Water region.

For all D tables, commissioning refers to those projects reaching the Beneficial Use stage in the year and the value reported refers to total project cost at the end of the year in which Beneficial Use is reached, apportioned to drivers where relevant. Both Q&S2 and Q&S3a projects are included. Data in the D tables are consistent with those in the G and H tables.

Scottish Water has comprehensive and well-managed processes for collecting data from project managers, applying proportional allocation and compiling the D tables.

Scottish Water has cleared the backlog in data entry for mains renewals. However, historical abandonments continue to be found from operational records, and 175 Km were deducted from the asset base in AR09.

The closing balance of critical sewers has been determined from the GIS data. We commend Scottish Water for taking this fundamental approach on a year-by-year basis (rather than adding or subtracting changes to last year's figures). The closing balance for all sewers is based on the total length of sewer in GIS, plus 1000km of main sewer which are assumed to exist but which are not yet in the asset inventory. New discoveries are added into the GIS without a corresponding reduction in the 1000 km allowance. A further addition of about 16000 km is made, representing lateral sewers assumed to exist but not yet included in the asset inventory. This addition was based on a statistical approach to the likely length of lateral sewer per dwelling of each type. Recalculation has produced a different length each year, reflecting changes in housing type which in practice can have little effect on actual sewer lengths in the ground. We recommend that Scottish Water reviews these two procedures, which will otherwise increasingly corrupt the quality of the return data.

Good processes are in place for the specification and production of new drainage studies and for managing the use and updating of existing studies.

SW has now completed its programme of establishing DMAs. Progress on this project has been reported regularly to the Regulatory Leakage Group.

Scottish Water has reasonable rules for proportional allocation. All Q&S3a projects use proportional allocation in accordance with those rules and proportional allocation is reviewed at each Capex stage. The same now applies to most Q&S2 projects. The correct allocation of projects and costs to outputs, asset types and Scottish Water regions has been confirmed by the audit.

Capital maintenance expenditure has reduced significantly in the report as a result of the substantial completion of capital maintenance programmes and the increased emphasis on quality projects in the 2008/09 programme.

6.2 Tables D1, D2 & D3 – Workload Commissioned Assets

Introduction

Key Points

- The report covers the value of assets reaching beneficial use in the report year. For rolling programmes of work this includes the quantity and value of the individual assets commissioned in the report year.
- The commissioned value given in the tables is the value at the end of the commissioning year, not including any later spending or differences between accrued and actual costs.
- The reported information includes Q&S2 completion projects and Q&S3a projects.
- Data are compiled from spreadsheet data returned by project managers and are consistent with data in the G and H tables.

Audit Process

During the audit we reviewed:

- Sources of data on the workload of commissioned assets
- The methodology for compiling the table
- The allocation of costs to project types
- The consistency of data with that reported in G and H tables

We also audited each line of the table to confirm the audit trail back to the base data, including making sample checks on the compilation of the data to reproduce the totals given in the tables. The audit was carried out by interviewing members of Scottish Water's staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

Tables D1, D2 and D3 are no longer compiled automatically from detailed data entered in tables G5 and G6. As in AR08, Scottish Water collected information on commissioned assets for the AR09 return directly from project teams and other areas of the business. The reported information includes both Q&S2 completed projects and Q&S3a projects.

Tables D1 and D2

Information for Tables D1 and D2 was compiled annually from 5 areas:

- Scottish Water Solutions, Capital Investment Delivery Team and Quick-wins projects
- Operations reactive projects
- Mains and sewer rehabilitation projects
- Adoptions
- Miscellaneous other projects

Information was collected from these areas as follows:

Scottish Water Solutions, Capital Investment Delivery Team and Quick-wins Projects

A spreadsheet template was issued by Information, Data and Reporting (IDR) for completion by project managers. This template was a download of CIMS data for projects expected to be completed in the year and included dropdown menus for WIC grades and Ellipse asset codes, as well as the project list. The project manager entered the asset category, WIC grade, X-factor and cost (apportioned in line with rules for capital allocation). The data were then uploaded by IDR into a standalone spreadsheet, recording the originator and date of the update, and then mapped onto the D tables. Project managers and others were also asked to make adjustments for any under- or over-reporting in previous years.

Operations Reactive Projects

Using a new methodology for AR09, reports were provided by Finance in a spreadsheet covering six areas of work: water non-infrastructure, wastewater non-infrastructure, mains, sewers, lead communication pipes and other communication pipes. Information on the work content was derived from WAMS and costs were provided from the job cost on PeopleSoft. It was assumed that all work on sewers was on non-critical sewers. The spreadsheet data were uploaded into a standalone Access database for the compilation of the tables. Sample checks were made on the base data, which showed that Tables D1, 2 and 3 had been correctly compiled from the base data.

Difficulties reported by Scottish Water in collecting these data in previous years have eased due to focussing the collection of the data through a single team and the provision of guidance on matching assets to asset codes. Some small potential for miscoding arises with CSOs as work on these has been included within the sewers category. Another area where data are believed to be incomplete relates to the 'Quick Hits' programme. These inconsistencies are reflected in the confidence grades.

Mains and Sewer Rehabilitation

Data were provided by the Capital Investment Delivery (CID) team. The methodology is unchanged from that used for AR08. CID made a spreadsheet return on work carried out, listing for each project; diameter, work type, location and length. Costs were calculated using a unit cost approach applied to the work volumes in the year (projects may span more than one year) so that the actual project costs were spread across the relevant assets.

For mains, the CID return distinguished between potable mains, lead communication pipes and other communication pipes. For communication pipes, the material and whether short or long side were given. Requested information on sewer criticality was not provided and instead it was assumed that any sewers under 600mm in diameter were non-critical. It was also assumed that no rising mains were included.

Adoptions

Spreadsheet information was provided by Customer Connections (CC) at a site-by-site level, identifying size bands and corresponding costs. The costs given for adopted assets corresponded to the cost to Scottish Water of the contributions made to developers, plus Scottish Water's fees. The information was provided by CC. This cost will be less than the construction cost of the assets in question, which are constructed at the developer's cost and offered for adoption.

Miscellaneous Other Projects

This category applied to only three projects in the report year where projects were being managed by a project manager not attached to one of the usual delivery vehicles. Information was provided by the project manager on an individual basis.

Guidance on the entry of figures for air-valves was checked and seen to have been properly applied. These are reported at line D1.18, band 1.

Sample checks were made on the spreadsheets listed above and the data were found to be consistent with the data listed in Tables D1 and D2.

Table D3

The methodology for compiling this able is unchanged from AR08. Data were provided as follows:

- Facilities (offices, labs, depots, workshops and control centres)
- Logistics (vehicles and plant)
- The Telemetry Manager (telemetry)
- IT (information systems)
- Estates and CID (other non-operational assets)

Data were collected on a spreadsheet sent out by IDR and manually entered into Table D3. During the audit the returns for each area were examined and seen to be specific as to projects, locations and costs. The commissioning date was either the Beneficial Use date or the date of purchase. Project costs included overheads and were in money of the day. The original spreadsheet data were examined and seen to be consistent with the table lines.

Due to the change in format in Tables G5 and G6, from AR07, there is no longer a risk of double counting of Support Services assets, since these are reported separately in Table G3 and not apportioned to water or wastewater services.

General Considerations for Tables D1 – D3

Tables D1 to D3 are consistent with Tables G5 and G6 as both use the same basic data from CIMS, although D1 to D3 are no longer compiled directly from G5 and G6, as was the case up to AR06. Tables D1 to D3 are also consistent with the H Tables as they use the same asset types and size bands.

Assets were allocated to asset types which are consistent with the table line definitions. Where investment in a treatment works resulted in a change of type, investment was reported against the revised asset type. Commissioned assets were reported as corresponding to projects reaching Beneficial Use in the report year, or to the date of purchase if a purchased item. Beneficial Use dates claimed by project managers were reconciled by IDR (now CIV) with those shown in CIMS. Where a project covered a rolling programme of work (for example asset maintenance or vehicle replacement) the quantity and value of assets completed in the report year are included in the return.

The reported value related to the asset commissioned, including spend in previous years as appropriate. For rolling programmes reporting commissioned assets over a number of years, the value in the report year was consistent with the quantity of asset commissioned in the report year.

For projects forming part of rolling programmes, the value of commissioned assets was captured, including actual costs to the end of the report year. For projects not part of rolling programmes, the value of commissioned assets was captured including actual costs to the end of the report year, plus forecast future costs including any accruals or other provisions. Where future costs prove to be different from those forecast this will result in a small error in the reported values however this is likely to be insignificant. A slight lag is inevitable between actual project commissioning and the entry of data into the tables, so the tables may not fully reflect the year's commissionings. This effect will be repeated each year and so will have very little effect on the accuracy of reported values year on year.

The project teams allocated costs across asset types based on detailed project cost data. This will exclude other costs incurred directly by Scottish Water and included in Scottish Water's project accounts. These costs were later spread across assets in proportion to the costs identified by the project teams.

The costs are in money of the day. Prior year costs included in the commissioned asset value are not inflated to report year prices.

Size bands used were compatible with those used in Table H. MEAV summaries were compatible between Tables G and H. When calculating the MEAV of a newly-commissioned asset the whole project cost was used, being allocated to quality or enhancement drivers. This effectively writes off the whole value of the replaced asset, but does not make any allowance for a potential reduction in MEAV, for example where a water treatment works is abandoned and a mains connection made. This is compatible with the approach taken for Table K56 in AR06 and with practice in previous years.

Information reported in D tables is generally consistent with the H tables and takes into account newly commissioned assets. However the source data for H tables were drawn principally from GIS and Ellipse and so are dependent on timely updating of those systems following the commissioning of a new asset. Comments on this issue are provided in the commentary on Table H, below. Information in Tables D1-3 relates to the commissioning of assets, rather than sites. Individual sites may consist of many assets and there may be many assets commissioned on a single site in a year, so for assets other than pipes numbers in the D and H tables cannot be directly reconciled.

Conclusions

From our audit we concluded that Scottish Water has a thorough and well-managed process in place for collecting base data direct from project managers and compiling Tables D1 - D3. Data checks showed the base data to be compatible with entries in the tables. It was noted that information on support services assets was manually entered into Table D3, which gives rise to some potential for human error.

Due to the change in format in Tables G5 and G6, from AR07, there is no longer a risk of double counting of Support Services assets. Guidance on the replacement of air-valves has been correctly followed. Size band definitions provided for Tables H2 – H6 were used for Tables D1 – D3. Our conclusions on confidence grades are given below.

Comments by Line

Line D1.18: Replacement air-valves are reported at line D1.18, size band 1. The costs of new air valves are included in mains at line D1.47.

Line D1.48 The assessed value of cathodic protection work is reported at line D1.48 under commissioned value, size band 1. No corresponding physical asset is reported on this line

Lines D3.7 – 8, 27 - 28:

The report tables do not make provision for a report of changes in asset stock for vehicles and plant.

Lines D3.13 – 16, 33 - 36:

The report tables do not make provision for a report of changes in asset stock for other non-operational assets.

Comments by Confidence Grade

The company generally reports B2 and B3 confidence grades for these data. We believe that, given the improvements noted in procedures noted above, these confidence grades are generally reasonable.

It was noted that confidence grades of A1 have been allocated in lines D1.48 – 51. It is not clear why higher grades have been allocated for these lines than for the remainder of the table and we recommend that B2 grades should be given.

We suggest that a BX confidence grade would be more appropriate for zero returns to allow for the risk that some minor asset types will not be identified in the data returns.

Confidence grades given to lines in Table D3 are similar to those assessed for AR08 and are supported.

6.3 Table D5: Activities - Water Service

Commentary by REPORTER

Introduction

Key Points

- Table D5 was a new table for AR07. Information on water mains rehabilitation and water resource planning was given in Table C7 in AR06, but owing to the change in information requirements, direct comparison is not always possible prior to AR07.
- Most new mains are added as a result of developers' activity. The bulk of mains renewal is carried out by Scottish Water Solutions (SWS) and Scottish Water Capital Investment Delivery (CID), who are managed associate delivery partners (ADPs). Smaller lengths result from reactive operational activity.
- Scottish Water's closing balance of mains length is derived every year from the GIS asset information. Last year's backlog of contractor data has been cleared.
- The source of data for reporting on DMAs is Perform Spatial Plus (PSP), the Scottish Water leakage and DMA management system, which is updated from GIS on a batch basis when DMAs are completed and uploaded. Because of batch uploading PSP may not be fully up-to-date.
- Further progress has been made during the report year and by the end of the report year Scottish Water had set up all its DMAs giving a total coverage of 95.1% of population. The figures reported in the table relates to the year-end position and not an average position.
- In the Water Resource Planning tables percentage property coverage is used as a surrogate for percentage population coverage.

Audit Process

During the audit we met with the operators and data extractors of Scottish Water's GIS database for water mains infrastructure. We saw the results of the extractions and discussed how alterations had been carried out through the year.

New and abandoned mains data comes from CID and also from WAMS. We inspected the list of new main and rehabilitation investment works in the year, and saw how the numbers were collated and fed through a summary spreadsheet into the Table figures. All completions claimed are within AR09 with an effective date at 31st March.

Similarly, we examined the mains cleaning contracts for flushing and swabbing. We discussed the water mains abandonment summary, which shows the mains lengths discovered to be abandoned in AR09. Historic abandonments are still being discovered; we were shown how these are not included in Line D5.7.

As the proportion of reline to rehabilitation has changed by more than 10%, we checked Scottish Water's policy (4.29% in AR09, 3.80% in AR08; 13% change).

Methodology

Mains Asset Balance

The source for data on lengths of mains renewed, relined, newly-laid and abandoned are Capex5 forms submitted after completion of the work. The basis of length assessment is contractors' record drawings for contract work and WAMS work orders for reactive operational work. Capex5 approval is not given until record drawings have been received, so final payments (including developer cost contributions) cannot be released and this provides an incentive to the project manager to submit records promptly. Upon receipt, records are loaded onto GIS, so a lag may result between beneficial use of the mains and their appearance on GIS.

The proportion of reline to rehabilitation has changed from 3.80% in AR08 to 4.29% in AR09. As this change is more than 10% we queried Scottish Water's policy on relining or replacing. Scottish Water states that the decision is based on asset condition grade (1, 2, 3 reline and 4, 5 replace) as determined by pipe samples on the intervention length. The policy is long-term and unchanged. Currently SW does not have a quality driven programme for its mains rehabilitation, which is reflected in the low percentage of reline. .

Scottish Water's mains flushing for quality purposes data (Line D5.5) is derived from the CID mains cleaning programme driven mainly by the iron and manganese quality standards. Mains cleaned for other purposes is derived from WAMS and added to give the total cleaned length in Line D5.4.

New and abandoned mains lengths are derived from the investment programme for the year. A list of these was provided for audit. We believe that while there may be a lag between Scottish Water's taking beneficial use of new assets and the updating of GIS, this has minimal effect on the total lengths recorded in the return.

Scottish Water cleared a backlog of renewals in AR08, which has not recurred. However, historical abandonments continue to arise from operational records, and 174.48 Km were deducted from the asset base in AR09.

Information on communication pipes is sourced from weekly returns from CID to GIS for the mains rehabilitation programme and from WAMS for reactive operational work.

Data quality checks are run routinely before data are uploaded onto GIS. Any inconsistencies found are referred back to the originator through a quality-assured snagging system for resolution, with payments being withheld in the meantime.

Water Resource Planning

The information reported is sourced from Scottish Water's leakage control management system "Perform Spatial +" (PSP)

The status of DMAs is monitored and assessed as being in one of three categories and this information is updated on PSP on a daily basis. The categories are:

Category 1: fully operable.
Category 2: not reporting due to a transient problem.

Category 3: problem requiring the DMA to be off line for some time.

Although DMA category is updated daily on PSP, other DMA data is not routinely updated after the initial entry. Consequently DMA data on PSP may become out of date with the actual metrics over time. Scottish Water has a programme to routinely update PSP with DMA data. This should both aid accurate leakage estimation and improve regulatory information for the current year.

Details of DMAs are first delineated on the GIS system which is used to calculate details on properties and mains in the DMA. The information is then downloaded onto PSP, which uses Strumap, another commercial programme, to allow visualisation of the DMAs in the same manner as the GIS.

Within the year, Scottish Water has completed its programme of DMA establishment. 147 additional DMAs were set up in the reporting year compared to 770 additional in the previous year. The current figure of 2773 DMAs includes a number of TMAs (Trunk Main Areas). TMAs are different to standard DMAs:

The TMA covers a length of trunk main which is metered at either end; it does not comprise a discrete area of many mains as a normal DMA.

The trunk main may or may not have a small number of direct customer connections.

The fact that nearly all the DMAs are recorded on the GIS system should allow an accurate count of property numbers, used as a surrogate for population when calculating % coverage. We believe that the use of this surrogate is acceptable.

Conclusions

Mains Asset Balance

The mains asset data is taken anew each year by direct interrogation of the GIS database. As such, this is as close to the company's record as possible and the approach is commended.

The lengths reported for work done on the network are taken from SW's investment data by information fed directly from capital investment section and the control at the end of year is reasonable. We therefore believe the return figures to be reasonably reliable and accurate.

The use of line 7a to hold both historical errors and the balance between annual length assessments is therefore logical and reasonable. After allowing for historical abandonments, this line represents 0.78% of the total mains stock variance.

Water Resource Planning

We believe that the data reported on the DMA programme is robust.

Comments by Line

Line 1: The opening balance of mains length is equal to the closing balance from AR08, Line D5.8.

Line 2: It is assumed that the length of mains renewed is the same as the length of the mains which are replaced.

Lines 2 - 3: Lengths given are derived from as built records.

Lines 4 - 5 The length of mains cleaned is assessed from WAMS job codes. Although the length is a reasonable assessment, WAMS resolution codes do not provide full confidence because site information can be incomplete or different from the initial works order.

Line 7: The basis for assessment of this line is GIS, updated from contractors' or operational survey sheets using a procedure set out in a Technical Guidance Note (TGN). Capex5 approval and the corresponding payments are withheld from contractors until this data has been provided.

Line 7a: As Scottish Water generates the total length of mains from GIS each year, this line is used to reconcile any differences which effectively arise from better information on the water infrastructure asset.

Line 8: Scottish Water generates the total length of mains each year from the GIS data.

Line 9 - 11: No communication pipes were replaced in the report year for quality purposes. Lead communication pipes were replaced after requests from customers and in conjunction with the mains rehabilitation programme.

Line 12: This line reports the cumulative total of all DMAs which have been handed over. At the time of handover all of these DMAs were in Category 1. Any of these DMAs may be temporarily in Categories 2 or 3 at any time. The position is at the year end; it does not represent an "average" for the year.

Line 13: This line reports the number of DMAs fully validated and handed over during the year. This is the same as the difference between line 12 for the reporting year and the previous year. The DMA programme is now complete but SW may show small variances in future years as DMAs are rationalised in the light of experience. Given other reporting mechanisms available to WICS through the Regulatory Leakage Group WICS may consider that in future years this block of lines need not be reported.

Line 14: This line is a snapshot at a point in time and represents the number of DMAs in a Category 1 condition at the point in time. This shows that at the time in question 81.6% of Scottish Water's DMAs were operable, a reasonable figure.

Lines 15 -16: PSP holds property data within DMA polygons uploaded from the GIS and these have been used to estimate the number of properties served by each DMA. Comparison with the total estimated number of Scottish households gives the quoted figure, with percentage properties standing as a surrogate for percentage population. For line 16, 'valid' is taken as meaning all DMAs which have been validated, even if some are currently at Category 2 or 3. This is considered to be acceptable.

Line 15 is calculated as Line 16 for the reporting year minus Line 16 for the previous year

The figures include for some larger DMAs (called super DMAs) and small water supply zones. All companies have some "super DMAs". The use of small water supply zones has been discussed at the Regulatory Leakage Group and are considered to be acceptable.

Line 17: For this line 'valid' is also taken as meaning all DMAs which have been validated, even if some are currently at Category 2 or 3. The number of connections in each DMA polygon is calculated on a DMA-by-DMA basis for each valid DMA from the number of properties in that DMA (as in lines D5.15 and D5.16), applying a rule-based approach which allots numbers of connections to groups of stacked properties. This approach is based on surveys carried out by East of Scotland Water under the INMS programme and is covered by Technical Guidance Note WIC/TGN/H3_07. Since some properties have shared connections, the number at Line 17 is, as expected, lower than that at Line 16, where percentage properties are used as a surrogate for percentage population. The total numbers of connections in SW is taken from the numbers of communication pipes in lines H3.6 and H3.7.

Line 18: For this line 'valid' is also taken as meaning all DMAs which have been validated, even if some are currently at Category 2 or 3. The length of mains in each DMA polygon is obtained from GIS and the length in valid DMAs is summed for comparison with the total length in Scottish Water (Line D5.8). The reported percentage is significantly lower than that reported in line D5.16 because many trunk mains and other associated mains are not covered by DMAs.

Comments by Confidence Grade

Lines 1 & 8: Scottish Water generate the mains total lengths directly from GIS each year. Less adjustment is now being made for updating from historical data (174.48 Km of abandonments) and we feel that grade A1 is reasonable.

Lines 2 - 3 Lengths are taken from contractors' returns, and we believe that the grade of B2 is reasonable.

Lines 4 - 5 Lengths taken from WAMS where resolution coding could possibly be improved; a grade of B3 is considered reasonable.

Lines 6 - 7 Lengths are taken from contractors' returns, and a grade of B2 is considered reasonable.

Line 7a: Line 7a includes an element of balance between the GIS trawls for AR08 and AR09, and a confidence grade of B2 seems reasonable.

Lines 9 - 11: Lengths include those replaced by reactive operational work recorded on WAMS. For lines 4 and 5 we noted that mistakes can be made in WAMS resolution codes, but as replacement of communication pipes should be less prone to error, we accept the grades suggested.

Lines 12 to 18: The stated confidence grades are accepted, but the use of percentage property connections as a surrogate for percentage population results in some minor uncertainty regarding Lines 15 and 16. Averaging occupancy rates over large numbers of households will tend to reduce the potential discrepancy

Scottish Water has reduced the confidence grade in Line 17 from an A3 to a B4. SW has based its calculations on an estimate of connections rather than simply properties. Any estimate of connections rather than properties is more inaccurate. Its accuracy is difficult to assess. We accept that there is some adjustment to recorded figures and so accept the B grade. We accept SW's revised accuracy grade but reiterate that the accuracy is very difficult to assess.

We are unsure if WICS meant SW to undertake its calculation on the basis of connections rather than properties, but note that properties is taken as a surrogate for population in Line 15.

Scottish Water has increased the confidence grade in Line 18 from an A3 to an A2. We accept that this figure, sourced from SW's leakage control computer system using downloaded data from the GIS system should be accurate and accept the revised grade.

6.4 Table D6: Asset Performance and Activities – Wastewater Service

Commentary by REPORTER

Lines 1 to 13; Critical /Non-critical Sewers

Introduction

Key Points

- The reported length of critical sewer reconciles with the asset inventory Table H4. Scottish Water has mainly used the same methodology as last year to estimate its critical sewer lengths. The methodology includes features for proximity mapping, such as tourist, retail, industrial and hospital sites and an assessment of traffic-sensitive sites. The methodology is discussed in the report for Table H4.

- The opening balances for the total lengths of sewer and critical sewer are the closing balances reported in table D6 lines 13 and 8 respectively in the AR08 return.

- The closing balances for the total length of sewer and critical sewer are the figures repeated in E7 lines 8 and 13 respectively.

Audit Process

In the audit we met with the operators and data extractors of the GIS database on which the infrastructure is recorded. We saw the results of the extractions and discussed how changes had been made to the data during the year.

New sewers are added from CAPEX via CID for improvement work and from development records for adoptions. Similarly abandonment data are supplied by CID. Data for lengths renovated or renewed may be supplied by CID or may be extracted from WAMS. We were provided with lists of project completions for the year with appropriate data to verify the return. We were able to see that lengths are only added or removed from the database once the work and the contracts had been completed. We inspected drawings for two projects. We were given a summary from WAMS to show lengths of CCTV and man-entry inspection. We note that the system should change next year and data should be extracted using Infonet, the new sewer data modelling software.

Some historic sewer abandonments are still being discovered. We were given a list of these and note that they are part of the figure given in Lines D6.7a and D6.12a for "Other changes" to sewers.

A summary of the sewer inventory balance was provided to show changes in AR09 compared to AR08 and to demonstrate some of the detail behind the return line figures. These were consistent with the details provided earlier.

As the GIS is interrogated every year, any differences unaccounted for by the stated adjustments are included in Lines D6.7a and D6.12a.

Methodology

All Scottish Water's infrastructure assets are recorded on a GIS database on an Ordnance Survey background map. The data can be interrogated throughout the company down to site level, where operators have handheld computers with this functionality.

Every year the GIS is interrogated for the annual return with the data as at year-end, but with a short period allowed for last-minute completions or deletions from the investment programme and from operational changes. These data are supplied by CID for major schemes, Developer Services for adoptions and taken from WAMS for work undertaken by operations. Consequently the final year-end statement is directly assessed from the sewer records with two additions:

- Adjustment for off-inventory sewers. An assessment in AR06 showed that when compared with the list of sewered properties and their proximity to a sewer, around 1000Km of sewer should be added. This is assumed to be 50Km of critical sewer and 950Km non-critical, and is not adjusted.

- Adjustment for lateral sewers. Scottish Water assessed by property type the lengths of lateral sewer it should own on a sample basis and hence calculated the length of laterals. This calculation is repeated every year on the basis of numbers of property types taken from published local authority data.

Conclusions

The closing balance of critical sewers has been determined from the GIS data. We commend Scottish Water for taking this fundamental approach on a year-by-year basis (rather than relying on adding or subtracting changes to last year's figures). We note that Scottish Water was able to claim in the adjustment summary the short length of 30m of sewer deducted because Ordnance Survey have revised the background mapping. Accordingly, we believe that the "Other Change" lines D6.7a and D6.12a are correctly used to reconcile all other adjustments.

The closing balance for all sewers is based on the total length of sewer in GIS, plus a further 1000km of main sewer, assumed to exist but which are not yet in the asset inventory, together with an allowance of about 16000 km representing lateral sewers which are assumed to exist but are not included in the asset inventory. The methodology was first carried out in the AR06 return and the same process carried out in every year since. There are two unresolved problems around this methodology:

- While 1000 km of main sewer was reasonably added (assumed to exist but not recorded) in 2006, any new discoveries are added into the GIS without a corresponding reduction in the 1000 km allowance. No account has been made for this.

- The estimate of around 16000 km of lateral sewers was based on a relatively detailed investigation into dwelling types etc. from local authorities in 2005-06. This was repeated in AR07 and this year. However, the initial investigation was based on a statistical approach of the likely length of lateral sewer per dwelling of each type. Intrinsically the number should not change with time, so recalculation should be unnecessary. In fact, recalculation has produced a different length each year, from 15364km in AR06 by stages to 16403km in AR09. The changes reflect the changes in housing type from published local authority data which can have little effect on actual sewer lengths in the ground.

We recommend that Scottish Water review these two procedures, which will otherwise increasingly corrupt the quality of the return data.

Comments by Line

Line 1: This is the figure reported last year as the closing balance of all sewers in Line 13.

Line 2: This is the figure reported last year as the closing balance of critical sewer in Line 8.

Lines 3 and 9: This is the length of new sewers added in the year – split into critical and non critical, as discussed in the methodology above.

13km of new critical sewer were added this year compared to 39 km in AR08 and 22km in AR07.

Line 4: This is the list of sewers inspected, made up of data from three sources as discussed above.

Lines 5 and 10: Scottish Water is reporting 10.49km of renovated sewer length this year.

Lines 6 and 11: Scottish Water is reporting a total replacement length of 10.46km for critical and 46.02km for non critical sewers.

The sewer length between manholes is reported as rehabilitated, even if the rehabilitation is only a local repair.

Lines 7 and 12: This is the length of sewers in GIS described as "abandoned" with the abandoned date in the report year. The length is split between critical and non-critical sewer as discussed in the methodology above.

Lines 7a and 12a: These are reconciliatory figures to enable the figures in the D6 table to summate to the "known" opening and closing balances.

Line 8: The closing balance for the length of critical sewer is 11502 km, which is based on GIS at the year-end.

Line 13: The closing balance of 50139km comes from the assessment of the sewer lengths in this years GIS dataset, with assumptions for additional main sewer and lateral sewer lengths which are assumed to exist, but are not detailed in the GIS.

Comments by Confidence Grade

We accept Scottish Water's assessments this year for Lines D6.1 to D6.13.

Lines 14 to 19; Studies

Introduction

Key Points

- Scottish Water has 805 drainage areas. 51 studies were identified for the Q&S3a period, of which 12 have now been deferred to the Q&S3b period, 17 completed and 22 are under way.
- Scottish Water has a good process in place for specifying and producing new drainage studies and controlling access to all studies for updating and use. In addition SW is making progress in reviewing and rationalising its stock of historic studies.
- The audit process for studies appears to be effective.
- The three drainage area studies examined had been carried out in line with the specification in use at the time of preparation and the audit process had effectively identified deficiencies, resulting in appropriate remedial action.

Audit Process

During the audit we reviewed:

- Scottish Water's methodology for DAS completion, access and updating
- Sources of data on DAS progress
- The methodology for compiling the table
- A sample of 3 drainage area studies to assess conformity with the methodology and the adequacy of the study as a basis for identifying and prioritising investment

We also audited each line of the table to confirm the audit trail back to the base data, including making sample checks on the compilation of the data to reproduce the totals given in the tables. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

Scottish Water has produced drainage studies for a variety of purposes, ranging from small, rural project-specific studies (for example to check spill volumes) to major, all-purpose urban studies. There are estimated to be over 2000 drainage models currently in existence. These have been produced over a number of years and Scottish Water considers those over 5 years old to be unreliable. A number of studies were inherited from predecessor authorities and many have been consolidated and rationalised. The SIIOP specification was defined after amalgamation to combine predecessor studies to a common specification. This was updated in 2007 and again in early 2009. Studies have been completed using the version of the specification in force at the time they were begun. As a result completed and continuing studies use different versions of the specification. New studies completed from now on will follow the latest version of the specification.

Scottish Water is now bringing all of its drainage studies together on a common platform using InfoWorks with an Oracle front-end. This work, which is not yet completed, will create a master database of studies. It will be held on the Scottish Water data network but will stand alone and not be part of the corporate data repository. Scottish Water has set up procedures to manage and control access to and updating of models. Access requests and issues identified are recorded in a stand-alone non-corporate database controlled by a nominated SW officer. Access to the DAS library folder is limited, modelling activity for different purposes such as investment projects, flooding verification and developers' drainage impact assessments is coordinated and there is a risk assessment process covering the risk of changes in the catchment not being fully understood.

The number of sewerage drainage areas, reported as 805, is unchanged again for AR09. An area may vary from the single large catchment area of an urban WWTW to a large rural area comprising the catchments of several small WWTWs. Models do not exist for all of these areas. In AR07 it was reported that Scottish Water had undertaken a major reassessment of drainage area study zone boundaries. Boundaries were redrawn to create zones which are, or might be, connected hydraulically. The objective was to define, on a common rational basis, a set of stable zones which are unlikely to change as future development occurs.

Scottish Water is now rationalising drainage area study zone boundaries. The boundaries will be based on the catchment area draining to a particular WWTW, giving an improved understanding of the population and distribution as well as subsequently assisting in the management of the treatment works. This would introduce the potential for joining previously separated catchment models. The catchment of Dalmuir WWTW for example has over 150 drainage area zones, split at hydraulic discontinuities. The revised boundary structure is thought by Scottish Water to be ideal, comprising a live document which changes as the network load changes with development and other changes within the catchment. The update is expected to provide Scottish Water with an accurate representation of system loading but that it will also introduce increased workload to simply maintain the drainage boundary data.

Scottish Water's methodology for DAS completion was reviewed and a sample of DAS was examined for consistence with it. The components of the methodology are:

- Introduction
- Initial planning study
- Data collection
- Model build and verification
- Needs assessment
- Optioneering
- Data management and software

Each stage is supported by process flow-charts, within which each activity has a procedure guide and specified data requirements. Data request return and issue, project change and risk register forms were seen.

The DAS specification covers all studies regardless of category.

Drainage area studies are carried out using industry standard software and technology available at the time of the study. The scoping study stage considers the development of appropriate tools to allow the robust identification/ confirmation and quantification of needs, perceived or otherwise, and solutions within the study envelope, in a cost effective manner. As a result the study may not be fit for purpose in the future when software and technology have developed and additional study drivers have been identified for the drainage area. It may then be necessary to revisit studies previously reported as completed to carry out model upgrades. In line with this thinking, a number of studies have been identified for update. The extent of these updates varies from desktop study to full verification.

In our report on AR08, we drew attention to one study where a non-verified model was used for solution development. It is confirmed that this was only possible for older studies and that the SIIOP and current DAS specifications require that models are verified. These specifications require that both the verification and optioneering stages are subject to independent audit. Where older, unverified models are used, Scottish Water is carrying out limited verification. Where UIDs are concerned, models are fully verified. Where modelling is required for other purposes, they are reviewed but not subject to full verification. This leads to a risk that flooding frequencies, volumes and locations could be inaccurate.

For line 19, populations are calculated from the AddressPoint data, also used for the calculation of line A1.21, where populations are assigned to each WWTW catchment. For this line drainage areas are associated with studies to derive the population in each. Property number are scaled down to 95.77% of total population to allow for non-connection. The same proportion is used for all regions.

The drainage study tracker database was examined during the audit. This lists for each study the location, catchment reference, DAS reference, consultant, type and progress and was the source of data for the completion of the lines in Table D6. For each line in the table the database was interrogated and the table data successfully reproduced.

Three drainage area studies were reviewed during this audit, with network access to the detailed DAP report. It was seen that the process for carrying out the study was followed, with appropriate reporting at each stage.

The first study examined was a 2008/9 update of a 2007 model for Eastern Edinburgh. The DAS specification was seen to have been followed in full. The DAS consultant concluded that verification was good, although plots of predicted versus observed flows, levels and velocities did not appear to entirely bear this out. There was a reasonable verification with historic flooding events. The audit report on the model identified shortcomings but concluded that it was fit for purpose, subject to some further investigation and re-modelling. We recommend that more rigorous verification is carried out and defined accuracy levels are met before studies are accepted.

The second study, in the Loch Leven area, was a limited study to assess CSO spill volumes and the potential for WWTW abandonment only. Limited verification showed adequate correlation at WWTW inlets and we concluded that the model was adequate for its limited objectives.

The third study, for Newton Stewart, was completed for a UID project. The study failed its audit. The audit report highlighted poor data and poor consultant performance and listed issues to be rectified during re-modelling. A revised model is now being constructed. This check demonstrated that Scottish Water's model audit procedure appears to be working effectively.

Conclusions

We concluded that Scottish Water has a good process in place for specifying and producing new drainage studies and controlling access to all studies for updating and use. In addition SW is making progress in reviewing and rationalising its stock of historic studies. The audit process for studies appears to be effective. We concluded that the data given in lines G6.14 – 19 are accurate within the confidence grades given. We also concluded that the three drainage area studies examined had been carried out in line with the specification in use at the time of preparation and that the audit process had effectively identified deficiencies, resulting in appropriate remedial action.

Comments by Line

Line 14:	At 805, the number of drainage area zones is unchanged since last year.
Line 15:	The number of drainage areas identified for study in the current programme is 51. This is reduced from the 68 reported in AR08 because 17 of the studies listed were found on review to be pre-existing models, rather than new studies.
Line 16	The number of studies on-going is reported as 22. Of the 51 reported at line 15, 12 have been deferred to the next investment period and 17 are now complete.
Line 17:	Scottish Water has taken the definition of this line as studies completed in the reporting year - 17. We note that as this line relates only to studies completed in the year it does not give a useful measure of the number of reliable studies available to SW.
Line 18:	This line is calculated from lines 15 and 17.
Line 19:	We note that this line relates only to studies completed in the year and does not give a useful measure of the percentage of Scottish properties population covered by a reliable model.

Comments by Confidence Grade

Lines 14 - 19:	Scottish Water has allocated a confidence grade of B2 to all of these lines. This grade represents a significant improvement on AR08, when C2 was allocated to lines 15 – 19 due to the fragmented nature of projects, where studies could be commissioned by several different areas of the business and programme information was held in different non-corporate systems and not always returned to Asset Studies at the end of the study. Improvements in procedures and data accuracy were noted during this year's audit and progress data are now held in a single company database. Accordingly the B2 grade is accepted.

6.5 Tables D7 and D8: Wastewater and Water Capital Maintenance Expenditure

Commentary by REPORTER

Introduction

Key Points

- The same methodology has been used to compile Tables D7 and D8. The methodology is consistent with that used for AR08.
- The table is compiled from project-specific data, where the operational area, proportion of cost allocated to capital maintenance, and function are all allocated to each project by the project manager before summation for the table totals.
- The allocation of costs to drivers was initially made differently for Q&S2 and Q&S3a projects. For Q&S2 projects allocation was initially made equally to all drivers, while for Q&S3a, project managers allocated costs to drivers based on their knowledge of the project, using an assessment of the actual cost of meeting each driver. However most Q&S2 projects have now had proportional allocation revisited using Q&S3a rules. Proportional allocation is revisited at each Capex stage. Procedures for the allocation of projects to categories are consistent with those used in the past.
- Scottish Water has reported on the basis of 8 operational areas. These areas are unchanged from AR08.
- The table shows expenditure made on all projects in the year 2008/9, rather than expenditure on projects commissioned in 2008/9.
- The correct allocation of project expenditure to categories has been confirmed by audit.
- Scottish Water uses written rules for proportional allocation of capital costs to project driver codes and these appear to be reasonable. In sample checks it was confirmed that with minor arithmetical differences in a few cases, these rules had been followed.
- 22% of Q&S2 projects and 32% of Q&S3a projects have more than one driver and so have proportional allocation applied.
- Tables D7 and D8 were reconciled with Tables G3a, G3b, G4a and G4b.

Audit Process

During the audit we reviewed:

- Sources of data on capital maintenance expenditure
- Scottish Water's methodology for allocating projects to regions and capital maintenance

- The methodology for data collection and table compilation

By audits of specific projects, we also checked that the proportional allocation of investment project expenditure conformed to Scottish Waters proportional allocation guidelines.

We also audited each line of the table to confirm the audit trail back to the base data, including making sample checks on the compilation of the data to reproduce the totals given in the tables. The audit was carried out by interviewing members of Scottish Water's staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

The table shows expenditure made on all projects in the year 2008/9, rather than expenditure on projects commissioned in 2008/9. The methodology used by Scottish Water is essentially the same as that used in AR08, except that project managers are now responsible for entering or checking and confirming all of the data, including proportional allocation. Rules for proportional allocation of project costs are unchanged.

Data were downloaded from the Capital Investment Management System (CIMS) into a single spreadsheet for both Q&SII projects and Q&SIII projects, immediately after the freezing of financial data in early April 2009. Operational area, capital maintenance proportions, function and infrastructure/non-infrastructure proportions were pre-populated. Proportions were then checked by project managers for each project as described below and the spreadsheet returned for summation to give the table lines. For AR09 project managers were given written guidance and also provided with drop-down spreadsheet menus to assist them in defining asset categories and allocating projects with capital maintenance element to operational areas.

Operational boundaries are unchanged from AR08. It can be seen that capital maintenance expenditure on sewerage infrastructure and non-infrastructure, sewage treatment, water distribution infrastructure and non-infrastructure, water resources and treatment and water management and general have all reduced significantly in AR09, when compared with AR08. This reflects the substantial completion of these capital maintenance programmes, with increased emphasis on quality projects.

During the audit, Tables D7 and D8 were reconciled with Tables G3a, G3b, G4a and G4b.

Allocation of Projects to Operational Areas

Reporting is on the basis of 8 operational areas. The geographical location of each project is known from GIS and the large majority of projects also have a Council Reference, which is the main basis of the allocation. During 2007/8 the boundaries of operational areas were rationalised to coincide with Council boundaries. This improves the accuracy of matching projects to operational areas and also reduces the number of linear projects which cross boundaries. Information on which SW region a project falls into is included in CIMS data.

As part of the data collection exercise project managers were asked to confirm the operational area for each project. For Scotland-wide projects, project managers apportioned total project cost to the relevant operational areas. For linear projects (such as sewers) crossing operational area boundaries project managers were also asked to apportion cost to the relevant two operational areas.

Allocation of Project Costs to Capital Maintenance

This was carried out on the basis of the project drivers allocated to projects by project managers. Scottish Water used guidance notes on capital expenditure allocation, unchanged from last year. All projects were assessed for the percentages to different capital drivers at CAPEX1 stage, before detailed costs were known. For Q&S2 projects, the rules in force at that time required that expenditure should be allocated equally between all of the project drivers, irrespective of the cost of meeting each driver. A review of the allocation of costs to drivers for the Q&S2 project was undertaken in support of the planning for SR06. The proportional allocation of costs to drivers was revisited during 2007/8 for completed Q&S2 capital maintenance projects and Q&S2 projects with spending in 2008/9 have also been subject to revisiting of proportional allocation percentages.

22% of Q&S2 projects (as reported in Table G5) have more than one driver and so have proportional allocation applied.

For Q&S3a projects, the guidance notes require that the allocation of project costs to drivers is revisited at each Capex stage, but with an exemption for projects with values below £100,000. This is because these small projects often progress directly from Capex1 stage to construction. For Q&S3a projects, costs were allocated to drivers in proportion to the project manager's estimate of the cost of meeting that driver. SW's procedures allow for the allocation of costs to drivers to be revisited at each Capex stage and this was found in practice to be the case during the audit.

32% of Q&S3a projects (as reported in Table G6) have more than one driver and so have proportional allocation applied.

A sample of Q&S2 and Q&S3a projects was reviewed to check the practical application of the rules. Our findings are described more fully in our commentary on Tables G5 and G6, but these checks indicated that rules for proportional allocation had been followed in practice with the minor exception of small arithmetical differences in a small number of cases.

Starting with calculations made in 2008/9, the percentage allocated to capital maintenance is now calculated to the nearest 1%, rather than being rounded to the nearest 5% as previously.

Allocation of Projects to Water/Wastewater and Infrastructure/Non-infrastructure

CAPEX forms make it clear whether a project is for Water or Wastewater and this is uncontroversial. The allocation of projects to infrastructure or non-infrastructure follows the rules given in the Annual Return Reporting Requirements. The selection of a particular work type in the spreadsheet drop-down menu automatically confirms the allocation to infrastructure or non-infrastructure.

Management and General

The allocation of projects to this category follows the definitions in the Annual Return Reporting Requirements and is one option in spreadsheet drop-down menus. All support services are included, together with any projects which cannot be allocated to other categories. Where projects are not clearly either water or wastewater projects, the cost is allocated on a 50/50 basis to both water and wastewater services. During the audit negative sums were seen at lines D7.37 and D8.28. These are genuine sums, arising through refunds paid by contractors reflecting poor performance.

Conclusions

During the audit we concluded that Scottish Water has rules for proportional allocation and that these are reasonable. Audit checks confirmed that the rules are followed and result in realistic allocations of expenditure to capital maintenance. Information is collected on a project-specific basis and prime purpose allocation is not used. The number of regions reported upon and procedures for expenditure allocation are both consistent with those used for AR08.

Comments by Line

These are not given as the same methodology results in the production of all lines.

Comments by Confidence Grade

A confidence grade of B3 has been assessed by SW for all of the lines in the two tables. This is a similar assessment to that made for AR08. However in view of the improved processes for data capture and the allocation of projects to operational areas we believe that a grade of B2 could be justified.

7. SECTION E: OPERATING COSTS AND EFFICIENCIES

7.1 Overview

7.1.1 General Overview

Scottish Water has made a complete return of operating costs and associated explanatory factors in the E Tables.

Key points:

- Scottish Water has developed a well structured set of departments in its accounting systems which allow costs to be allocated directly to assets. Scottish Water estimates that more than 90% of costs were being coded directly to assets by the end of the report year. Scottish Water has advised us that their target is to code almost 100% of attributable operational costs directly to assets.

- Scottish Water has allocated operating costs in the report year using an activity based management (ABM) system. This builds on the direct capture of cost to assets in the general ledger. The methodology adopted provides a rigorous and logical system of allocation based on recorded costs and activity measures and the knowledge and experience of managers. We have described the methodology and our audit of it in more detail below. The methodology used is the same as for AR08.

- Scottish Water has commented on the movement in total cost by line. In most cases these movements reflect real changes in cost although there are some movements in cost which reflect changes to the allocations made by Scottish Water.

- A change for this reporting year is the establishment of a new business, Scottish Water Horizons Ltd for non core business. This new business deals with approximately 90% of the non core business activities and only about 10% remains in Scottish Water, including elements such as third party charges where a contractor damages an asset and shipping water which is sold directly to shipping companies.

- The asset base reported in the E Tables differs from the asset base reported in the H Tables. The E Tables cover operational assets while the H Tables also include decommissioned and redundant assets. Wastewater treatment works are banded by load in the E Tables and by nominal design capacity in the H Tables.

- As for previous years some of the information on PPP in table E3a is based on original information extrapolated by SW which does not have access to up to date information from the PPP contractors. This significantly reduces the accuracy and use of the data. The format of the tables does not allow full information on failures against consents to be recorded.

7.1.2 Activity Based Management System

Scottish Water uses an activity based management system (ABM) based on Metify software to better understand its business. One output of the activity based costing system is the allocation of costs which are used within the E Tables.

Costs are initially coded to a matrix of accounts and departments which has been structured to allow costs to be reported against the specific expenditure types and activities required in the Annual Return.

The department structure classification includes a series of staff departments and asset departments. Staff departments reflect the structure of the organisation. Individual staff departments are created at manager or team level, typically including 1 to 20 staff. Asset departments generally relate to individual assets. For the water service individual assets are included for water resource, water treatment and water distribution. For the sewerage service individual assets are included for sewerage collection, sewage treatment works and sludge treatment centres. Some small septic tanks are grouped into single departments based on materiality and ease of management. Networks assets may be grouped into a water distribution operating area or drainage operating area.

Staff costs are initially coded to staff departments. Where possible, staff costs are recharged to asset departments based on timesheet entries against generic work orders related to normal task schedules or specific work orders raised to individual activities. Travel time to a job is recorded as part of the job. Non operational time for holidays, sick, training etc are also captured. These costs are captured in Peoplesoft from the Company's Ellipse or Promise systems and taken directly into the ABM system. Staff cost recharges include an element of facilities or support costs including vehicle costs, property costs and IT costs charged in from other departments as appropriate.

For non operational staff or where no timesheets are available these costs are allocated by managers based on time spent on various activities, or effort in supporting a department.

For 2009/10 Scottish Water are extending timesheets to a further 700 staff, including finance, HR, facilities and procurement, bringing the number of staff using this approach to approximately 2400. This will further improve direct capture of staff costs for AR10 through the Peoplesoft system.

Where possible, direct purchases of goods and services (for example SEPA charges, power costs and chemical purchased) are allocated directly to the relevant asset department centrally. Where this is not possible costs are allocated by the operational staff responsible.

Cost data from the General Ledger was processed to generate ABM input accounts and departments.

For each ABM Department the General Ledger costs (excluding recharges) are allocated to a consistent set of ABM activities used for all Departments. Historically the data used to make these allocations was based on specific knowledge of costs or activities and the advice of relevant department managers. However, the improving ability to code or recharge costs to assets has produced an allocation based primarily on data with limited reliance on judgement of managers to complete gaps in the information.

A set of allocation rules were developed to reallocate relevant activities across departments and direct activities based on activity drivers such as the utilisation of IT systems or the number of customer contacts relating to that department.

The input data was processed through repeat allocations on the ABM software to provide a matrix of reallocated costs by ABM department and activity.

The structure of the reallocated costs allows them to be allocated to WICS categories allowing the E Tables to be populated.

During the audit we noted the allocation of general ledger costs to ABM input departments and accounts. All costs on the profit & loss accounts are processed including interest, depreciation and the infrastructure renewals charge. These categories of cost were stripped out of the final analysis for the E tables.

The reconciliation between the total sums reported in Tables E1 and E2 and Scottish Water's accounts is as follows:

From the Annual Return

Total operating cost (water service) – Line E1.31	318.8	£m
Total operating cost (wastewater service) Line E2.30	234.5	£m
Total operating cost (PFI) Line 3a.24 & E3a.26	136.1	£m
Total operating cost	689.4	£m

From Scottish Water's Accounts 2008/09

Cost of sales (ex Income and expenditure account)	632.7	£m
Administrative expenses (ex Income and expenditure account)	101.8	£m
Exceptional items (ex Income and expenditure account)	0.0	£m
Charges to SWBS for support	1.5	£m
FRS 17 adjustment	3.4	£m
Deduct running costs of Business Stream	(22.0)	£m
Total operating cost	717.4	£m

These SW accounts include £28m for non regulated business now undertaken by Scottish Water Horizons Ltd. and so excluded from E Tables. When this is removed the accounts reconcile with the Annual Returns.

Based on the reconciliation above, the total operating costs reported in Table E1 and E2 excludes:

- PPP costs, including fees paid and SW internal costs, which are reported in Table 3a.
- Net interest payable.
- Taxation
- Gain on sale of assets.
- Running costs of incurred by Scottish Water Business Stream

The ABM accounts combine one or more General Ledger accounts and match the WICS cost categories in the E Tables. Information on the ABM source account is maintained throughout the reallocations. Therefore the allocation of cost by category in the E tables maintains the allocation of cost to accounts in the General Ledger.

Each ABM department covers one or more of the accounting departments in the general ledger. The ABM input departments are developed to match the main functions of the company, either the operation of particular asset groups or the general functions which support Scottish Water's business. The asset based ABM departments broadly reflect the WIC asset categories in the E tables with separate sets of ABM departments covering the eight operational areas in Scottish Water.

Scottish Water developed a standard set of ABM activities which reflect the main activities carried out across its business. Appropriate managers and staff allocated department staff time and other costs to ABM activities. Much of this allocation work now takes place centrally from detailed accounting and timesheet records. Individual department managers are asked to check the allocations and adjust them for staff time not captured by timesheet and to correct any apparent errors.

Separate allocations of department costs were undertaken for staff time and other costs. Where appropriate (for example vehicle use) other costs were allocated in proportion to staff time.

The quality of the data generated by the ABM system is dependent on the allocation of department costs to activities which creates the ABM input data. During the audit we reviewed the allocations made for two of the eight operational areas with the staff who prepared the allocations. Each area is multifunctional covering water and wastewater and infrastructure and non-infrastructure activities. We also reviewed the allocation within the Facilities Department

ABM Departments related to operational assets are a combination of accounting departments on the General Ledger. ABM departments reflect, in part, the operational areas and the service categories which are required to complete Tables E1 and E2. This alignment between the ABM departments and the operational areas and service categories is a key component of the allocation of costs in Tables E1 and E2.

The ABM Accounts, which summarises account information from the general ledger, reflect in part individual lines in Table E1 and E2. The source account information is maintained in the allocations carried out in ABM. The source account is used as a key component of the allocation of costs between lines in Tables E1 and E2.

Scottish Water has developed a department structure in its accounts which has a strong link to assets. Asset departments in the accounts are typically an individual water source, an individual treatment works, a Drainage Operating Area or a Water Operating Area. This allows costs to be allocated directly to individual assets.

The asset departments roll up to ABM departments which reflect the operational activity of the company.

A key component of the ABM system is the allocation of ABM department costs by "Activity". A standard activity list has been developed to match reporting requirements and internal business requirements. Each activity is clearly defined and included with the schedules to assist managers with allocations.

General Ledger cost information is the primary source of asset based cost information. Metify ABM is used to supplement this direct cost capture and to allocate support activity costs which cannot be charged directly to assets.

7.1.3 Audit Findings

From our audits we found the following:

Facilities

The Facilities Department has a FTE staff of 36. Facilities do not have a timesheet system at present and so allocations to ABM activities were made on the basis of discussion between the department manager and her team leaders, facilitated by the management accountant allocated to her department. While formal records of the meetings were not available for audit, following our review we believe that the allocations were made with due consideration and were likely to be reflective of the actual work balance of the department. We note that timesheets are being introduced for next year which will improve the quality of the allocations made.

Operational Departments

The operational areas audited were the Tweed and Nith Regions. Both are multifunctional, consisting of a number of teams each with a specific team leader. For the majority of staff, time is captured either directly through the work planning system where each job is allocated to an asset or by timesheets which are then input into the Ellipse system. Where this is not the case the team leader or local manager allocates the time based on the work undertaken by the individual. From our audits and discussions with local managers, team leaders and management accountants we conclude that the allocation is based on the type of work undertaken and is correctly allocated. There a specific activity code set up for each ABM department entitled "Own department team management" where the team leader and managers time are coded to as well as time spent in team meetings etc. Costs other than manpower costs are generally allocated directly to the assets but where this is not possible local managers allocate the costs based on local knowledge of the assets. This is described in more detail below.

During our audit we noted that non-pay direct costs including power, hired and contracted services, materials and consumables and SEPA charges are allocated directly to asset departments in the accounts. While these costs are rolled up into ABM departments to allocate costs for Tables E1 and E2, the detailed cost allocations in the accounts form the basis for the allocation of this type of costs to specific assets in the subsequent E Tables.

Pay costs are typically allocated to accounts for individual teams responsible for a group of assets. The costs are then recharged in the accounts to individual assets. The recharges are based on internal recharge rates which are built up to take account of all employment costs including an allowance for vehicles. The recharge rates also include an allowance for management and support staff whose time is not recharged direct to assets. The ABM process used ledger data before recharges. Ledger data after recharge forms part of the information used to allocate costs to assets.

Scottish Water has continued to implement the electronic time-sheeting systems for its operational staff. Direct allocation of WTW and WWTW operational staff time is high, typically running at 80%. Direct allocation of network staff time to assets is typically 50-60%. The company has recognised difficulties in the integration of time recording between activities generated through the customer contact system, Promise and activities generated through the works management system, Ellipse. In our audit for AR08 Scottish Water were investigating the introduction of a single timesheet system to address this. However, this was not progressed as there was no advantage gained. Instead further effort has been made in ensuring the correct allocation of time from the existing Ellipse and Promise systems and ensuring work orders are allocated for customer contact jobs which relate costs to the appropriate assets.

As a result of the introduction of operational staff time-sheets, the company has been able to increase centralisation of the production of the activity schedules which form part of the input data for ABM. Draft schedules are produced showing recorded costs or staff time. Operational managers are asked to allocate the remaining costs and make any other amendments necessary based on their experience. As the timesheet system becomes fully used, direct cost capture to assets will be almost complete. The main function of ABM will then be to distributes central costs and allow the company to generate whole cost data for individual assets or activities.

The allocation of time not captured by timesheets is one of the key areas of judgement underpinning the allocation of costs to the E Tables. During our audit we noted that staff preparing the allocations had direct experience of the work they were being asked to allocate and had made every effort to relate actual activity to ABM activities. This process is facilitated by the structure and size of staff departments. At the level of expenditure types and activities required for the Annual Return, we believe that these allocations are robust.

The main reasons for non capture of operational time in the timesheets include out of hours work which don't have work orders allocated, problems with IT equipment and inconsistent capture of non productive time for holidays, team meetings etc. During the audit we noted one team where timesheets for operational staff working on waste water treatment works had not been directly captured. The reason for this was not clear but the time had been appropriately allocated by the manager when he reviewed the cost schedules. The split of staff costs by activity is based on normal working time. Overtime is split by the same proportion across activities.

Scottish Water are currently introducing an advanced work scheduling system for operational staff which will require them to complete the capture of time and materials against a work order before they move onto the next job. The accurate completion of time and materials used in the Ellipse and Promise systems also forms one of the objectives in the individual performance and review assessments. This is regularly monitored by the team leader and discussed with the individual concerned to drive completion towards 100%. It was clear from our audits that team leaders have a real focus in this area.

The draft schedules prepared centrally for operational departments have the majority of non pay costs allocated to assets. For the areas audited these were between 85-90% complete and the local management accountants and managers work together in allocating the remaining costs. Individual drill downs are taken into the ledgers to check and review the initial coding of individual expenditure and reallocations made as appropriate. Accruals are made at year end for goods received but not invoiced or paid. Accruals are made at year start and year end for stock (e.g. chemicals).

During our audits we were able to reconcile asset accounts to the general ledger. inspection of the item descriptions indicated that the initial cost allocation was reasonable and that the accounts had been actively checked and reviewed. The two key reasons for costs not being allocated centrally were either that they had been allocated to an asset but there was no activity code, or they had been allocated to a team code. For those in the former category allocations were made on the basis of local knowledge and experience. For those allocated to a team code some costs were reallocated to the activities such as chemicals used for secondary disinfection but some were allocated on the basis of FTE as they were used over a number of activities. Examples of this include protective equipment and hire of vehicles and plant. From our audit the allocation of costs appeared reasonable with just one error being found where £3500 power costs had been allocated to burst mains where it should have been attributed to distribution pumping.

The ABM schedules are run six monthly, draft schedules are reviewed by managers and their management accountants at period 6 and period 11 to allow time for a detailed review. These are then updated for period 12.

A number of key expenditure types are managed centrally and costs journalled out to individual departments. These include SEPA charges and power costs. In each case, monthly accruals are made based on historic run rate with actuals posted as they arise. The process allows for a robust allocation of these costs.

Some asset cost centres will capture costs for more than one function recorded in the E Table. In particular a sewage treatment works cost centre may capture costs of the associated sludge treatment works. A water treatment works will include pumping into distribution. In these circumstances managers are asked to spilt relevant costs between the two process areas which are then captured in the ABM activity allocations.

The AR08 audit highlighted that the split of these costs had not been reviewed and recommended that Scottish Water review these splits for AR09. There was an audit trail in ABM which showed that these reviews had taken place, the name of the reviewing manager and the date of the review.

During the audit we discussed a sample of these reviews with local managers and accountants. The split of power costs for distribution pumping has been made on the basis of KW rating, hours run and flow. This approach is reasonable, although the methods and calculations used were not clearly documented.

Although some sludge treatment centres have their own asset codes there was very little captured directly against these codes with the costs being attributed to the WWTW. The split of costs between WWTW and sludge treatment centres had been made on the basis of local knowledge. There were no guidelines issued and the split of costs for chemicals, power, rates, SEPA etc. appeared to show some differences in allocations between works. There were no documented methodologies available for audit.

We looked in detail at one works, Kinneil Kerse WWTW, where the splits looked considerably different to those at other works. The sludge treatment facility was previously a sludge press but this is now mothballed and the sludge is treated using a centrifuge which is operated by contractors. The big impact for SW at this site relates to power which is much higher than the budget for the site. A number of studies have been undertaken which confirm that the centrifuge is proving more expensive to operate than envisaged. Under the contract SW are responsible for the power costs for the operation of the centrifuge rather than the contractor. The power split between sewage treatment and sludge treatment was estimated at 40%:60% on the basis of this study rather than the KW ratings. The majority of the sludge treatment costs for manpower and chemicals are included in the contract rather than SW costs. Other costs appeared to be split appropriately based on the local managers' knowledge and experience.

Scottish Water stated that it will review the split of costs between sewage treatment and sludge further with managers through the year. We recommend that guidance is given to managers and that there is a documented audit trail showing the methodology used to calculate the split of costs between WWTW and Sludge Treatment for each works.

The activity drivers used to allocate central costs were based on appropriate data sets for which clear audit trails exist. .

The activity costs entered in ABM are totalled and the ABM system reallocates cost of activities which do not relate directly to the primary activities which deliver services to customers. The "activity drivers" used to make these allocations are based on measures of activity for individual ABM departments such as the number of work stations supported or the number of customer contacts in a particular operational and service area. Once the reallocation to ABM departments has been made the cost s are reallocated to activities within that department, either based on the same driver, if that driver is activity specific (e.g. water bursts contacts), or based on the activities undertaken by that department. This might result in cost being allocated back to support activities and the process of reallocation is repeated until the residual cost allocated to support activities has reduced to trivial amounts.

In our audit we noted slight differences between the raw ABM data and the GL which related to the ABM slightly over-allocating to Capital. To maintain consistency with the accounts, the ABM output is adjusted to match the financial accounts. The residual is distributed across other ABM departments by E table services and account lines following analysis of ABM output. This analysis means that the account line is maintained from the original source cost. Where no service information is recorded within ABM output the cost is allocated in proportion to recorded ABM output.

For PFI no adjustment is made as the difference reflects inter-site sludge tankering, terminal pumping and additional support costs which are not captured in the financial accounts.

The output from ABM is then used in a complex Excel spreadsheet for allocation to the E tables A number of checks are built into this spreadsheet. This data is reconciled back to the General Ledger. There is a good audit trail which can track individual costs throughout the process.

7.1.4 Allocation of costs to assets

The ABM output allows all costs to be allocated to groups of assets consistent with the asset and operational area structure required to complete the E Tables. A further stage is required to allocate costs to the individual cells in the E Tables. For water mains and sewerage costs this can be achieved by summing the costs for the relevant ABM departments. For water and wastewater treatment, it is necessary to allocate costs to individual treatment works to ensure that costs for large treatment works can be identified and small treatment works can be banded by capacity or load.

The allocation of cost to individual water and wastewater treatment works is carried out outside the ABM system and is based on the costs allocated to each asset on the general ledger (including recharge).

All water treatment works, wastewater treatment works excluding septic tanks and most sludge treatment centres identified as a separate department on the general ledger which capture costs either directly or by recharge. For septic tanks, a general ledger department will cover a number of assets and the costs recorded on the general ledger are distributed across individual septic tanks in proportion to design capacity or load.

The final schedules are checked back against the general ledger. For each group of assets the difference in the cost allocated by ABM and the costs allocated in the ledger including recharge are identified and a residual calculated for various types of expenditure. These residual direct costs were distributed back across the individual assets in proportion to the cost of expenditure type within the operational area. Given the high rate of cost capture, the adjustments required are small.

In the report year the company has allocated general and support expenditure across assets in proportion to direct labour cost capture. This follows allocation of support activity costs to primary activity / service based on support activity drivers. Scottish Water has adopted this policy on the assumption that most general and support expenditure supports staff rather than other work. Since staff costs are now captured through time-sheets, the company considered this allocation to be more robust. The same approach was used for AR08.

7.1.5 General remarks on the allocation of costs

We have followed an audit trail through each step of the process and found it to be a rational and logical method of allocating costs which cannot be booked directly to assets on the general ledger.

We found that the department structure in the accounts provides a good basis for the allocation of cost direct to assets.

We have noted action taken by Scottish Water to improve the quality of the allocations by developing the activity and driver allocations. We have found that Scottish Water makes good use of the available data to provide a robust and rational allocation. Where the allocations cannot be made centrally local managers and financial staff work closely together to allocate the remainder of the costs and these allocations appear reasonable.

We have noted that whilst some of the allocation of sludge treatment costs and water distribution pumping costs off water treatment works have been reviewed by local managers, there are no clear audit trails as to the methodologies used to allocate the split of costs. We recommend that these allocations are further reviewed through the year and updated if necessary for future returns. The methodologies used should be available for audit.

We reviewed the process of assessing operating costs from capital investment in our audit of the draft business plan. During this audit we confirmed that operational costs are included once the capital project is complete and handed back to the operational departments. All costs associated with commissioning a treatment works are included as capital costs. We discussed one works Dunbar WWTW, where maintenance costs associated with the new works are higher than envisaged due to a number of pump failures. SWS have worked with operational staff to understand the issues. All SWS costs go to capital spend against the scheme. All operational costs are being collated into a unique code which can be allocated back to the Capital code for the scheme if the problem is confirmed to be as a result of the capital scheme. This confirmed that no work carried out by SWS post scheme completion is included in operating costs.

We have audited the process with a view to the allocations required in the E Tables. The ABM process may be used to provide other regulatory information from time to time. For these returns it would be necessary to consider the activity allocations and drivers which are material to those returns to ensure that they are fit for purpose.

7.1.6 Infrastructure depreciation charge

This year Scottish Water has set an infrastructure depreciation charge of £104.2 million. This is an increase from last year's figure of £90.0 million.

Scottish Water's infrastructure depreciation charge is not set the same way as in England and Wales but has generally been taken from the final determination. The final determination figure results in an IDC of £88M over the period 2006/7 to 2009/10 (2005/6 prices) and in the final determination WIC assumed that last year's IDC would be £88M, rising with inflation resulting in a figure of £90M for the reporting year.

In tables G1 and G2 Scottish Water is forecasting its future IME. This indicates a spend of £126.31 million this year and £69.41M next year, at variance with the proposed £90 million of IDC. Overall the actual spend IME for the 4 years of Q&S3a including the estimate for 2009/10 is forecast to be £428.3M compared to WICS IDC of £364.0M.

SW is also proposing to increase its spending on its infrastructure in the SR10 period partly as a result of deterioration modelling of its assets and partly due to other considerations. The average spend is estimated at £113.0M post efficiency (Tables 5.1 and 5.3).

Based on these facts SW's Board has agreed a figure of £104.2M for the reporting year.

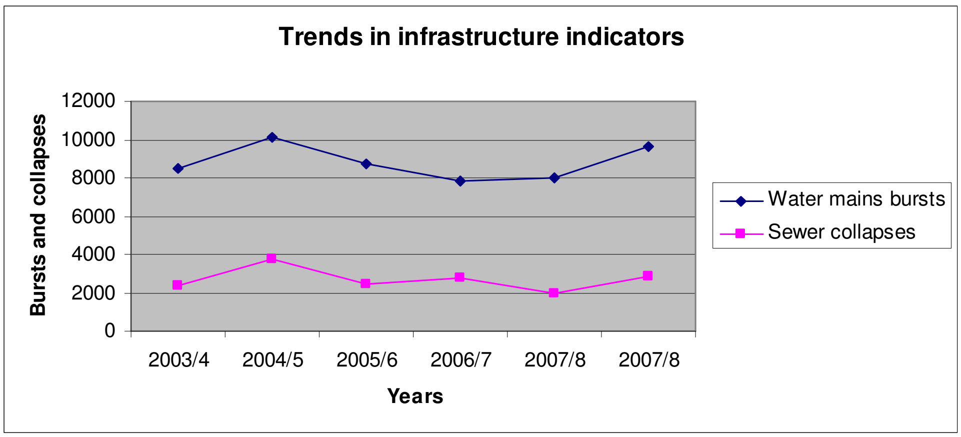
In 2006 Scottish Water reported that its consultants had reviewed the level of IDC that should be sustainable and concluded that a figure of around £92M would be acceptable, largely based on comparative methods rather than engineering analysis. We understood from our reading of the consultants' report that this figure was around 6% more than the average used in England and Wales for the period 2004/5 to 2009/10 when expressed as a £/km of pipe. Since then SW has undertaken other studies such as deterioration modelling of its asset stock as part of its SR10 submission.

Previously we compared water main burst rates in Scotland with those in England and Wales and concluded that they were roughly comparable. We also compared sewerage data. The comparison was confused by the inclusion of laterals in the sewerage asset stock in Scotland but not in England & Wales. However, we concluded that the sewerage IDC for Scotland appears to be consistent with companies in England & Wales.

The pattern of water mains bursts and sewer collapses as reported by Scottish Water since 2003/4 is shown in the table below:

Indicator	2003/4	2004/5	2005/6	2006/7	2007/8	2007/8
Water main bursts	**8466**	**10102**	**8713**	**7822**	**7975**	**9631**
Sewer collapses	**2399**	**3740**	**2468**	**2754**	**1978**	**2884**

This is shown below in graphical form:



While this year's results are higher than the average this does not show any particular trend of deterioration based on the current pattern of spend. However, SW has undertaken a more detailed review of deterioration for its 2nd draft business plan. We have commented on SW's future estimates of spend in our report on the 2nd Draft Business Plan.

7.2 Table E1 and E2: Activity Based Costing

Commentary by REPORTER

Introduction

Scottish Water has provided an allocation of operating costs to water and wastewater services in Tables E1 and E2 respectively.

In the comments by line we note the key drivers used to allocate OPEX to individual cost categories and our view of the robustness of those allocations.

Because of the link between Table E1 and E2 we have opted to combine the comments by line in this section to reduce duplication. Scottish water have provided a detailed commentary and further detail of the explanation of variance between the water and sewerage services is given in the SW commentary for tables E1 and E2.

Key points:

- The allocation is based on operating costs recorded in Scottish Water's general ledger which have been allocated through Scottish Water's Activity Based Management system (ABM). We have commented on the ABM methodology above.
- Overall operating expenditure has increased from £260.9m in 2007/08 to £288.9m in 2008/09, an increase of £28m.
- Scottish Water has commented on the movement in total cost by line. Many of the overall changes reflect a series of increases and decreases which are detailed in SW commentary.

Comments by Line

Employment costs:

Direct employment costs are identified from the allocation of employment costs to activities. Employment costs have increased in the report year by £2.4m to £62.4m. This reflects inflationary and pay performance increases of £2.4m along with additional pension contributions of £0.8m offset to a degree by efficiency savings.

In its commentary, Scottish Water reports an average headcount employed during the year of 3583, an increase from 3557 reported in 2007/08. The total number of employees reported in Table E11 is 2340, up from 2355 in 2007-08. These figures exclude employees associated with capital works, third party services and PFI to give consistency with the costs reported in Tables E1 and E2.

Power costs:

Power costs are generally allocated directly to assets based on meter readings and these direct allocations are maintained through the ABM system. There are a number of exceptions where power consumption recorded on a single meter must be allocated to different service areas. This includes the allocation of power cost for sludge treatment and the allocation of costs for water treatment works between resource and treatment and distribution.

Power costs increased marginally during the report year to £32.5m. SW has a number of initiatives in place to manage power usage both at operational and non-operational sites. This, along with the procurement strategy, and the reduced power costs as a result of leakage reduction, has helped to mitigate against the high wholesale power costs seen during the Autumn of 2008. Additional power costs from capital investment have been absorbed within the year.

Hired and contracted services

: Hired and contracted services are generally allocated directly to assets or sub-areas of the operational areas in the accounts.

There has been a substantial increase in hired and contracted services during the report year, increasing by £13.8m to £34.6m. Water service costs have increased by £14.6m, mainly due to significant increase in activity on the network for leakage reduction. There was also some work to improve customer service as well as the impact of capital investment. Sewerage service costs have decreased due to less maintenance activity, partly offset by increases from capital investment.

Materials and consumables

Material and consumables are generally allocated directly to operational assets or sub-area of the operational areas in the accounts.

For the report year there was a decrease in costs from £16.3m to £13.6m. Some of this is reported as being due to reduced chemical costs from leakage and procurement strategies, partly offset by increased chemicals from capital investment. The main cost reductions follow the reduced activity on the sewerage network.

Bulk supply costs

Scottish Water does not receive bulk supplies.

Service charges by SEPA

SEPA costs are allocated directly to assets in the accounts and this allocation is maintained through the ABM system. There is a £0.2m increase in SEPA costs for the report year to £10.3m mainly due to inflation.

Other direct costs

The reduction in other direct costs of £1.0m is mainly due to a reduction in insurance claim costs.

Total direct costs:

Calculated line summing the direct costs.

General and support costs:

General and support costs are identified by the activity allocation in ABM with the main costs allocated from general and support accounts in the ledger.

There has been an increase in G&S costs for the report year of £3.7m to £35.5m. This is made up of increased costs in a number of areas including inflation and performance related pay increases, reductions in the G&S charge to Scottish Water Solutions due to reduced work in this area. There is also an impact of reduced recovery of fixed IT costs from SWS and Business stream returning these costs to the core business. This increased costs by £1.8m, partly offset by reductions in IT costs of £0.4m.

Functional expenditure

Calculated line summing the direct costs and associated general and support expenditure.

Customer services covers billing activities.

The allocation of customer service and billing activities between water and sewerage service is driven by various activity drivers, e.g. the volume and the type of bills issued and other billing activities.

Customer service costs have decreased by £0.7m in the report year to £17.3m. This is due to reduction in a number of activities from the previous year, primarily reduced activity associated with business stream and a reduction in vacant property surveys. There have been increases in the billing costs for both SW and the local councils amounting to £0.3m.

Scientific services

Scientific services is allocated between the water and wastewater services using drivers, applied to relevant activities, which include the number of sample visits and sample analysis undertaken in the year.

Costs for the report year have increased by £0.7m to £11.6m. There has been an increase in the number of samples as well as inflationary increases which account for around £0.4m. Additionally for the previous year there was a shift in the mix of opex and capex samples with increased numbers allocated to capex for particular surveys such as lead survey work. For the report year the shift has swung back to opex as these surveys are completed.

Other business activities

Other business activities include interaction with regulatory bodies including reporting and liaison.

The costs for the report year have decreased by £0.4m due to a decrease in Central Marketing Authority costs of £1.5m as the set up costs included in the previous year are no longer relevant. This has been offset against increases to WICS fees, £0.7m and increased internal regulation activity £0.4m.

Total business activities

Calculated from the three lines above.

Local authority rates

Local authority rates are charged against specific assets for the sewerage service and as a single sum for the water service. Rates are also charged on buildings which serve general business activities.

It is possible to allocate rates to specific assets for the wastewater service.

Rates for buildings serving a general business purpose are allocated between the water and wastewater services on the basis of internal property recharges and occupancy rates by department.

ABM allocates an element of rates bills to third party services. This allocation is maintained for tables E1 and E2 and an element of the total rates bill included in third party services.

For the report year rates have increased by £2.4m due to inflation increases and the loss of transitional relief. This has been partly offset by an increase in allocation to non-regulated activity.

Doubtful debts

Doubtful debts are allocated between the water and sewerage service using a driver which identifies aged debt against water and sewerage accounts weighted on 100% of debt >1year and 40% of debt > 4 months.

For the report year total doubtful debt has increased by £7.7m. The atypical release for 2008/09 is £8.1m, £9.2m less that that for 2007/08 of £17.3m. This reflects a deterioration in the collection rates by local councils. There has been a decrease in bad debt provision on non-regulated businesses of £1.5m, mainly due to improvements in sundry billing and credit management activities since the transfer of these activities from Business Stream to Scottish Water.

Exceptional items

No exceptional items are reported this year

Total opex less third party services

Total opex less third party services is calculated from the data above.

Third party services – opex

Third party costs included in the E tables relate to core third party costs only. The increase of £0.2m for the report year reflects a number of increases and decreases which are detailed in the SW commentary to the tables.

- A reduction of £1.6m for recharge to Business Stream under service agreements
- An increase of £0.9m in the allocation of wholesale water for building services, standpipes, troughs etc.
- An increase of £0.6m for fire hydrant installation and maintenance
- An increase of £0.3m in mains diversion costs.

Planned and reactive maintenance (included in opex)

Planned and reactive maintenance costs included in opex have increased by £10.5m in the report year.

For the sewerage service there was a decrease of £3.1m for infrastructure reflecting more effective management of sewer network activities and £1.7m for MNI due to less maintenance and repair activity

For the water service there was a significant increase of £16.7m for infrastructure, reflecting the increase in leakage activity. For MNI there was a decrease of £1.42m reflecting less activity in this area.

Infrastructure Depreciation Charge

Depreciation is allocated between water and waste water on the asset information held in the asset register. The IDC has increased for the report year by £14.0m, reflecting an increase of £21.9m on water assets and a reduction of 7.9m on sewerage assets. This reflects the long term asset plan forecasts updated for the 2010 strategic review.

Non-infrastructure depreciation charge

Depreciation is directly charged to assets, and therefore services, based on the fixed asset register. Depreciation on support activity relates assets are allocated based on the relevant ABM support activity drivers e.g. IT application user numbers. The company has noted the increase of £3.2m non-infrastructure depreciation in the water service due to new assets being commissioned.

Comments by Confidence Grade

The company reports confidence grades of A2 for most cost allocations and A3 for reported planned and reactive maintenance costs. This is the same as for 2007/08 and we believe that this is reasonable.

7.3 Table E3 – PPP Project Analysis

Commentary by REPORTER

Introduction

The 9 PPP concessions reported in Table E3 cover twenty wastewater treatment works and one sludge treatment plant.

The treatment works treat almost half the total load discharged to sewer in Scotland. An estimated 83% of the wastewater sludge produced in Scotland is treated and disposed of through the PPP concessions.

The return has been prepared by Scottish Water's PFI Team with detailed technical and financial knowledge of the PPP schemes.

Audit approach

An audit was carried out in Scottish Water's offices in Inverness. Meeting were held over two days (May 12-13 2009) between the Reporter and Scottish Water.

During the audit each cell in the Table E3 was investigated. An audit was done on a number of schemes and the origin of the value used in the Table was pursued back to the original paperwork for these schemes.

Changes between 2007-08 and 2008-09.

Compliance.

In the report year 08-09, less than 100% compliance was reported for 7 works compared with 7 works in the previous year. Although the number of works not achieving 100% compliance has not changed some works from 2007/08 where 100% compliance was not achieved are now achieving 100% compliance and vice versa. New works with failures are Persley, Lossiemouth and Blackburn, with Peterhead, Meadowhead and Stevenson now achieving 100% compliance. Values are shown in the Table below.

Works with less than 100% compliance 08-09	Value (%)	Works with less than 100% compliance 2007-08	Value (%)
Nigg	94	Nigg	94
Persley	97		
Lossiemouth	99		
Newbridge	98	Newbridge	98
Blackburn	98		
Whitburn	98	Whitburn	97
Dalmuir	85	Dalmuir	96
		Peterhead	98

Works with less than 100% compliance 08-09	Value (%)	Works with less than 100% compliance 2007-08	Value (%)
		Meadowhead	88
		Stevenston	90

Sewerage

During 08-09 a new sewage pumping system which transfers flow from the Stonehaven catchment to the Nigg works was constructed and commissioned. This includes an additional 9 pumping stations and 16.5 km of sewer.

Sludge treatment and disposal.

Sludge treatment and disposal quantities varied as shown in the table below. There as small increases to incineration and land reclamation with a decrease in landfill.

Parameter	Total 2008-09	Total 2007-08
Farmland Untreated	0	0
Farmland Conventional	2.4	3.3
Farmland Advanced	26.9	26.6
Incineration	55.2	53.3
Landfill	2.4	6.1
Composted	0.7	0.4
Land Reclamation	8.7	6.8
Other	3.9	4.1
Total	100.4	100.6

Comments on methodology and output

Project Data

The loads for individual treatment works were calculated in the same way as other treatment works loads using the methodology and data sources described in our report on Table A2. The population equivalent in line 3 equals the load reported in table A2 line 60 using a conversion factor of 60g. BOD/d.

Line E3.0: The PPP projects plants and groupings are those reported in previous years.

Line E3.1: Resident population- The resident population has been taken from the assessment and distribution of connected population described under Table A2 and is consistent with the load reported in A2.60.

Line E3.2: The non-resident population has been taken from the assessment and distribution of holiday populations described under Table A2 and is consistent with the load reported in A2.60. The reported population is the average monthly population.

Line E3.3: Population Equivalent of total load received. - The population equivalent stated is for the total load including household, non-household, non-resident, trade effluent and tanker loads discharged to the effluent stream. It equals the load reported in table A2 line 60.

Scope of works.

Line E3.4: There have been no changes from 2007-08 submission.

Line E3.5: There have been no changes from 2007-08 submission.

Line E3.6: At Persley, part of the Aberdeen PFI, some sludge cake was conventionally treated and exported to farmland for a short period.

Line E3.7: At Nigg a terminal pumping station was incorrectly included in the scope in 2007-08 submission. This has been removed in the 08/09 submission.

Line E3.8: There have been no changes from 2007-08 submission.

Sewage Treatment - Effluent consent standards.

CAR licences from all the works have been inspected and it is evident from the licences that Table E3 does not reflect the detailed requirement of these licences. It is recommended that the Table be re-designed to match the requirements of final effluent consents issued to Scottish Water by SEPA.

The CAR licence includes different final effluent consent standards for spot samples and composite samples. The consent standards reported in the tables are the lowest numerical value required by SEPA with no indication whether they are spot or composite, 95%ile, upper tier or annual average. Failure of the consent standards are measured using look up tables and have an upper tier limit which is an absolute. Thus a works can fail if only 1 upper tier limit is exceeded on one parameter or if the number of samples in the look up table is exceeded for each parameter.

Line E3.9: Reported values are spot samples taken from river quality objectives (RQO).

Line E3.10: River quality objectives are measured as spot samples with a 95%ile pass rate based on a look up table. UWWTD samples are composite samples with a 95%ile pass rate based on a look up table. UWWTD final effluent consents are 25mg/l. Where this is lower than the RQO values these have been used. If the value in line E3.10 is below 25mg/l then the RQO spot sample value has been used.

Line E3.11: UWWTD samples are composite samples with a 95%ile pass rate based on a look up table. UWWTD final effluent consents are 125mg/l. This value has been used in the Table.

Line E3.12: RQO spot sample 95%values have been entered into the Table.

Line E3.13: UWWTD requires an annual average value of composite samples of Total Phosphorus in order to assess whether a works has passed or failed. RQO requires spot samples to be assessed against 95%ile and upper tier values for Soluble Reactive Phosphorus. These tests are completely different and in some instances SEPA have not reported the different test results. Where test information is available Scottish Water has correctly reported the information in line with E3.14.

Line E3.14: Compliance measured as a percentage of samples passing the consent value do not reflect SEPA compliance nor does it affect the award of OPA points. The current method of calculation as a percentage does not indicate if a works is passing or failing.

Compliance with the effluent consent standard has been calculated as the number of sanitary determinants passing divided by the number of sanitary determinants tested and reported by SEPA over 1 calendar year.

Treatment Works Category

There has been no change since last year.

Sewerage Data.

The sewerage data has been taken from information in concession agreements supported by information provided directly by the PPP contractors. In the 2006/07 Scottish Water undertook a review to provide a consistent report and a robust audit trail for the data

The company has followed the reporting requirements to include terminal pumping stations in the peak pumping capacity but not the installed power. We suggest that the line definitions are reviewed and confirmed by WICS.

Scottish Water has changed this section of the Table based on the completion of construction of a new pumping main from Stonehaven to Nigg. The values entered into the table are based on the agreement between Scottish Water and the Construction entity. In addition data has been collected from operation and maintenance manuals issued for installed plant associated with the contract. We have checked through the contract and O&M manuals as an audit of the origin of this data.

Line E3.22: 16.5km of new sewer have been constructed from Stonehaven to Nigg.

Line E3.23: All the new sewer is considered critical.

Line E3.24 9 new pumping stations have been constructed.

Line E3.25: 159365m^3/d of new pumping capacity has been installed.

Line E3.26: 1425kw of extra pumping capacity has been installed.

Line E3.27: 7 new combined pumping stations have been constructed.

Line E3.28: 62856 m3/d of new combined pumping capacity has been installed.

Line E3.29: 2 new storm water pumping stations have been constructed.

Line E3.30: Capacity of stormwater pumping stations (m^3/d) - 96509 m3/d of new storm water pumping capacity has been installed.

Line E3.13: 3 new combined sewer overflows have been constructed.

Line E3.32: All 3 combined sewer overflows are screened.

Sludge Treatment and disposal

In line with Table A2, the reported quantity of sludge is an estimate of the quantity of raw sludge produced. For the PPP schemes this has been developed from records of the quantity of sludge disposed of from the works with a factor applied to reflect the quantity of sludge mass converted to water or gas during treatment. The numbers in the table do not as such reflect the quantity of sludge that has been disposed of as solids have been destroyed in treatment (e.g. Digestion 35% solids destruction). This method has been used in previous years and reflects the amount of sludge input to the sludge treatment process.

The sludge quantities disposed of from each works are provided by the PPP concessionaire. These are not checked by Scottish Water with the exception of sludge output from Daldowie where payments are made on the basis of sludge quantity. However Scottish Water carries out audits on sludge disposal. This has been carried out at 3 sites in 08/09 at Hatton, Levenmouth and Meadowhead.

Line E3.33: None

Line E3.34: SW reports a small decrease from 2007/08

Line E3.35: There has been a nominal increase from 2007/08

Line E3.36: There has been a small increase from 2007/08

Line E3.37: There has been a 60% decrease from 2007/08. The decrease is due to more sludge going to incineration and to land reclamation.

Line E3.38: There has been a small increase from 2007/08

Line E3.39: There has been a 28% increase from 2007/08

Line E3.40: There has been a marginal decrease from 2007/08

Comments by Confidence Grade

We consider the confidence grades allocated by Scottish Water to be reasonable.

Conclusions

Scottish Water have filled in the table correctly and diligently and was able to provide back up data for all entries where requested. Where we found some numerical errors these have been corrected. Scottish Water has been very helpful and provided data as requested without exception.

The section of the table for compliance gives a simplified view of works consents and does not reflect the complexity of the final effluent consent system. (There is no indication whether the sampling is by spot sample, composite sample, 95%ile, upper tier or annual average). The assessment of the compliance standard as a percentage does not reflect whether a works is passing or failing. A single upper tier failure means a failing works but if this was only one in a hundred samples this would be reported as 99% whereas a works that has a number of 95%ile failures would not necessarily be a failing works and would be reported with a lower percentage.

The sludge treatment and disposal numbers do not reflect the amount of sludge disposed of but are rather an estimate of the amount of raw sludge produced before treatment. The sludge disposal numbers are available and would provide a more accurate measure, subject to the need to report against the benchmarking criteria used by Ofwat and WICS.

7.4 Table E3a PPP Cost Analysis

Commentary by REPORTER

Introduction.

During the audits each cell in the Table E3a was investigated. An audit was done on a number of schemes and the origin of the value used in the Table was pursued back to the original paperwork for these schemes.

Changes from 2007/08

The combined total Scottish Water cost and Annual charge totals £136.065 million, an increase of £5.742 million (4.4%) on the 2007/08 charge. The is due to a large increase in gas price and an increase in sludge volume processed at Daldowie Incinerator due to less sludge being disposed of to land fill.

Comments on methodology and output

Sewerage costs

Line E3a1: The reported costs are not the actual costs incurred by the concessionaire and Scottish Water has no method of ascertaining the actual operating costs from the concessionaire. The confidence Grade is thus D6 indicating the lowest possible confidence in these numbers. We agree with this assessment. It is likely that these cost estimates will become increasingly inaccurate as the years pass.

Estimated direct operating costs have been calculated from the financial models prepared when the concession agreement was closed. In some cases this is over 10 years ago and in some cases additional plant has been constructed by the concessionaire at the site and thus the cost model may have significantly changed.

Where a financial model does not make a direct split between sewerage, wastewater and sludge costs, factors have been applied based on the financial models for other PPP concessions which included a split of cost between the relevant categories. The direct cost does not include for rates which are reported on line E3a2. Some financial models include for rates, the value of the rates are known and so these have been removed where they are included in the financial models.

In order to fill in the tables, Scottish Water has stripped out the estimated inflation applied by the concessionaire and applied the actual inflation values over the period since the concession was started. No allowance has been made for the change in energy cost over the period as it is not known if the actual energy usage is as predicted.

Line E3a2: No rates are paid by the PPP for sewerage.

Line E3a3: SEPA charges paid by the PPP contractor have been requested by Scottish Water from the concessionaires and have been made available. We have checked that the information is correct for the 5 sites that make up the ASVE contract.

Line E3a4: The total direct costs is the sum of line 1, 2, 3 above.

Line E3a5: Scottish Water's general and support expenditure covers all other costs incurred by Scottish Water but excludes rates paid by Scottish Water. Costs are allocated to individual works where there is a direct link. Other general and support costs are distributed across the works using the same principal that the direct costs are split.

Line E3a6: No SEPA charges are paid by Scottish Water for sewerage.

Line E3a7: This value is the sum of lines 4, 5, 6.

Sewage treatment costs

Line E3a8: See E3a1

Line E3a9: Depending on the concession agreement the rates may be paid by the concessionaire or by Scottish Water direct. In some cases rates paid directly by the PPP concessionaire are known by Scottish Water and are taken from rates bills. Others are estimated by Scottish Water using the published rateable value of the property and the rate multiplier.

Scottish Water has reported all rates paid (whether by the concessionaire or by Scottish Water) under "rates paid by the PPP contractor". Rates paid directly by Scottish Water are not double counted in Scottish Water costs.

Line E3a10: See E3a3

Line E3a11: Line 11 is the sum of lines 8, 9, 10.

Line E3a12: See E3a5

Line E3a13: SEPA charges paid by Scottish Water have been checked against invoices received from SEPA for 4 out of the 5 works where Scottish Water paid the charges.

Line E3a14: Line 14 is the sum of 11, 12, and 13.

Line E3a15: Scottish Water has identified the cost of terminal pumping stations operated by Scottish Water which pump to PPP works. Again, to maintain consistency with the allocation of costs for econometric analysis, the cost of £0.3 million incurred by Scottish Water has been included in Table E3.

Sludge treatment and disposal cost

Line E3a16: See E3a1.

Line E3a17: See comments on E3a9.

Line E3a18: See E3a3.

Line E3a19: Line 19 is the sum of 16, 17, and 18.

Line E3a20: See E3a5 for a general explanation. In addition Scottish Water's general and support expenditure includes £2.7 million for tankering sludge from Scottish Water's treatment works to PPP plant for treatment and disposal. The largest cost is tankering to Daldowie which accounts for £1.538million.

Line E3a21: No SEPA charges for sludge were paid by Scottish Water.

Line E3a22: Line 22 is the sum of lines 19, 20, 21.

Total cost analysis

Line E3a23: Line 23 is the sum of lines 1, 8 and 16.

Line E3a24: Line 24 is the sum of lines 5, 6, 12, 13, 20, 21.

Line E3a25: Line 25 is the sum of line 7, 14 and 22.

Line E3a26: The annual charge is the amount paid by Scottish water to each concessionaire. An audit was carried out on the Tay PFI. Individual invoices for each month were checked and the total paid was checked against the entry in Table E3a.

The combined total Scottish Water cost (Line E3a.24) and Annual charge (E3a.26) totals £136.065 million, an increase of £5.742 million (4.4%) on the 2007/08 charge.

Scottish Water has provided commentary on the variance in these costs. The two largest increases are at Levenmouth where increase in gas price has added an additional £2.64 million and a higher sludge volume at Daldowie Incinerator increasing costs by £1 million.

Line E3a27: The public sector capital equivalent values are calculated using a base date, an estimate of the public cost of building the works at the base date and inflation applied to bring the cost up to date. Scottish Water provided a copy of the base cost data used for each project including the cost base year and the inflation indices applied. The base figures have been inflated by either RPI or RPIX depending on the scheme. Construction cost inflation can vary significantly from retail price inflation. We believe that COPI may be a more appropriate inflation index for the public sector capital equivalent values.

The base costs and date are taken from three pieces of information which have been inspected:

- A letter dated March 2001 which references a report to the Transport and Environment Committee where public sector costs are given.
- A letter sent to WICS in July 2000 where base dates and public sector costs are given.
- The WICS return for 2001/02. The costs included at the 2001/2 were assumed to be the cost at the base year which was some years prior the 01/02 (1997/98). This assumption may or may not be correct but this method has been carried out in all subsequent years and is possibly leading to an over estimate of this value for the Levenmouth and AVSE PPP schemes.

We recommend that WICS provides further advice on the inflation factors to be applied to the public sector capital equivalent values.

Contract information

Line E3a28: For all entries there is no change from 2007/08. We have checked the contract period for the following schemes: Tay, AVSE and MSI from the concession agreement documents for these schemes and the periods have been correctly entered into the Table. These represent 9 of the 21 schemes covered by the PPP.

Line E3a29: For all entries there is no change from 2007/08. We have checked the contract period for the following schemes: Tay, AVSE and MSI from the concession agreement documents for these schemes and the periods have been correctly entered into the Table. These represent 9 of the 21 schemes covered by the PPP.

Comments by Confidence Grade

Scottish Water reports a D6 confidence grade against estimated direct operating costs and total direct cost (Lines E3a 1, 4, 8, 11, 16 & 19. This is carried into the total cost lines in Lines E3a.7, 14, 22, 23 and 25). This reflects the use of data from historic financial models and other reports rather than current actual costs. We agree with this level of accuracy and note that this is the lowest level of confidence. However as the concessions continue this accuracy will be decreasing.

We consider the confidence grade of C4 for the total Scottish Water cost to be reasonable, as this is indeed an extrapolation of costs based on the split used to allocate operating costs to the various schemes which is mostly not accurate.

Summary

Scottish Water has filled in the table correctly and diligently and was able to provide back up data for all entries where requested. Where we found some numerical errors these have been corrected. Scottish Water has been very helpful and provided data as requested without exception.

The PPP operating costs are taken from the financial model for each scheme prepared when the concession agreement was closed. The reported costs are not actual costs incurred by the PPP concessionaires. The longer the concessions run the less accurate these estimates become.

The public sector capital equivalent values are reported to be taken from a report to the Transport and Environment Committee on 21 June 2001 adjusted by inflation. The reported costs are not the actual costs of constructing the plant but are based on an estimate prepared by Scottish Water over 10 years ago with RPI factored in.

For public sector equivalent value, we recommend that WICS provides further advice on the inflation factors to be applied to the public sector capital equivalent values.

Scottish Water has provided a detailed explanation of movements in costs including an explanation of atypical costs.

7.5 Table E4: Water Explanatory Factors – Resources and Treatment

Commentary by REPORTER

Introduction

Key points

- This table reports on operational assets only and covers all assets operational at any time in the report year. The methodology used is as in previous years. Changes to the asset inventory can be tracked.
- From AR08 a change was made in the counting of numbers of direct and indirect sources. Ellipse is not capable of distinguishing between direct and indirect sources. Consequently a separate spreadsheet is maintained distinguishing between them. WIC guidance is followed when counting direct and indirect sources.
- Operating costs have been allocated through the ABM process described in Section E Summary. The reported costs reconcile to the resource and treatment costs reported in Table E1.
- The Company has made substantial improvements to the data available for the average pumping head calculation.

Methodology

The methodology is outlined under "Comments by Line" below. Our comments on asset data and inventory in the section on Table H2 of this report are relevant to Table E4. These are not repeated here but reference should be made to them.

Comments by Line

Lines 1 to 7: The table covers all treatment works that were in operation at any time during the report year.

Ellipse is the basic source of data on numbers, size, type and operational area. Scottish Water is able to identify the individual changes made in the year. Because Ellipse cannot distinguish indirect sources, a separate spreadsheet is kept which makes this distinction. This consists of data from 2007, updated manually for 2009. While there are unlikely to be significant changes in individual years, this method is likely to become more inaccurate over time and we recommend that is should be revisited for AR10.

The total average daily output (line E4.5) is the same as the distribution input reported in Table A2 (line 2.11). No allowance has been made for losses in the raw water transmission systems or treatment works losses. No data infilling was required on outputs for operational works in Table E4.

In general Scottish Water does not have records of the raw water output from individual sources. In the absence of this data, the distribution input from a treatment works served by multiple sources is attributed to all of the sources feeding it, which for AR09 are counted as a single source.

Lines 8 to 12: Source outputs are allocated to areas using the operational area designation held in Ellipse. Scottish Water now reports against 8 areas. The total volume of distribution input produced is consistent with the distribution input reported in Table A2.

Line 13: The same methodology has been used this year as last year. Scottish Water has developed the same spreadsheet from last year, adding the 2008-9 data. As in AR08 the ratio is close to unity and therefore the peak to average ratio has not altered between AR08 and AR09.

Lines 14: SW advised that it does not have flow meters on the source of raw water or at the entrance to treatment works for the majority of its sites. It records distribution input as the flows leave the treatment works. To determine the flow required for the average head calculation the Company has assumed a percentage process flow loss through the works. If the source flow volume is known the Company has used it. This leads to a potential, unconfirmed, inaccuracy to this figure.

To improve the accuracy of the data SW has completed a survey in AR08 to fill gaps in its knowledge on pumping head and flow. Only 107 of the 694 pumping stations (15%) required in the calculation now need data gap fill and these are in the smaller ranges. We were presented with data from Ellipse for treated water pumping stations and Operations BH and Spring data for pump sizes. We were also presented with 2008-2009 Telemetry data for annual average daily flows and spreadsheets combining all the data to give the figure in the return.

For sites with no pressure data available, the pumping head is based on the difference in ground level between the pumping station and the discharge point. SW has assumed there is a system head loss at these sites (friction, bends, etc) of 0, 5 or 10m. This assessment is simply based on short distance, reasonable distance and long distance or height pumped (there is no strict definition of these bands). As this is only applied to the lower 15% of pumping stations this is a reasonable approach prior to obtaining more reliable data.

The data collection and order of preference is as follows:

- If the pumping station has been surveyed then surveyed data is used. This is from both on-site pressure loggers and flow meters, and meters on the supporting networks.

- If pressure is not available then the difference in ground level determined from GIS is used with an assumption of the system head losses.

- If level survey data is not available then the kW data included in the Ellipse database is used.

- Power (in kWh) was used for Treated Water Pumps where no other data was available. Using data for sites that had flow, lift and power a relationship was determined between Power and flow time lift. This relationship was used for the pumps where only power was available. As this relationship was based on only pumping stations with all data, the power use of pump sets is accounted for in the relationship and no assumed power use percentage was used. SW assumes that 100% of the power is used for the pumps at a pumping station and 60% at a treatment works.

- If the kW data is not included in the Ellipse database then the pumping station is banded with known pumping stations producing the same flow; so the assumed head is based purely on the known flow. From our audit the latter can be potentially very inaccurate but we understand is not used on many sites and will make little difference to the average.

In the audit we saw that the data is now comprehensive and consistent within the actual figures held.

Lines 15 to 19: The number of works has reduced by 14 for the report year. The total DI has reduced by 127.5Ml/d to 2143.7Ml/d.

Costs have been allocated to assets using the ABM process described in Section E Overview. SW states that around 86% of costs are directly allocated to specific asset codes for the report year. The reported costs reconcile to the resource and treatment costs reported in Table E1.

Scottish Water allocates costs to resources and treatment works separately and must allocate resource costs to treatment works to complete Table E4. Where necessary, resource costs are allocated between treatment works in proportion to the design capacity of the treatment works. If a source feeds more than 1 works costs are allocated on the basis of DI from the works.

The allocation of costs from ABM to individual assets takes account of the allocation of power costs between resource and treatment and distribution.

Water resource and treatment costs by region shows a mix of small increases and decreases as compared to the previous year, the reasons for these are covered in SW's commentary.

The reporting of costs associated with water treatment works by process type covers the number of works which were in operation during the year. There were a number of changes to the works banding either from process changes or from reclassification for 2008/09. overall costs reduced by £0.2m and the changes between process bands are included in SW commentary. The main changes include:

- Increase costs for simple disinfection mainly due to misallocation at two borehole sources in the previous year
- Increase costs for band W2, single stage complex treatment, due to the full year operation of Milngavie, partly offset by works closures
- Decrease in W3, multiple stage complex treatment, due to reduced production at Balmore WTW.

SW has also included in its commentary details of the costs by works size, which again shows small changes due to changes in bands. These relate to changes in output from a number of works either from capital investment or due to problems experienced at the works during the report year. Again the misallocation from the previous year highlighted above has had a small impact.

Line 20-26 Comprises operational WTW that provided water into supply at any time during the report year. By contrast, Table H2 reports the situation at 31st March 2008. SW reports a reduction of 14 WTWs in the report year.

Lines 28 to 37: The number and type of treatment plant distributed by size band is consistent with the asset inventory recording operational assets only. The works size is the design capacity taken from the asset inventory.

There were a number of movements in costs due to operational changes for works in a particular size band. These are detailed in SW commentary.

Comments by Confidence Grade

We consider the confidence grades reported by Scottish Water to be generally reasonable, with the following comments:

Lines 1 to 7: For AR09 Scottish Water has claimed an improved confidence grade of B3. This is consistent with the reported confidence grade of B3 for distribution input in Table A2 and is justified by improvements in data collection and handling in the report year.

Line 13 In our commentary on AR08, we recommended a confidence grade of C4, as adopted here. While current year data collection may have improved the resulting peak demand remains from the 2004-5 historic data which has not been improved. We would therefore advise the confidence grade remains at C4.

Line 14	SW made marked improvements during AR08 to the quality of its data for head and flow at each pumping station. We believe that a confidence grade of B3 is reasonable, consistent with that now claimed for distribution input.

7.6 Table E6: Water Explanatory Factors – Distribution

Commentary by REPORTER

Key Points

- The line definition for line E6.1 requires consistency with Table A2, line 1 - the winter population (population supplied during the reporting year in SW's area of supply). The E6.1 definition "Average Annual Resident Connected Population" (average annual resident population connected to the water distribution system in each distribution sub area) is consistent in so far as the two definitions imply connected or supplied populations. However the reported numbers for both are the total Scotland population and not the serviced population as reported in line A2.5 and implied for line E6.1. The reasons for reporting the total winter population appear to be historic. We recommend that WICS clarifies exactly which number is to be reported if consistency is required.

- The information reported is generally consistent with other sections of the return including populations, properties and water supply in the A Tables, burst and pressure information in B Tables and the asset inventory reported in the H Tables.

- Operating costs have been allocated through the ABM process described in Section E overview. Total operating costs for water distribution align with those in table E1.

- The lengths of main in various categories are taken from the corporate GIS. Lengths reported include infilling for missing data and the default diameter where this is unknown is 150mm. The total length of main reported is consistent with the length of potable water main in other tables. The length of unlined iron main includes a downward adjustment for mains which have been lined but where GIS has not yet been updated. This is discussed in greater detail in our commentary on Table D5.

- The total leakage quoted at line E6.20 (869.091 Ml/d) differs from line A2.3 (868.134 Ml/d) due to the inclusion of field troughs in E6.20. This is referred to in SW commentary.

Audit Process

During the audit we reviewed:

- Sources of data on populations, volumes, operating costs and efficiency and assets

- The methodology for allocating costs and compiling the table

- The consistency of data with that reported in other relevant tables in the Annual Return and other sources where relevant

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

The methodology used varies for the different lines of the table and is described under Comments by Line where relevant below.

Conclusions

From our audit we concluded that Scottish Water has thorough processes in place for collecting base data for Table E6. Data checks showed the base data to be compatible with entries in the tables. Line entries in the table were generally consistent with other relevant lines in the Annual Return, although there is a difference in total leakage quoted at line E6.20 (869.091 Ml/d) and line A2.3 (868.134 Ml/d) due to the exclusion of field troughs in line A2.3.

Scottish Water has generally provided explanations for changes in table data and disclosed material assumptions. These are detailed below in our line commentaries where relevant. We are not aware of any sensitivity analysis carried out on table data. Except where noted in detailed line commentaries, populations and connected properties, water volumes, lengths of mains, numbers of bursts, leakage levels and asset information are consistent with other relevant lines in the Annual Return. Costs reported in Table E6 align with those reported in Table E1.

Comments by Line

Line 0: For AR09, Scottish Water's 8 regional operational areas are unchanged. They are based on the 32 regional council boundaries. Three unitary authorities cover more than one regional operational area, but Scottish Water's boundaries then generally follow lower local authority boundaries so that populations follow published data.

Line 1: The average resident connected population is the winter population distributed across the regional operational areas. Connected population was derived from figures for each unitary authority area reported in WIC4. Where unitary authorities cross Scottish Water operational boundaries connected population was distributed using OS address points to link to the regional operational areas.

This line total (5,001,656 population) is consistent with the number derived by Scottish Water for the total annual average resident water population of *[Domestic lines A2.3 + A2.4 + population not in domestic properties (89,799)]*. The number is consistent with line A2.1.

Line 2: The reported total number of connected domestic properties is derived from local authority data in the same way as in line 1 above. Non-domestic properties are added from address point postcode analysis. The reported total connected properties equals line A1.10, as defined. The methodology for calculating line A1.10 is described in our commentary on Table A.

Lines 3 & 4: The volumes of water delivered have been derived for each operational area using standard Scotland-wide assumptions of per capita consumption, supply pipe leakage and water consumption per rateable value for unmeasured non-domestic properties. Measured supply data are specific to each regional operational area.

The reported volume for households equals the sum of Table A2 lines 12 and 13. The reported volume for non-households equals Table A2 lines 14 and 15. The methodology for calculating line A1.10 is described in our commentary on Table A.

Line 5: The reported area of each operational area has been calculated using the corporate GIS database and a query tool based on regional operational area polygons. The polygons used to define the operational boundaries are the same as in AR08, and the total area is the same at 79761 km2.

Line 6: The number of supply zones is reported as the regulatory supply zones defined under the Water Supply (Water Quality) Scotland Regulations which came into force at the end of 2003. Regulatory supply zones must have no more than 100,000 population and may include one or more water supply zones fed from a service reservoir or downstream of an hydraulic discontinuity

At the end of AR08 there were 329 regulatory water supply zones not exceeding 100,000 population. The number of zones in calendar year 2008 was 344; the reduction has resulted from rationalisation of water quality regulation zones. As a result of adjustments to zone boundaries following major changes in the Glasgow area, the Burncrooks zone was deleted from the Clyde operational region and added to the Forth.

Lines 7 – 11 The allocation of costs is described in the Overview to our commentary on the E tables. The allocation by geographical area combines the costs associated with the assets and teams within that area. Our sample audit of two operational areas confirmed this to be the case.

As in the previous report year where a water treatment works has a distribution pumping station within the works site boundary, the Opex costs have been reallocated to the water distribution activity within ABM. This is on the basis of the kilowatt rating of the pumps and the hours run. The total operating costs for water distribution reflect these reallocated costs.

Total costs for water distribution operating cost align to those in table E1.

Lines 12 – 18 The lengths of main in various categories are taken from the corporate GIS. Lengths reported include infilling for missing data and the default diameter where this is unknown is 150mm. Infilling is discussed in greater detail in the commentary on Table H3. The total length of main reported at line 16 is consistent with the length of potable water main in D5.8 and H3.4. The assessment of this length is discussed in greater detail in our commentary on Table D5.

Systems for updating the data for development, renovation and new construction were examined in previous years. Procedures have been formalised for updating records and for rehabilitation work and contractors have direct access for updating following the completion of work. Quality assurance procedures are followed, version control records changes and validation routines are imposed before updated information becomes the accepted version.

During the audit the MEAV database for infrastructure assets was examined. This is the database which Scottish Water compiles and maintains for the reporting of the asset inventory and is the basic source of data for Table E6. It is downloaded from GIS, but in addition to GIS data also includes infill for missing data. Data listed included diameter, material, type (public or other), SW area, surface type and commissioning date. The total length of potable main at line E6.16 was checked and seen to be consistent with the database. Data were interrogated for 8 sample mains lengths and some infilling was noted, including diameter, material and date of commissioning. All data seen were specific to mains lengths.

Line 17

The length of unlined iron mains is determined in the same way as lines 12 – 16 above, except that a reduction is made to account for lengths of main which have been relined but where GIS has not been updated to reflect this fact. The methodology for this adjustment is covered by internal guidance note WIC-ID-WTA-05060008 TA E6.17. The adjustment is made on the basis of an assessment made in 2005 that half of the unlined iron pipe in the former West of Scotland area and a proportion of the North of Scotland area had been relined but not shown as such on records. The adjustment is made on an area-by-area basis and resulted in a reduction of 151.0 km in the assessed length of unlined iron pipes for AR09. This corresponds to 1.09% of the length contained in GIS.

Line 19

The methodology for reporting bursts is commented on under Table B8. Burst data comes from two sources. The majority are extracted from the repair work orders recorded on the WAMS/Ellipse database and a small proportion from ongoing proactive leakage projects being carried out by Scottish Water Solutions. The combined data is then cleansed to remove work that is excluded by the WICS definition for B8.1. Duplications are also removed, where SW staff have been called out to support SWS

The number of bursts has been allocated between operational areas based on the postcode on the work order. A very small number of records from WAMS do not have a geo-reference and these have been assigned to each area using other information in the records.

The total number of mains bursts reconciles approximately with the product of lines E6.16 and B 8.1 The small difference is within the quoted confidence grades for the lines.

Line 20: Leakage is the balance between water delivered and the distribution input. Specific measurements of distribution input are made for each operational area. However, the assessment of water delivered relies on Scottish wide assumptions of per capita consumption supply pipe leakage and water consumption per rateable value for unmeasured non-domestic properties. The total leakage quoted at line E6.20 (869.091 Ml/d) differs from line A2.3(868.134 Ml/d) due to the inclusion of field trough leakage in this line. SW's commentary applies.

Line 21: Numbers of properties reported for low pressure are consistent with line B2.9.

Lines 22 to 24: Data for numbers and capacities of pumping stations are abstracted from Ellipse. The asset information is consistent with the asset inventory but records any assets operational during the year. The geographic split is carried out based on operational area information held in Ellipse. Data infilling is carried out on pumping capacities by assuming that the spread of capacities among unknown sites is the same as the spread among known sites for that operational area. The proportion of missing capacity data is smaller among operational sites reported in Table E6 than among all sites (including non-operational), reported in Table H2.

In order to infill the missing data SW has compared kW data with known data for properties served on billed energy use. Pumping capacity is taken as design capacity recorded on Ellipse, except where operational data shows greater average flows. Where this is the case these are substituted. Therefore gap filling will be partly based on average flows (rather than total installed capacity), but underestimation is unlikely to be significant.

Ellipse was interrogated with direct access to the Scottish Water network. Ellipse records the capacity, SW region and operational status for each pump, although among a small sample of sites examined a significant proportion did not have the actual capacity recorded. Investment has brought 34 new pumping stations into use, while 12 have become non-operational.

Line 25: As for water resources and treatment PS Scottish Water completed a substantial survey exercise in AR08 to improve the accuracy of the average pumping head. The methodology used is as described in our commentary on Table E4.

Lines 26 to 29: Data for numbers, capacities and operational areas for service reservoirs and water towers are abstracted from Ellipse.

The asset information is consistent with the asset inventory but records any assets operational during the year. The geographic split is carried out based on operational area information held in Ellipse. Data infilling is carried out on capacities by assuming that the spread of capacities among unknown sites is the same as the spread among known sites for that operational area. Investment has brought 14 new service reservoirs into use, while 34 were decommissioned.

Ellipse was interrogated with direct access to the Scottish Water network. Ellipse records the capacity, SW region and operational status for each service reservoir and water tower. A small sample of sites was examined and the status and capacity were given in every case and change requests recorded.

Comments by Confidence Grade

Lines 1 to 4: The confidence grades given mirror the grades given for Table A line items. Both sets of table returns were derived from the same data sets and using the same methodology. Subject to the comments on individual line grades in Table A, we consider the confidence grades reported by Scottish Water to be reasonable.

Line 5: This line is abstracted direct from Scottish Water GIS data. The grade is allocated is reasonable.

Line 6: The number of supply zones is reported as the regulatory supply zones defined under the Water Supply (Water Quality) Scotland Regulations and reported to DWQR. The grade is allocated is reasonable.

Lines 7-11: The Company reports confidence grades A2 for these costs. The majority of the costs are directly captured in the Company's core systems and directly allocated to assets. There are a few elements where a degree of manual allocation is required, e.g. distribution pumping, but these are based on local knowledge using the kilowatt rating of pumps and hours run. We consider the Company's reported confidence grades to be reasonable.

Lines 12 – 18, 22, 26 and 28:

The B2 grade given for these lines is identical to that for the corresponding lines in the H Tables. All of these lines come from the same source and these grades are supported.

Lines 19 and 21: The confidence grade given for these lines corresponds to the confidence grades for lines B8.1 and B2.9 respectively and are supported.

Line 20: The confidence grade allocated mirrors the grade given for Table A2 line 2.30 and is accepted.

Lines 23 and 24: These lines rely on significant infilling of capacity data and the allotted grades of C4 and C3 respectively are supported.

Line 25 SW made marked improvements during AR08 to the quality of its data for head and flow at each pumping station. We believe that a confidence grade of B3 is reasonable, consistent with that now claimed for distribution input.

Lines 27 and 29: Capacities are recorded in Ellipse for all service reservoirs and water towers, based on design capacity and the B2 confidence grade is supported.

7.7 Table E7: Wastewater Explanatory Factors – Sewerage

Commentary by REPORTER

Key Points

- The information reported is generally consistent with other relevant sections of the Annual Return.
- The drained area has increased by 5% (E7.6). There are two apparent reasons: developers' extensions to the drained area, and the work done to improve drainage area boundaries.
- The estimated length of lateral sewers is based on a statistical approach of the likely length of lateral sewer per dwelling of each type. Recalculation produces a different length each year, reflecting changes in housing type from published local authority data which can have little effect on actual sewer lengths in the ground. We recommend that Scottish Water review this procedure.
- The length of all sewers is based on the total length of sewer in GIS, plus a further 1000km of main sewer, assumed to exist but not yet in the asset inventory.
- Data on sewage pumping are poorer than that for water supply. Whereas around 85% of water pumps have data in Ellipse, only about 20% of sewage pumps do so. Data on numbers, capacities and types of pumping stations have been subject to significant infilling using data from known sites to infill missing pumping capacity and average head.

Audit Process

During the audit we reviewed:

- Sources of data on populations, volumes, properties, pumping head, loads and assets
- The methodology for compiling the table
- The consistency of data with that reported in other relevant tables in the Annual Return and other sources where relevant

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

The methodology used varies for the different lines of the table and is described under Comments by Line where relevant below.

Conclusions

From our audit we concluded that Scottish Water has thorough processes in place for collecting base data for Table E7. Data checks showed the base data to be compatible with entries in the tables. Line entries in the table were consistent with other relevant lines in the Annual Return.

Scottish Water has generally provided explanations for changes in table data and disclosed material assumptions. These are detailed below in our line commentaries where relevant. We are not aware of any sensitivity analysis carried out on table data. Subject to comments in detailed line commentaries, populations and connected properties, sewage volumes, lengths of sewers, numbers of collapses, pumping head, loads and asset information are consistent with other relevant lines in the Annual Return.

Comments by Line

Line 0: For AR09, Scottish Water uses 8 regional operational areas, based on the 32 regional council boundaries. Three unitary authorities cover more than one regional operational area. This approach is consistent with the AR08 methodology.

Line 1: The average resident connected population (4,726,700) is the household population connected to the wastewater service reported in Line A2.8 distributed across the operational areas. The reported numbers are consistent.

Line 2: The distribution of tourist population is made on the basis of average occupancy rates for different types of visitor accommodation. The allocation is prone to uncertainty due to the use of average bed spaces for different types of visitor accommodation and the possibility that visitor accommodation on the outskirts of built up areas will be connected to the sewerage system but not included within the drainage area boundary. The difference between the wastewater winter and summer population (lines A2.6 and A2.7) is 156,965. As for previous submissions the annual average figure reported in this line (104,200) differs from the maximum figures reported in Table A2. .

SW notes that the figure has decreased by 14% as it has made no adjustment to correspond with total bed space nights figure supplied by visit Scotland.

Line 3: Scottish Water's methodology for calculating average flow is generally the same as last year. The calculation is in two parts: the assessment of flow in dry weather, and a calculation of storm run-off.

For both dry-weather and storm flows sample catchment analysis is used to generate flow factors which are then applied to all drainage areas across Scotland. The analysis does not distinguish between regions. For dry weather flow, flow survey recorded data from 93 works is now used in this assessment, as lat year.

Dry-weather flow component

The dry-weather flow has been assessed from flow records at a small sample of works. The sample was selected as works with good continuous flow records and rainfall data, and others where a flow and rainfall survey has been carried out for a development constraints project. As a result, the updated sample consists of 93 WWTWs (including 10 PFI works). Scottish Water noted that the weather in AR09 was unfavourable to dry weather flow assessments.

The increase in the sample of works used from the previous year increases confidence in the analysis. However, continuing to rely on a small sample of works limits confidence in the overall result and may create a geographical bias.

The dry weather data selected might not meet a typical definition of dry-weather flow which is usually measured after a week with virtually no rain. It is possible that the results contain a small element of storm-water run-off.

PFI schemes at coastal sites may also include storm water storage to limit intermittent discharges. This retained flow will be returned to the main sewer for treatment after the storm subsides. It is likely that some of this retained storm water is included in the dry-weather flow estimate.

The dry-weather flow per head per day is calculated for each works and an average figure calculated. The calculated values for the sample works resulted in an average of 0.39 m^3/h/d, as last year.

The estimate of dry-weather flow used in the assessment appears high. Audit interviews revealed that sewerage models can show high background flows, particularly in urban areas where it was once common practice to allow ground water sources to discharge to sewers.

Storm flow component

Storm flow has been determined as the run-off predicted by a sample of existing sewer models. The data is used to generate average storm run-off factor in terms of m^3 per mm of rainfall per hectare of sewered area.

The range of predicted run-off from the models used appears to be reasonable, and is based on sewerage models. The assessment covers the whole sewered area and the rainfall is derived from national statistics published by the Centre for Ecology and Hydrology.

Calculation of volume of sewage collected from dry weather and storm components

The volume of sewage collected is the combination of estimated dry-weather flow and storm flows calculated as follows:

- The dry-weather flow factor described multiplied by the resident population.
- The storm flow factor described above, multiplied by the sewered area, multiplied by the average rainfall in the report year.

Line 4: The number of connected properties is obtained from an analysis of OS AddressPoint data in each operational area. This figure is then factored up to reconcile with the total number of properties which was calculated for the base information for the A tables.

Line 5: The reported area of the sewer district of each sub-area is the same as that reported for water regional operational areas; line A2.5. This is consistent with the approach adopted for AR08.

Line 6: The drained area is measured from the sewered area boundaries on the GIS system. Some new developments are on the edge of or outside previous sewered area boundaries and, the boundary is updated to account for this, resulting in an increase from AR08.

Line 7: Annual precipitation is calculated in the same way as last year, from data obtained from the website of the Centre for Environmental Hydrology, the source of the data is the Met Office. The CEH report a monthly rainfall depth for the 7 former River Purification Board areas, covering the whole of Scotland. This data is then applied to the relevant operational area. Overall, the data shows that AR09 was a wetter year than AR08.

Lines 8 – 13 The overall length of sewer (line E7.8) reconciles with the asset inventory (sum of lines H4.1 – 4.3) and line D6.13 and includes critical and non-critical sewers, laterals, pumping mains and an allowance against under-reporting of existing connected properties on the corporate GIS. The length of sewer has been allocated to each area on the basis of the sewerage stock recorded on the corporate GIS.

The lengths of sewers in various categories are taken from the corporate GIS. Lengths reported include infilling for missing data including diameter. This is carried out using rules based on experience of sewerage networks, initially using data from CCTV surveys, a digital terrain model and STC25 data. Remaining gaps are then infilled using a logical process using connectivity, for example using the diameters of adjacent known pipes. Infilling is discussed in greater detail in the commentary on Table H4.

Systems for updating the data for development, renovation and new construction were examined in previous years. Procedures have been formalised for updating records and for renovation work and contractors have direct access for updating following the completion of work. Quality assurance procedures are followed, version control records changes and validation routines are imposed before updated information becomes the accepted version.

During the audit the MEAV database for infrastructure assets was examined. This is the database which Scottish Water compiles and maintains for the reporting of the asset inventory and is the basic source of data for Table E7. It is downloaded from GIS, but in addition to GIS data also includes infill for missing data. Data listed included diameter, material, type (public or other, critical or non-critical), SW area, surface type and commissioning date. Data were interrogated for 8 sample sewer and rising main lengths and some infilling was noted, including diameter, material and surface type. The date of commissioning was largely unknown. All data seen were specific to sewer lengths.

Line 9: The estimated length of lateral sewers was based on a relatively detailed investigation into dwelling types etc. from local authorities in 2005-06. This was repeated in AR07 and this year. However, the initial investigation was based on a statistical approach of the likely length of lateral sewer per dwelling of each type. Intrinsically the number should not change with time, so recalculation should be unnecessary. In fact, recalculation has produced a different length each year, from 15364km in AR06 by stages to 16403km in AR09. The changes reflect the changes in housing type from published local authority data which can have little effect on actual sewer lengths in the ground. We recommend that Scottish Water review this procedure. Further comments are given in our commentary on Table D6.

Lines 10 – 12: The lengths of the various categories of sewer are taken from the MEAV database. The length of separate foul sewer is not reported separately in table E7. The length of all sewers is based on the total length of sewer in GIS, plus a further 1000km of main sewer, assumed to exist but not yet in the asset inventory, together with an allowance of about 16000 km representing lateral sewers assumed to exist but not yet in the asset inventory. The methodology was used for AR06 return and the same process repeated every year since then.

While 1000 km of main sewer was reasonably added (assumed to exist but not recorded) in 2006, any new discoveries are added into the GIS without a corresponding reduction in the 1000 km allowance. No account has been made for this. We recommend that Scottish Water review this procedure, which will otherwise increasingly corrupt the quality of the return data.

Line 13: The length of critical sewer at line E7.13 was checked and seen to be consistent with the database and with line H4.1. In 2004/05 Scottish Water updated its assessment of critical sewerage by undertaking a comprehensive assessment based on a defined rule set applied through the GIS system. This method was updated further in 2005/6 and is now updated every year. All sewers which were identified in 2005/6 as critical remain so for AR09. In addition any new sewers in AR07 AR08 and AR09 are categorised as critical if:

- they have a diameter >450 for foul sewers;
- They have a diameter >600 for storm sewers;
- their depth is > 4m; or,
- they are masonry or brick

Scottish Water recognises that the methodology has some limitations. We believe that these limitations include:

- The data infill rules used to complete the population of key sewerage data.
- The interpretation of Sewer Rehabilitation Manual rules which relate criticality to surface features.
- The lack of key information such as traffic flows and soil conditions which have either been omitted from the assessment or inferred from other data.
- Different assumptions or additional information would result in a different results and this is reflected in the confidence grade.
- In addition new sewers added to GIS are now identified as critical by a slightly different method.

Line 14: The methodology for determining sewer collapses is unchanged, with data being obtained via the WAMS/Ellipse database. The work orders are attached to addresses not assets. The address is generally the address of the customer reporting the problem. The system generates a location code based on the address and this code is then used to allocate problems to report areas. Reports without location codes were spread pro-rata to the eight areas. This figure does not match that in Line B8.10 as it includes private pipework excluded from the B table.

Lines 15 to 21: The audit for these lines was undertaken in conjunction with that for Line E4.14, and the methodology for pumping head and power is the same. We commend the approach, but do not describe it again here. However, the data for sewage pumping is much poorer than for water supply. Whereas around 85% of water pumps have data in Ellipse, only about 20% of sewage pumps have. Scottish Water's Information, Data and Reporting (now GIV) Section are keen to see improvement and have been sending queries to operations on a drip-feed basis to improve recorded information over time.

Data for numbers, capacities and types of pumping stations are abstracted from Ellipse. Data from known sites survey has been used to infill missing Ellipse data pumping capacity and average head. The asset information is consistent with the asset inventory but records any assets operational during the year. The geographic split is carried out based on operational area information held in Ellipse. Data infilling is carried out on pumping capacities by assuming that the spread of capacities among unknown sites is the same as the spread among known sites for that operational area. The proportion of missing capacity data is smaller among operational sites reported in Table E6 than among all sites (including non-operational), reported in Table H2.

In order to infill the missing data SW has compared kW data with known data for properties served on billed energy use. Pumping capacity is taken as design capacity recorded on Ellipse, except where operational data shows greater average flows. Where this is the case these are substituted. Therefore gap filling will be partly based on average flows (rather than total installed capacity), but underestimation is unlikely to be significant.

Ellipse was interrogated with direct access to the Scottish Water network. Ellipse records the capacity, SW region and operational status for each pump, although among a small sample of sites examined a significant proportion did not have the actual capacity recorded. Investment has brought 83 new pumping stations into use, while have become non-operational and 3 were re-categorised as not being Scottish Water assets. Data on stations becoming non-operational and a sample of 3 new pumping stations were reviewed and the change requests confirming change of status were verified.

Lines 15 to 16a: In 2007-08 SW surveyed 71 targeted sites (126 pumps) to examine pumping efficiency. Data from this survey has been used to infill missing Ellipse data for these lines. Measured figures were used so that there may be small differences in comparison with previous years, and it is not clear exactly how measured average and peak capacities have been allowed for. Although the numbers of pumping stations and kilowatt capacity have risen, the calculated flow capacity and pumping head figures have fallen.

The asset data are consistent with the asset inventory but reports any assets operational during the year. Pumping stations operated under PFI concessions have been excluded.

Lines 18 to 21: Ellipse does not distinguish between combined and stormwater pumping stations. Scottish Water maintains a spreadsheet in which type is listed. This includes categories for combined and stormwater pumping stations. The spreadsheet totals were reconciled with lines E7.18 – 21.

Lines 22 to 23: In the report year the company has reported the number of CSOs consistent with Table H4 but excluding those discharges which occur from sewage treatment works. Data are extracted from Ellipse. Some reductions in the reported numbers have occurred as the CSO programme leads to better information and removals due to investment projects.

Scottish Water is reporting overflows in the same way as in 2008. The reported number excludes overflows at sewage treatment works and emergency overflows from pumping stations. This explains the difference between the number reported in table E7 and the number of CSOs reported in table H4.

Lines 24 and 25: The number of operational sewage treatment works reconciles with that in Table E8 line 8. The number of treatment works and reported loads exclude PPP. The total load is consistent with the load reported in table A2.

Comments by Confidence Grade

We consider the confidence grades reported by Scottish Water to be reasonable subject to the following comments.

Lines 1 - 2: The confidence grades for these line items mirror the grades given for Table A line items. Both sets of table returns were derived from the same data sites and using the same methodology. Subject to the comments on individual line grades in Table A, we consider the confidence grades reported by Scottish Water to be reasonable.

Line 12: The confidence grade remains at B2 on the basis of infrastructure surveys carried out.

Line 13: We recommend a confidence grade of B4 on the length of critical sewer to account for the data infill, interpretation of SRM rules and gaps in the specific data required to complete the assessment.

Line 14: The confidence grade has moved from B3 to A2. SW reports that it has made the change on the basis of better reporting. We accept that SW has worked hard to improve its reporting and on this basis accept the revised confidence grade. However, we note an inconsistency in this line with Line B8.10, where a confidence grade of only B3 is claimed.

Line 17: The allocated grade of C4 is accepted for this line. This is a lower grade than for drinking water pumping head, reflecting an increased degree of data infill and this grade is accepted.

Lines 22 - 23: The confidence grade claimed remains at A3, as last year. However we see no reason why the information on CSOs should be any better than that on sewage treatment works and suggest that B3 is more appropriate.

7.8 Table E8: Sewerage Explanatory Factors – Sewage Treatment Works

Commentary by REPORTER

Introduction

Key points

- The data sources are consistent with other sections of the return, including the populations and loads in Section A and the asset inventory in Section H.
- The data excludes PPP treatment plant.

Audit Process

We reviewed work done in AR09 to refine the drainage boundaries for the smaller WwTWs. As part of this exercise, we were shown how information for a WwTW is assembled centrally in the IDR department and then sent to the Regional Operational Planners for them to check. We examined the details for two WwTW.

Methodology

Scottish Water has compiled a spreadsheet derived from Ellipse for Table H5 that holds data on all treated and untreated continuous discharges. It also contains data for operational and non-operational assets and PFI works. The list of works and discharges is continually reviewed by Asset Planners to ensure that it is updated to correct errors in historic data and take account of improvements in the year. The works reported in Table E8 are a subset of those in Table H5 and are those in operation, excluding PFI works, at the end of the report year.

The reported loads in this Return are based on Scottish Water's current assessment of resident and visitor populations, trade effluent loads and tanker loads discharged to individual treatment works. Details of the methodology are provided in Table A2.

In AR09, Scottish Water has been working to improve WwTW information in Ellipse through the drainage area work reviewed in the Audit Process. The exercise requires input from Regional Operational Planners, and we understand the work will continue for some time.

The reported loads are consistent with Table A2. Loads are based on 60g BoD/head/day as specified by the WICS.

The asset data is consistent with the data in Table H5 with the following exceptions:

- Table E8 includes operational works only. (Table H5 includes all assets including redundant and decommissioned assets.)
- Table E8 includes unscreened sea outfalls that have no treatment asset and are not included in Table H5.
- As in AR08 works banding in Table E8 is based on estimated load to the works. The works banding for table H5 is based on the nominal design capacity of the works.

Compliance data are extracted from a SEPA report supplied to SW by SEPA and as in AR08 covers the fiscal year (change from 2007).

Conclusion

Data for this table are partly derived from spreadsheets of flows and loads compiled by IDR for Table A2. Other data are taken from SEPA published data for WwTW performance which also used in Table B8. We believe that these sources are reasonably reliable and accurate within the stated confidence grades.

Comments by Line

Lines 1 to 20: The data in Table E8 lines 1 to 20 was taken from the company's analysis of treatment works loads which includes data on all treated and untreated continuous discharges.

PPP works are not included in reported data in table E8.

Lines 11 to 20: The total load is consistent with the load reported in table A2, subject to the fact that septic tank loads are excluded from the totals in table E8.

Lines 21to 30: The compliance report includes performance against the CAR and UWWTD standards included in the consents or licences. UWWTD consent limits may be more onerous than the other consent limits included in the analysis.

Lines 31 to 42: Costs have been allocated to assets using the ABM process described in the Section E Overview. The costs are consistent with the direct costs and functional expenditure reported in Table E2 for sewage treatment.

The majority of costs for WWTW are directly allocated to the specific asset code. Where this is not possible costs are allocated by local managers. For septic tanks costs are allocated to a group of septic tanks linked to a works team. Costs are spread across the number of septic tanks within the group based on load.

General and support expenditure has been distributed between treatment works in proportion to the direct employment costs allocated. This was done on the assumption that general and support expenditure is mainly to support staff as opposed to other expenditure.

Movement in costs for the report year between treatment categories mainly relate to movements in works between categories

Comments by Confidence Grade

We consider that the confidence grades reported by Scottish Water are reasonable.

7.9 Table E9: Large Sewage Treatment Works Information Database

Commentary by REPORTER

Introduction

Key points

- 23 large treatment works are reported. The report excludes the PPP works. West Barns WwTW has been included renamed as Dunbar, Galashiels has been reinstated this year and Iron Mill Bay has been included. Mauchlie, WWTW has been excluded
- The data sources are consistent with other sections of the return, including the sewage loads in Section A.

Audit Process

In addition to the audit work for Table A2 and Table E8, we looked at the reasons for WwTW being newly included and, in the case of Mauchlie, excluded.

Methodology

The size of works has been determined by the population equivalent of the total load received. The load received is calculated using the same methodology described for Table A2.

The one works added in AR08, West Barns, as a result of a population increase is now known as Dunbar WwTW. Changes in sludge imports caused loads to increase at Galashiels, bringing it back above the 25000 pe qualifying criteria for this table. Sewerage changes in the Dunfermline area increased loads at Iron Mill Bay and brought this works into reporting status.

Compliance data are taken from published SEPA figures and there were no anomalies to be commented on this year.

Conclusion

Data used in this reporting table are partly derived from Scottish Water's own data spreadsheets compiled by IDR and used elsewhere in the return. Data not so derived comes from SEPA published data.

We believe these sources to be reliable and accurate within the confidence grades given.

Comments by Line

Line 1	Reports the population equivalent rounded to the nearest 1000.
Lines 2 to 6	The reported consent parameters are the tightest licence figures and therefore include UWWTD parameters.

Line 7: The reported data is the number of sample failures against the look-up table consent limits in the COPA section of the consent. This is consistent with the approach adopted for Table E3 and E8.

Lines 8 to 14: Treatment works category information is consistent with previous years.

Lines 15-19: Costs have been allocated to assets using the ABM process described in Section E Overview. The costs are consistent with the direct costs and functional expenditure reported in Table E2 for sewage treatment.

In the report year general and support expenditure has been distributed between treatment works in proportion to the direct employment costs allocated. This was done on the assumption that general and support expenditure is mainly to support staff as opposed to other expenditure. Prior to 2006/7 general and support expenditure was allocated in proportion to load.

Comments by Confidence Grade

We consider the confidence grades reported by Scottish Water to be reasonable.

7.10 Table E10 – Sludge Treatment and Disposal

Commentary by REPORTER

Introduction

Key Points

- Sludge treatment and disposal is reported for sludge treated and recycled or disposed of from Scottish Water's operational sites, excluding sludge disposed of by PPP concessions.
- The resident population reported is the total for Scottish Water's treatment works, but is incompatible with the sludge quantities because some sludge is supplied raw to PPP concessions for treatment and disposal.
- The sludge quantities reported are the quantities of sludge produced from SW's sludge treatment centres.
- Total operating costs for sludge treatment and disposal have been allocated through the ABM process described in Section E1.
- Prior to 2007 sludge costs have been distributed between outlets in proportion to sludge quantity. Since 2007 costs have been distributed in proportion to a disposal and cost model, providing a more robust allocation of cost between outlets.
- Sludge treatment and disposal costs have increased by £1.0m to £11.5m for the report year. The estimated sludge quantity has reduced slightly from 21.5 ttds in 2007/08 to 21.4 ttds in 2008/09

Audit Process

The data for this table is largely the same as that used for deriving Table A2 and the audits were carried out in conjunction with those for populations and loads.

Sludges are treated or part treated at sludge conditioning and sludge treatment centres before ultimate disposal. All movements are controlled using the Gemini sludge management system (except one to PPI via a metered pipeline) and we were shown the spreadsheets where the data is down loaded and collated to provide the return figures.

We were able to follow an audit trail through the data to the reported quantities by outlet.

Methodology

The methodology for estimating and allocating sludge production is outlined in our report on table A2. The return figures are consistent.

The sludge quantities and sludge disposal costs reported in this table are limited to sludge disposed of by Scottish Water. It excludes sludge disposed of through PPP concessions.

The resident population reported is the total resident population served by Scottish Water treatment works and excludes resident population served by PPP works. Much of the sludge from this population is treated and disposed of through PPP concessions including Daldowie.

The quantity of sludge is taken from Scottish Water's Gemini tanker movement system which records and tracks sludge from point of production to point of disposal.

The reported quantity of sludge is the estimated raw sludge production before it is treated. Treatment processes applied generally results in some reduction in sludge mass.

The quantity of sludge reported is that treated and recycled or disposed of from Scottish Water operational sites only.

Operating costs have been allocated through the ABM process described in Section E Overview. Despite there being separate cost codes for sewage treatment and sludge treatment there was a degree of manual allocation as not all costs were correctly allocated and there was a need to split power costs between the two processes. All sludge disposal is undertaken by contractors and so the associated G&S costs are split on the basis of H&C costs.

The costs are consistent with the direct costs and functional expenditure reported in Table E2 for sludge treatment.

For the report year £2.8 million has been reallocated to PPP sludge costs in Table E3a to reflect the costs incurred by Scottish Water in transporting sludge from its own works to PPP plant for treatment. This aims to ensure that the costs of treatment are aligned with the sludge quantity reported for the purpose of comparative efficiency.

Scottish Water has allocated the estimated total sludge cost between outlets using a combination of direct cost capture on the general ledger supported by a sludge "model" which sets out the basis for sludge collection routes, quantities, and disposal routes. This is the same basis as for 2007/08. For some sites sludge is moved from one site to another for treatment and disposal. Costs are traceable between works showing a corresponding negative and positive cost as sludge moves from one site to the next. Costs are included for the final treatment centre.

Generally works have only one route of disposal so the costs are allocated to the correct disposal category. One works has more than one route where 90% of the sludge goes to composting and 10% to farmland. The costs are allocated on the percentage split.

The change in disposal outlets for sludge in the report year is summarised below:

Outlet	**Ttds (rounded)**		**Costs £m**	
	2008-09	**2007-08**	**2008-09**	**2007-08**
Farmland Untreated	0.0	0.0	0.0	0.0
Farmland Conventional	6.4	7.3	3.2	2.8
Farmland Advanced	13.0	11.9	6.2	5.8
Incineration	0.0	0.0	0.0	0.0

Outlet	Ttds (rounded)		Costs £m	
	2008-09	2007-08	2008-09	2007-08
Landfill	0.6	0.6	0.9	0.9
Composted	1.5	0.2	1.2	0.1
Land Reclamation	0.0	1.5	0.0	1.0
Other	0.0	0.0	0.0	0.0
Total	21.4	21.5	11.5	10.6

There has been a small reduction in sludge quantity overall of 0.5%, which seems within annual variation. The greatest change has been caused by the ending of land reclamation using sludge as a soil improvement medium, and disposal of conventional sludge to farmland has also decreased. Scottish Water has therefore disposed of more advanced treated sludge to farmland and the biggest increase to composting (which we understand is effected by cross border export).

Conclusion

As the data is taken from Scottish Water's corporate data and the operations are carefully and effectively controlled for environmental reasons, the Return figures are likely to be reliable.

Comments by Line

Lines 1 to 2: The reported resident population served is the resident population associated for all treatment works operated by Scottish Water and excludes PPP works. It is not compatible with the sludge quantities disposed of by Scottish Water included in table E10. The figure is comparable with AR08 (but not with AR07 because all sea outfalls were accidentally included in that year).

Lines 3-11: Operating costs have been allocated through the ABM process described in Section E1.

The ABM system includes sludge treatment and disposal cost centres linked to assets. This allows a significant proportion of sludge costs to be reported by disposal route. Some transport costs continue to be allocated to disposal route based on estimates from a separate sludge logistics model.

Direct costs were allocated between sludge outlets in proportion to cost estimates on the sludge model used by Scottish Water in the management of sludge treatment and disposal.

General and support costs (from table E2) were allocated between outlets in proportion to the direct costs.

The total cost is consistent with the costs in Table E2 – Sludge Treatment

Comments by Confidence Grade

We consider that the confidence grades reported by Scottish Water are reasonable with the following exception:

Line 2: We accept a confidence grade of B3 for the sludge quantities against individual works, whilst noting the uncertainty associated with measurement and the factors applied to convert to raw sludge quantities.

Lines 3 to 9: We believe that a B2 confidence grade is appropriate for the total costs allocations.

7.11 Table E11: Operating Costs and Efficiency– Management & General

Commentary by REPORTER

Introduction

Key Points

- Employee numbers include staff who are directly employed by Scottish Water. They exclude staff employed in capital projects, staff seconded to SWS, staff transferred to SWBS from 01 November 2006, non core staff, temporary staff and agency staff. Part time staff are included as part time equivalents

- For our detailed commentary on Management and General assets see our commentary on Table H6.

- During the report year Scottish Water undertook surveys of its offices, depots and laboratories. The surveys included measuring the areas of the assets and assessing their condition. This has resulted in a significant improvement in the quality of the information in this return.

- We have audited vehicles and plant and telemetry this year: these were not audited in AR08.

Audit process for management and general assets

In the audit we were shown the databases and extraction processes for compiling the table figures. Where these were not live databases, we saw how changes are made during the year. Calculations were demonstrated and the final figures are inclusive and without double counting.

We also built on our audits from 2DBP so that we were confident that buildings had been recently surveyed and revalued and that vehicle, plant and IT values are consistent with the General Ledger.

Methodology

Employee numbers

The methodology has remained unchanged from last year.

Employee numbers have been obtained from the payroll system.

The payroll system comprises a database of all Scottish Water staff including: permanent staff, temporary staff, staff seconded to Scottish Water Solutions and non core staff. Temporary and Agency staff are billed direct to departments or projects and are not included on the database.

Every staff member is expressed as a "full time equivalent" (FTE). Thus a staff member who works for 50% of each month will be recorded as 0.5FTE. Every staff member is assigned to a department.

Allocations to the lines in the table are made as follows:

- SW's Activity Based Management (ABM) system is used as the basis of the allocation.
- The total average staff recorded in SW's human resources database sums to 3582.88 FTE. Subtracting staff involved in PFI contracts and assigned to SWS leaves 3482.3 FTE.
- ABM financial outputs are used to assign staff to the core business and non core business and to allocate core staff to operations or capital works. Departments are not used directly to assign staff as staff are "recharged" to other work and the ABM system picks this up. The assumption is made that staff inputs are proportional to costs.
- Allocations to water and wastewater and lines E11.1 to E11.3 are allocated in proportion to the costs recorded in tables E1 and E2 as follows:

1.	Direct operations:	Employment costs in tables E1 and E2
2.	General and support:	General and support costs in lines E1.9 and E2.8
3.	Other	Customer services – costs in lines E1.11 and E2.10
		Scientific services – costs in lines E1.12 and E2.11
		Other Business Activities – costs in lines E1.13 and E2.12

Each month a FTE report is prepared from the payroll system. The 12 reports for the year are averaged to give the results for Table E11.

We believe that the figures generally give a proper representation of Scottish Water's operations staff but it should be noted that:

- they exclude all staff involved in capital projects; given that the numbers should be consistent with employment costs reported in the other E tables this is believed to be correct; and
- they do not include temporary staff or staff hired through agencies. Scottish Water reports that the latter is small as Scottish Water does not encourage the use of agency staff.

Properties

The basic data source for property returns is the spreadsheet maintained by Property Facilities and analysed by the IDR group. This covers properties managed by Estates (legal title, farms, forestry and houses), Property Facilities (non-operational buildings) and Property

Maintenance (operational buildings). The spreadsheet is not a live document, but revisited annually for the Annual Return, when known changes are made.

Asset surveys were carried out during 2007 and floor areas for 47 properties were re-measured. The areas reported in lines 11.6, 11.8, 11.10, 11.12 and 11.14 are therefore comparable with AR08, but not previous years.

Offices are defined as buildings having more than 100 workstations. The 10 offices include Watermark House which is leased by Scottish Water (and who are liable for its maintenance) although SWS are using a part of it. Offices with 100 or fewer workstations are reported as depots.

Scottish Water disposed of one laboratory in the year.

Scottish Water reports that it does not have any separate workshops, although some depots have limited workshop facilities. The number of depots reported at line E11.9 (52 properties in use) is consistent with the 52 reported at line H 6.2. for both depots and workshops. Three depots were disposed of in the year.

Vehicles and Plant

Vehicles and Plant data is held and maintained by a section of the procurement team. All items are listed and valued at General Ledger procurement values. The Gross MEAV is report in Table E11 split as required between water and sewerage services, and the figure equals that shown in Table H6.4 split between life bands.

Telemetry Systems

The majority of telemetry outstations are recorded in Ellipse, but certain types of external but dependent assets (such as bore holes outside the boundary of the main site) have to be identified separately. These are held in Open Enterprise and WMS databases and are combined without duplication for the AR09 return figures. The percentage coverage figures are derived from the respective totals of telemetry outstations divided by the number of Ellipse sites and are consistent between Lines E11.16 and H6.5.

Information Systems

The basic data source for information systems is the IS inventory, which is maintained up-to-date on a day-by-day basis and is a live management tool. All IS assets are allocated to offices, not people, although the whereabouts of portable items is recorded each time they log on. This database justifies the allocated confidence grade of A2 for asset stock.

The database lists comprehensive information on each asset including; site reference, asset ID and categorisation, reference number, model name, date delivered, condition and performance grade, value, life categorisation, criticality and age.

As for AR08 differing categorisations are used for IS assets in Tables E and H. In AR09 the following allocations are made:

- H6.6 Band 1 = E11.18 (laptop computers or personal machines)

- H6.6 Band 2 = E11.19 (desktop computers or workstations)
- H6.6 Band 3 = E11.20 (Mainframes or servers)

Conclusions

We conclude that the work has been well done. Numbers and figures given in the Table are well-founded on up to date information drawn from Scottish Water's own databases and the calculations are well supported.

Comments by Line

Lines 1 to 4: Includes staff who are directly employed by Scottish Water. Excludes staff employed in capital projects, staff employed on PPP work, staff seconded to SWS, non core staff, part time staff and agency staff.

Scottish Water reports that the increase of 102 staff over last year reflects additional staff required to deliver customer service improvements.

Lines 5, 7, 9 & 13: The numbers of offices, depots, laboratories and control centres are shown against both the water service and the wastewater service. This double counting is expected by the WICS guidelines.

Lines 6,8,10 & 14: Areas have been allocated to water and wastewater services in the same ratio as employee numbers in these services.

Lines 11 & 12: Scottish Water has no separate workshops, although some depots do have limited workshop facilities.

Line 15: The value of vehicles and plant has been split between the water and sewerage services in the same ratio as the numbers of employees in these services.

Lines 16 & 17: The percentages and numbers shown are split according to the recorded status of the plant monitored.

Lines 18 to 20: Servers and mainframes are double counted in the table, appearing against both water and wastewater services. Scottish Water explains that this is because they are used by staff from both services. On line 18 the PCs have not been double counted, although this is asked for in WICS guidance.

Comments by Confidence Grade

Confidence grades in Table E11 are consistent with the data sources and calculations used in compiling the table figures. They are generally consistent between E11 and H6.

We accept that the definition of a dept and workshop is open to greater interpretation and so accept the B4 grade suggested.

8. SECTION G – INVESTMENT PLAN

8.1 Overview

Scottish Water has populated Tables G5 and G6 with detailed project information which is summarised in Tables G1 to G4b. We concluded that the data given in Tables G5 and G6 are a fair and representative picture of the programme as it stood at 31st March 2009 and are valid and sufficiently accurate for the purposes of the other G Tables. Delivery of Q&S2 outputs, Q&S3 Ministerial objectives and Q&S3 serviceability measures are reported in Tables G7 to G9.

The Company reports substantial completion of Q&S2 outputs in Table G7. The on-going uncompleted projects are focused on a small and reducing number of projects which are subject to critical third party issues.

Scottish Water reports delivery of its outputs for years 1 to 3 of Q&S3 in Tables G8 and G9 and has met the targets in its Delivery Plan subject to minor exceptions. There has been some deterioration in performance against serviceability targets, which in some cases remains below the target for the year-end. In Table G9 performance on the number of microbiological failures at WTWs, number of properties with unplanned interruptions, bursts per 1000km of main, number of properties internally flooded due to other causes and number of unsatisfactory intermittent discharges has deteriorated from the position reported at AR08. Comparing actual performance for AR09 with the target position for the same date, performance on % compliant zones for iron and manganese, the number of unsatisfactory intermittent discharges and the number of pollution incidents remain below target. We have undertaken audits of projects and programmes of work which are reported in Tables G5 and G6. We have carried out an audit of the transfer of data within the G tables. We have also reviewed consistency between the G tables and the Capital Investment Return, the revised WIC 18 programme for Q&S2 and Table K56 from the Annual Return 2005-06.

Key points

- There continue to be significant issues in a small number of Q&S2 completion projects relating to definition of project scope or the required permissions to complete the works which may result in further cost escalation and/or delay to project completion. Based on a sample audit of on-going projects we concluded that the level of uncertainty regarding the cost and programme completion of these projects has been reduced. At the time of audit only one Q&S2 project had not reached Capex3 approval. 1974 Q&S2 projects are due to reach Capex5 in 2009/10. However 1927 of these already have actual Beneficial Use dates so there is quite limited risk of further slippage to add to the £38.1m of Q&S2 project expenditure which Scottish Water has currently reprofiled into 2010/11. The forecast value of reprofiled Q&S2 expenditure for 2010/11 is mainly made up of two projects - Dunoon Sewerage (£21.0m) and Campbeltown WWTW Interim Measures (£10.9m).

- There remains the potential for a reduction in project completions and output delivery, due to the impact of third-party issues on a number of Q&S3a projects. Forecast overhang into the Q&S3b programme period has doubled, compared with that forecast at AR08, to £149m. A large number of projects remain to be completed during 2009-10 and there is potential for this figure to increase, delaying the delivery of outputs to beyond the current review period. Much of the overhang is concentrated in a small number of large projects, including UID projects in Ayrshire, one of which (37478 UID – Airdrie & Coatbridge Transfer) is on hold for a review of the solution owing to its high cost of £41m.

- Significant progress has been made during the past year on bringing projects to Capex3 approval. Over 85% of projects in Table G6 had reached or passed this stage by the end of the report year. However 608 Q&S3a projects had not reached Capex3 approval by 31st March 2009 and with one year to go to the end of the investment period there is a significant risk that some of these projects will not be completed in the year. Scottish Water has reprofiled a number of projects and 202 Q&S3a projects are now programmed to reach Beneficial Use after 31st March 2010, resulting in a forecast expenditure of £149m on Q&S3a projects in the Q&S3b period. This is an increase of £75m on the position for AR08, when £74m of Q&S3a project expenditure was forecast to fall into the Q&S3b period.

- The reported serviceability performance assumes that targets will be met by March 2010. However the expenditure programme already includes a significant overhang beyond 2009/10. Some of this overhang relates to key quality programmes of water quality, wastewater quality and UIDs which have a bearing on the delivery of serviceability indicators. It is therefore not possible to confirm that the necessary outputs will be achieved by March 2010 in all cases. In some cases reported actual performance has deteriorated from that reported for AR08 and remains below the target for the year-end. Scottish Water faces a challenge in reversing this trend to achieve targeted levels for the end of the investment period.

- Where specific project estimates have been developed, we concluded that robust systems were in place for estimating future expenditure profiles. Where possible, projections are based on detailed project programmes. Risk analysis has been undertaken both at project and programme level and has been accounted for in both outturn cost and profile.

- We noted that Scottish Water now employs a risk analyst who develops the risk management autocodes and the information within them, based on formal risk registers. This is a more structured approach than we have seen in previous years and we believe that it is a beneficial development. For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project in the Q&S3a programme, totalling £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a). This project is coded to drinking water quality - other parameters. However it is also known to cover a range of other outputs such as general items, water non-infrastructure capital maintenance, growth, sewer flooding, non-strategic UIDs and wastewater quality.

- In previous years' audits we have noted that information in CIR Q4 and Tables G5 and G6 on estimated outturn cost and completion date usually corresponded to the latest Capex approval, even where the project manager was aware of factors likely to cause significant change to cost and programme. This year we are pleased to note that estimated outturn cost and completion date in general correspond to the project manager's latest best estimate (LBE), although exceptions were noted.

- During our audits we continued to note that the focus of SWS's staff involved in projects remains on contract cost, rather than overall project cost. We found some examples where significant external risk factors (such as the need to agree consents or reach agreements with third parties) which could affect project completion dates were not included in project risk registers, which focus on costed risks. We recommend that project risk registers should be reviewed to ensure that they contain all risks, including those borne by Scottish Water, particularly where these could affect completion, but do not affect outturn cost.

8.2 Tables G1 & G2 – Investment Plan Summaries

Commentary by REPORTER

Key Points

- The transfer of data from Tables G5 and G6, via Tables G3a to G4b, was fully reconciled.
- Total operating costs in Tables G1 and G2 are consistent with information in Tables E1 and E2.
- Proportional allocation of costs to outputs has generally been correctly carried out.
- New obligations relate to items in SW logging claim. The values are the total project cost in the year and not necessarily the amount being claimed.
- For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project in the Q&S3a programme, totalling £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a). This project is coded to DW3 – drinking water quality, other parameters. However it is also known to cover a range of other outputs such as general items, water non-infrastructure capital maintenance, growth, sewer flooding, non-strategic UIDs and wastewater quality.
- There remains the potential for a reduction in project completions and output delivery, due to the impact of third-party issues on a comparatively small number of Q&S2 and on a number of Q&S3a projects.

Audit Process

Tables G1 and G2 summarise detailed project data captured in Tables G5 and G6. For this section of the audit we checked and confirmed the manipulation of Capex, Opex, grant and contribution data from Tables G5 and G6, via Tables G3a to G4b, to Tables G1 and G2. We also reviewed the assessment of Capex and Opex associated with new obligations since the Final Determination and confirmed that total operating expenditure is consistent with Tables E1 and E2.

Commentary

Capex Costs

Tables G1 and G2 summarise the investment reported at project level in Tables G5 and G6 by purpose code. Information from tables G5 and G6 is first used to compile Tables G3a, 3b, 4a and 4b and the data in these tables is then used to compile Tables G1 and G2. The manipulations are as follows:

For Q&S2 projects, data on costs and output codes are taken from Table G5 and used to compile Tables G3a and G3b. For Q&S3a projects, data on costs and output codes are taken from Table G6 and used to compile Tables G4a and G4b. Table G1 is then compiled from Tables G3a and G4a, while Table G2 is compiled from Tables G3b and G4b.

We were able to fully reconcile the transfer of data between Tables G5 and G6 and Tables G3a, G3b, G4a and G4b. We were also able to fully reconcile the transfer of data between Tables G3a and G4a and Table G1 and between Tables G3b and G4b and Table G2.

Tables G1 and G2 summarise expenditure in the four years 2006-10. For the Q&S3 programme, Scottish Water also reports expenditure of £24.3m prior to 2006-07 and £149.3m post 2009-10.

Expenditure is estimated in money of the day allowing for inflation. We have not identified a clear audit trail showing a consistent application of inflation across the programme.

For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project in the Q&S3a programme, totalling £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a). This project is coded to DW3 – drinking water quality – other parameters. However it is also known to cover a range of other outputs such as general items, water non-infrastructure capital maintenance, growth, sewer flooding, non-strategic UIDs and wastewater quality.

We have commented on the allocation of Capex to purpose codes under our commentary on Tables G5 and G6. For Q&S2 projects the practice was to allocate costs equally to each project driver at Capex1 stage, so a project with four drivers would have 25% of cost allocated to each driver irrespective of the actual cost to meet each driver. The proportional allocation of costs to drivers was revisited during 2007-08 for completed Q&SII capital maintenance projects. 22% of Q&S2 projects have more than one driver and so have proportional allocation applied.

For Q&S3a projects, costs have been allocated to drivers in proportion to the project manager's estimate of the cost of meeting that driver. The initial allocation is made at Capex1 stage, before detailed costs are known. SW procedures allow for the allocation of costs to drivers to be revisited at each Capex stage and this was found in practice to be the case during the audit. 32% of Q&S3 projects have more than one driver and so have proportional allocation applied.

A small sample of projects was reviewed to illustrate the application of the rules and gave an indication that costs had generally been correctly allocated to drivers.

Opex Costs

Additional Opex for each project is calculated using a spreadsheet download of CIMS data and therefore consists of a mixture of actual Opex impact (for completed projects) and forecast Opex impact (for projects not yet completed). During the preparation of these data Scottish Water run consistency checks to check that Opex impact has been removed for stopped projects, identify anomalies in Capex submissions (such as missing data and large changes), and compare forecast Opex impacts with those forecast in the Business Plan.

Each project records the total Opex impact and percentages to the appropriate drivers and these data are used to apportion Opex impact to the appropriate parts of the programme. Opex impact is apportioned in the same proportions as capital costs and is taken from the most recent approved Capex submission.

Opex impact is apportioned to financial years by spreading the total impact pro-rata over the two relevant years using 365 days from the operational acceptance date. This is earlier than the Capex5 completion date shown in Table G5 and G6. Opex impacts are only revisited for Capex submissions and are not updated in between. However when projects have been in operation for about a year CIMS is updated with the actual, measured Opex impact, which may be significantly different from that forecast.

During the audit a sample of 6 projects was audited for Opex and in each case it was confirmed that Opex and its apportionment had been calculated as outlined above. In addition the calculation of data for all of the additional Opex lines in Tables G1 and G2 was reproduced using the spreadsheet download and seen to correspond exactly with the line entries.

Base Opex in the tables is calculated by taking the total operating expenditure for the programme and year and deducting Opex impacts to give an inferred base Opex. We recommend that WICS provides further advice on whether this is the correct approach or whether the cumulative Opex from the base year for the Business Plan should be reported. Total Opex at lines G1.22 and G2.22 was confirmed as being identical to lines E1.20 and E2.19. The reconciliation of these lines with the Annual Accounts is covered in our commentary on the E Tables.

New Obligations

Under new obligations SW has entered data primarily from its March 2009 Logging Claim, where SW believes that these projects have arisen due to new obligations. The table below shows the build up of the entries:

Item	Value 2008/9 (£M)
Table G4a – water service	
Ullapool WTW	1.512
Customer charging: area based banding investigations	1.568
Blairnamarrow WTW	0.227
Tighnabruich No 1 reservoir improvements	0.042
Langholm WTW	6.856
FEH flood studies	0.250
Wholesale development	0.716
Total water service	11.171
Table G4b – wastewater service	
Dunnswood STW – upgrade	0.747
SR10 flow and load investigations	0.183
EC 11 landfill Directive – 5 sites	1.134
Total wastewater service	2.064

We have reported on the Ullapool, Blainamarrow and Langholm projects in some detail following our special audit of SW's Logging Report.

For the Annual Return we have audited a sample of the above figures back to the base information in CIMS, SW's capital programme management system. We confirm that the figures are the total expenditure in the year on the relevant projects apart from Ullapool where only a portion was taken. From our work on the Logging report we are aware that SW is not necessarily claiming the whole of the project cost as a new obligation. Subject to Ullapool the reported figures are not therefore necessarily the expenditure just to meet the new obligation.

The projected opex figures are the estimates of additional opex made by the project manager when the capex 3 estimate is worked up.

Grants and Capital Contributions

Grants and capital contributions reported in Tables G1 and G2 are summed from the individual project lines in Tables G5 and G6 and relate mainly to the infrastructure charge. Figures reported are the actual receipts reported by the Finance department. Scottish Water report no grants and contributions against future years in either table as there is no guarantee that these will actually materialise.

Scottish Water makes an infrastructure charge for each property newly connected to the water supply and sewerage systems, as in England and Wales. Unlike England and Wales however, SW pays developers a "reasonable cost contribution" of providing infrastructure for properties [The Provision of Water and Sewerage Services (Reasonable Cost) (Scotland) Regulations 2006 (WSRC2006)].

We give details of the overall infrastructure charge in Table E1.

When each new connection is approved a unique job number is raised which records both invoicing and income for that job. The PeopleSoft system holds these data on a site-by-site basis, is reconciled on a monthly basis with the general ledger and is used as the basis of data on income received. The income appears in the year in which it was invoiced. During the audit the PeopleSoft system was reviewed and four sites checked. In each case the address, service, unitary authority and income due were recorded and seen to be consistent.

Adopted Assets, Nil-cost Assets

These lines were not audited for AR09.

Conclusions

From our audits we have concluded that the data in Tables G1 and G2 have been correctly compiled, either from Tables G3a, G3b, G4a and G4b, or directly from other sources. The tables present a realistic view of the investment programmes as they stood on 31st March 2009. There remains the potential for a reduction in project completions and output delivery, due to the impact of third-party issues on a comparatively small number of Q&S2 and Q&S3a projects.

Comments by Line

Lines 1: Base operational expenditure for 2008-09 is calculated as the total operating expenditure for the year less the additional operational expenditure in the report year. Total operating expenditure was reconciled with base Opex in Tables E1 and E2.

The Company has not estimated base operating expenditure for future years and the figures shown in Lines G1.22 and G2.22 for future years are the sum of forecast Opex impacts only.

Lines 15 and 16: No grants have been received or are forecast.

Lines 17: In addition to the infrastructure charge, these lines include other infrastructure contributions, such as those arising from NRSWA pipe relocations.

Line 19: Grants and contributions are those received and accounted for in the report year. The Company has not estimated grants and contributions for future years, owing to the uncertainty surrounding whether they will actually be received.

Line 20: The Company has not estimated adopted assets and assets acquired at nil cost for future years.

Comments by Confidence Grade

Scottish Water generally reports a confidence grade of B2 for capital expenditure estimates for the report year and for future years. We believe that a grade of B2 is reasonable for the report year and previous years, but suggest that a confidence grade of B3 is applied to future years to reflect the inclusion of projections for projects yet to be confirmed and the risks to progress on individual schemes and the programme as a whole.

For new obligations capex in Line 13 SW reports a confidence grade of B2 (In table G4a it reports a confidence grade of A2). The information has been obtained directly from a corporate system and the grade of B2 is satisfactory provided it is accepted that it relates to the total spend on the project as reported in the table and not an allocation to the new obligation

8.3 Tables G3a & G3b – Q&S2 Delivery

Commentary by REPORTER

Key Points

- Summary data in Tables G3a and G3b were fully reconciled with detailed data in Table G5 and with summary data in Tables G1 and G2 and with base data in CIMS

- A number of Q&S2 projects have not had proportional allocation reviewed following completion and we recommend that this should be completed for all Q&S2 projects

Audit Process

Tables G3a and G3b summarise the delivery of outputs detailed in projects contained in Table G5. For this section of the audit we checked and confirmed the manipulation of Capex costs and output data from Table G5. We also reviewed base data in CIMS to check the derivation of sample lines in Tables G3a and G3b and checked consistency with Tables G1 and G2.

Commentary

Tables G3a and G3b summarise the investment reported at project level of Table G5 by quality driver. They are produced by summing projects in Table G5 and are in turn summarised to produce the Q&S2 information in Tables G1 and G2.

The allocation of report year expenditure reconciles to the detailed project data in Table G5 and to the summary data in Tables G1 and G2. During the audit base data in Tables G5 were filtered to reproduce the data for 19 lines chosen at random in Tables G3a and G3b and in every case these were seen to be consistent.

Total expenditure in Table G3a line 25 reconciles to the sum of net expenditure in Table G1 line 21 and grants and contributions in Table G1 line 19. Total expenditure in Table G3b line 37 reconciles to the sum of net expenditure in Table G2 line 21 and grants and contributions in Table G2 line 19.

We have commented on the current methodology for allocation of Capex by output measures in our commentary on Table G5, below. The robustness of allocations for Q&S2 projects has improved following a review and a greater proportion of allocations are now based on an analysis of project scope and expenditure. Significant numbers of projects have however not been reviewed. We continue to recommend that this review should be completed for all projects except those having a single capital maintenance driver.

Conclusions

We concluded that data in Table G5 had been correctly processed to produce Tables G3a and G3b and were consistent with data in Tables G1 and G2. We continue to recommend that all Q&S2 projects with more than one investment driver should have capital allocation percentages checked.

Comments by line

None

Comments by Confidence Grade

Scottish Water generally reports a confidence grade of B2 for capital expenditure estimates by individual quality drivers for the report year and for future years. The allocation of equal allocation of expenditure between drivers on individual projects has been revisited on many Q&S2 projects, but by no means all. In addition risks remain to the progress of individual schemes and the programme as a whole and there is uncertainty in the level of grants and contributions to be received. We therefore suggest a B3 confidence grade overall.

8.4 Tables G4a & G4b – Q&S3 Drivers

Commentary by REPORTER

Key Points

- Summary data in Tables G4a and G4b were fully reconciled with detailed data in Table G6 and with summary data in Tables G1 and G2 and with base data in CIMS
- Proportional allocation of costs to outputs is robust and has generally been correctly carried out.
- For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project in the Q&S3a programme, totalling £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a). This project is coded to DW3 – drinking water quality – other parameters. However it is also known to cover a range of other outputs such as general items, water non-infrastructure capital maintenance, growth, sewer flooding, non-strategic UIDs and wastewater quality.

Audit Process

Tables G4a and G4b summarise the delivery of outputs detailed in projects contained in Table G6. For this section of the audit we checked and confirmed the manipulation of Capex costs and output data from Table G6. We also reviewed base data in CIMS to check the derivation of sample lines in Tables G4a and G4b and checked consistency with Tables G1 and G2.

Commentary

Tables G4a and G4b summarise the investment reported at project level of Table G6 by quality driver. They are produced by summing projects in Table G6 and are in turn summarised to produce the Q&S3a information in Tables G1 and G2.

The allocation of report year expenditure reconciles to the detailed project data in Table G6 and to the summary data in Tables G1 and G2. During the audit base data in Table G6 were filtered to reproduce the data for 13 lines chosen at random in Tables G4a and G4b and in every case these were seen to be consistent.

Total expenditure in Table G4a line 47 reconciles to the sum of net expenditure in Table G1 line 21 and grants and contributions in Table G1 line 19. Total expenditure in Table G4b line 51 reconciles to the sum of net expenditure in Table G2 line 21 and grants and contributions in Table G2 line 19.

We have commented on the allocation of Capex by output measures under Table G6. The allocation of costs to drivers is more robust for Q&S3a projects than for many Q&S2 projects, being based on an analysis of project scope and expenditure for the majority of projects and being subject to revisiting at Capex stages except for projects under £0.1m in cost.

Conclusions

We concluded that data in Table G6 had been correctly processed to produce Tables G4a and G4b and were consistent with data in Tables G1 and G2. Proportional allocation of costs to outputs is robust and has generally been correctly carried out.

Comments by line

None

Comments by Confidence Grade

The Company generally reports a B3 confidence grade for expenditure by individual quality drivers. This is supported, given the still incomplete extent of detailed development of the programme at this stage, risks to the progress of individual schemes and the programme as a whole and the uncertainty in the level of grants and contributions to be received.

8.5 Table G5 – Q&S2 Project Analysis – Actual and Forecast

Commentary by REPORTER

Key Points

- Table G5 covers the completion of the Q&S2 programme.
- We have been able to reconcile the total expenditure and the phasing of expenditure between Table G5 and Tables G1, G2, G3a and G3b and between Table G5 and the Capital Investment Report for 31st March 2009.
- Table G5 was reconciled on a sample basis with the WIC18 programme
- Based on a sample audit of on-going projects we concluded that the level of uncertainty regarding the cost and programme completion of projects carried over from Q&S2 has been reduced. At the time of audit only one Q&S2 project (Campbelltown WWTW Interim Measures) had not reached Capex3 approval. However with 1974 Q&S2 projects due to be completed (reaching Capex5 approval) in 2009/10, there remains a significant risk of further slippage, adding to the £38.1m of Q&S2 project expenditure which Scottish Water has currently reprofiled into 2010/11.
- The forecast value of reprofiled Q&S2 expenditure for 2010/11 is mainly made up of two projects - Dunoon Sewerage (£20.993m) and Campbeltown WWTW Interim Measures (£10.863m).
- The Q&S2 expenditure profile does not allow for future work expected on improvement to the continuous discharges to Loch Ryan following decisions by SEPA regarding requirements for discharges to shellfish waters. Funding is not available for these outputs and the work has been deferred to beyond the end of the Q&S3a period.
- In previous years Table G5 recorded a negative adjustment of the SWS share account to reflect current assessment of the outcome of the Q&S2 programme. This year Table G5 does not include for any risk adjustment. This partly reflects the fact that the programme is very near completion but an element of project 40020 that appears in table G6 for risk allowance relates to the Q&S2 programme. Further information on project 40020 can be found in our narrative in Table G6.
- Grants and contributions reported in Table G5 are the total grants and contributions the Company expects to receive on the Q&S2 programme. No allowance is made for grants and contributions in future years in the G1 and G2 summary tables as there is no guarantee that these will actually materialise.
- We noted that Scottish Water now employs a risk analyst who develops the risk management project and the information within it based on formal risk registers. This is a more structured approach than we have seen in prior years prior and we believe that it is a beneficial development.
- The conclusions of project-specific audits on Q&S2 projects are given below.

Audit Process

Table G5 contains detailed project information relating to Q&S2 projects and the Reporting Requirements require the Reporter to check its validity. In this section of the audit we:

- Compared and reconciled Table G5 with the Capital Investment Report for the quarter ending 31st March 2009 (CIR Q4), Tables G1 and G2 and the WIC18 programme

- By programme analysis, interviews with the relevant SW staff and the analysis of base data, reviewed programme issues including:
    - Progress in obtaining Capex3 approval
    - The treatment of inflation
    - Risk reserves, programme adjustments and the SWS share allocation

- Carried out audits of a range of projects selected from Table G5, interviewing the project managers and reviewing project documentation to confirm the validity of Capex costs, Opex costs, outputs and proportional allocation and review the treatment of risk

Methodology

Table G5 reports expenditure on the completion of the Q&S2 programme and outputs only. The structure of the table follows the structure of Table C of the final business plan and Table K56 of the 2005-06 annual return.

Scottish Water provides a detailed description of the content of each column in its commentary on the table.

The key source of data for the project reports in Table G5 is Scottish Water's Capital Investment Management System (CIMS). This includes:

Actual expenditure information. Actual expenditure is imported into CIMS on a daily basis from the Project Ledgers.

Future expenditure profiles. Future expenditure profiles are initially entered and updated by the Capital Investment Team. Once a project is allocated to a project manager, the project manager updates the data on CIMS including the capital expenditure profile. Information provided by Scottish Water Solutions is used to update projects undertaken or managed by Scottish Water Solutions.

Purpose codes and output measures reported in Table G5 taken from Scottish Water's Capex approvals system.

Actual or forecast milestones dates, particularly the Capex approval dates, which are taken from the Scottish Water capital approvals system.

The above information is summarised into the quarterly Capital Investment Report (CIR). CIR for the quarter ending 31st March 2009 (CIR Q4) was used as the basis of Table G5.

Conclusions

Based on our audit and our experience from previous audits of the capital programme we have concluded that Scottish Water provides robust reports on project data and accurately carries this data into the Annual Returns. Based on our audits, we noted a very small number of areas of uncertainty where the Company has made judgement for the current project report based on a potential range of outcomes. These are detailed in our commentary of the audit of specific Q&S2 projects, below. In addition we noted a very small number of projects which had developed such that the project manager's current view of the project was different from that reported in CIR Q4. We concluded that these were due to differences in timing between the production of the CIR and the date of the project manager's estimate.

Comparisons with Other Submissions

Compatibility with the Capital Investment Report - Quarter 4.

CIR Q4 is divided into completion of the Q&S2 programme and the Q&S3a programme. A comparison of the totals for the Q&S2 programme with Table G5 is set out below:

Comparison of Q&S2 Programme (Table G5) with the CIR

	2006-07	2007-08	2008-09	2009-10	Post 09/10
Table G5 expenditure profile	173.075	64.479	25.029	51.851	38.100
CIR expenditure profile	173.075	64.479	25.029	51.851	38.100
Difference CIR – Table G5	0.000	0.000	0.000	0.000	0.000

Prior to AR08 the CIR for the completion of Q&S2 contained an adjustment line reflecting the opinion of Scottish Water management on overall future progress of the completion programme. The adjustment reflected an overview of programme risks which might not be accounted for in individual project assessments. For AR08 this adjustment item was removed from the programme and for the current year project expenditure with a value of £38.1m has been re-phased to after 2009/10. This adjustment principally reflects expected slippage due to third party factors in Dunoon Sewerage - 1243 (£21.0m) and Campbelltown Sewerage Infiltration Permanent Solution 8806 – (£10.9m).

Compatibility of Table G5 with Tables G1 and G2

The overall expenditure profile reported in Table G5 is summarised in the table below where it is compared with the total expenditure in Table G1 and G2.

Comparison of G5 with Tables G1 and G2

	2006-07	**2007-08**	**2008-09**	**2009-10**	**Post 2009-10**
Table G1 (Q&S2)	77.077	22.024	1.946	3.615	0.512
Table G2 (Q&S2)	95.999	42.456	23.082	48.235	37.588
Table G1 & G2 (Q&S2)	173.076	64.480	25.028	51.850	38.100
Table G5	173.075	64.479	25.029	51.851	38.100

	2006-07	2007-08	2008-09	2009-10	Post 2009-10
Difference (G5-G1&G2)	-0.001	0.001	-0.001	0.001	0.000

The slight differences in some columns are due to rounding errors.

Reconciliation of Table G5 with the WIC 18 Programme

We have compared the on-going projects in Table G5 with a copy of the WIC 18 programme provided by Scottish Water. A random sample of 20 WIC18 projects was taken and all were found in G5, with a match of outputs except where these have been revised with the agreement of the quality regulator. Scottish Water also provided information summarising changes, aggregations and disaggregations. We concluded that, on a sample basis, Table G5 is consistent with the WIC18 programme.

Programme Issues

Progress on Achievement of Capex3 Approval

At the time of audit only one Q&S2 project (12062 - Campbeltown WWTW Interim Measures) had not reached Capex3 approval. This project has been reprofiled into the Q&S3b investment period.

Risk Reserves, Programme Adjustments and SWS Share Account

In previous years Table G5 recorded a negative adjustment of the SWS share account to reflect the current assessment of the outcome of the Q&S2 programme. This year Table G5 does not include for any adjustment. This partly reflects the fact that the programme is very near completion but also that an element of project 40020 that appears in table G6 for risk allowance relates to the Q&S2 programme. This now totals £4.470m, down from £24.030m recorded for last year. The major part of the current risk allowance is that for the wastewater programme (£3.4m). Further information on project 40020 can be found in our narrative in Table G6.

Inflation

Tables G5 and G6 and the CIR are all at project outturn prices. Up to Capex3 stage no better estimate of cost is available and project costs are essentially Business Plan estimates at 2003/4 prices inflated by COPI to the projected mid-point of construction. From Capex3 stage onwards estimates are the project manager's estimate of outturn cost, comprising some actual past costs and also future costs, including tendered and framework rates, inflated using projected COPI to the midpoint of construction. Overall we were concerned that we had not been able to establish a clear approach to inflation in the various sub-programmes, in particular the calculation of spend in the various programme holding lines.

Allocation by Project Driver

Checks on the allocation of costs to project drivers were made during the audit of the Q&S2 projects listed below. These concluded that costs had been correctly allocated in line with Q&S2 practice, which was to allocate cost equally to all drivers present. This was necessary for the 22% of projects in the Q&S2 programme which have more than one driver. However one project 37699 - Alness and Invergordon WWTW Phase 2 is a new phase of an original Q&S2 project developed entirely within the Q&S3a period and we recommend that Scottish Water considers applying the Q&S3a proportional allocation rules to it.

Checks on the Validity of Data in Table G5 - Q&S2 Projects

The Reporting Requirements ask the Reporter to undertake audits of a range of projects to check the validity of data in Table G5. These are summarised below. From these audits we concluded that there continue to be significant risks to the progress and outturn costs of a small number of Q&S2 completion projects. These are generally projects which continue to have the potential for some delay relating to a key issue such as the required consent or scope of works or by third party issues such as land acquisition or planning permission.

Key Points From Project–specific Audits

The following key points apply equally to Q&S2 projects in Table G5 and Q&S3a projects in Table G6:

- Information in Tables G5 and G6 corresponds to the Quarterly Capital Investment Report for the end of year 2008/9 (CIR Q4).

- In previous years' audits we have noted that information in CIR Q4 and Tables G5 and G6 on estimated outturn cost and completion date usually corresponded to the latest Capex approval, even where the project manager was aware of factors likely to cause significant change to cost and programme. This year we are pleased to note that estimated outturn cost and completion date in general correspond to the project manager's latest best estimate (LBE), although exceptions were noted.

- In virtually every case the Opex impact stated in Tables G5 and G6, corresponded to the most recent Capex submission. This is because Opex impact is only revisited for Capex submissions.

- Proportional allocation of costs to outputs has, with only minor exceptions, been carried out in accordance with agreed guidelines and been revisited at each Capex stage.

- During our audits we continued to note that the focus of SWS staff involved in projects remains on contract cost, rather than overall project cost. We found some examples where significant external risk factors (such as the need to agree consents or reach agreements with third parties) which could affect project completion dates were not included in project risk registers, which focus on costed risks. We recommend that project risk registers should be reviewed to ensure that they contain all risks, including those borne by Scottish Water, particularly where these could affect completion, but do not affect outturn cost.

- We conclude that the data given in Tables G5 and G6 are a fair and representative picture of the programme as it stood at 31st March 2009 and are valid and sufficiently accurate for the purposes of the other G Tables.

Audit Process

The Reporting Requirements require the Reporter to check the validity of the data in Table G5 for a variety of project sizes and types. In order to do this, a sample of 5 projects was audited. The reduced number of projects audited from Table G5 this year reflects the reducing number of Q&S2 projects remaining to be completed.

The purpose of the project-specific audits was to check on project Capex and Opex estimates, the project programme, drivers, risks and outputs and comment on their reliability. For each project the project manager was interviewed and project documentation was examined. Documentation reviewed included Capex approval forms and supporting information, project risk registers, engineering drawings and specifications. For each project the Capex and Opex estimates and programme dates contained in Table G5 were compared with:

Information contained in Scottish Water's Capital Investment Report for the period ending March 2009 (CIR Q4)

Capex approval paperwork

The project manager's latest best estimate (LBE).

The allocation of drivers was also checked and where the project had more than one driver, the proportional allocation of costs to drivers was checked.

All projects have been developed by Scottish Water or Scottish Water Solutions within the context of its Capex reporting mechanisms and approval procedures. Information provided by SWS in Capex submissions is checked and approved through the Capex approvals procedure and input by Scottish Water. Scottish Water also review SWS Latest Best Estimate (LBE) project information data provided on a monthly basis by SWS. Scottish Water run checking routines on this information, looking for discrepancies and slippages, which are referred to SWS for clarification. Information input direct to CIMS by SWS by means of uploads from P3e remains briefly unchecked by SW until it reaches either a Capex submission or monthly review.

Project-specific Audits

The projects audited and our conclusions upon them are given below:

<u>230 Kenmore ST</u>

Treatment of sewage at Kenmore is currently provided by a septic tank discharging direct to the River Tay without further treatment. To provide secondary treatment a new collection system is proposed, leading to a new treatment works on a new site. The project comprises a collection tank, pumping station, rising main with river crossing, new septic tanks, rotating biocontactors and humus tanks with a relocated discharge to the river. The project has been subject to very long delays due to difficulties in finding and acquiring a site for the treatment works.

A site has now been agreed with the landowner which is, in Scottish Water's view, the only practicable site. The land is to be acquired as part of an arrangement with the landowner where SW will provide treatment to a leisure centre, hotel, holiday lets and houses (with a total population equivalent of 1145) on the Kenmore Estate in an arrangement which includes the transfer of ownership of the land. This arrangement has not yet been finalised. The total population equivalent served will be 1500, including the current population of the village of Kenmore.

The project drivers are EC1/2 (UWWTD) and WQ3/2 (Prevention of Risk). Costs have been equally apportioned to these drivers and were correctly allocated for the original project, which did not include for the Kenmore Estate development. When the next Capex submission is made, drivers will be amended to include a growth driver. A risk register exists for the project, in which the main risks are identified as land acquisition and the river crossing. The project has planning permission and the CAR licence is agreed. A risk cost of £786000 is included in the LBE.

The most recent Capex approval is Capex3, dated February 2005, but this relates to a previous proposal. A Capex4 submission has been prepared but not yet submitted pending finalisation of the land agreement and population equivalent. The project manager's LBE is £4.884m, which corresponds to CIRQ4 and Table G5.

Table G5 shows an Opex impact of £0.050m, corresponding to the Capex3 submission, but the Project manager's LBE is now £0.037m.

Table G5 shows a forecast Capex5 date of July 2010, which corresponds to the project manager's LBE, but CIR Q4 shows February 2010.

We concluded that the forecast total cost and Opex impact given in Table G5 were not fully consistent with the project manager's LBE. The Table G5 forecast completion date was consistent with the LBE. These should be updated at the Capex4 submission. The correct procedures had been followed for proportional allocation of costs.

<u>1233 Bowmore ST Facilities</u>

This project is to eliminate the discharge of raw sewage to the sea. A consented trade effluent discharge from a distillery is also discharged through the same outfall. The works consist of sewers, a pumping station, treatment in a facultive lagoon and the construction of a new long sea outfall. The lagoon also provides the strategic solution for sludge on the island of Islay. The original proposal was to collect and treat both effluents through the proposed system. However surveys have shown that the distillery effluent is very high in copper and cannot be discharged to the lagoon as it would inhibit treatment.

The SW project consists of the public element of the project, comprising sewers, two pumping stations, a rising main and treatment by facultive lagoon with a new long sea outfall. Also included is the network element necessary to transfer distillery effluent, after private treatment, to the same outfall. Work has begun on site.

Scottish Water is still attempting to agree private treatment requirements with the distillery. As an interim solution, prior to this agreement, it has been agreed to discharge the distillery effluent (which is a licensed trade effluent) without pre-treatment through the new outfall.

Separate sampling points will be provided. The project drivers of EC1/4 (UWWTD Coastal) and WQ3/1 (Protection of Risk) have been correctly allocated.

The project risk register was inspected. All of the external risks have been discharged, although the most significant of these – agreeing pre-treatment with the distillery and turning the distillery flows – was not included as this was seen as a Scottish Water (client) risk and not a project risk.

Costs have risen very significantly due to the long delays in defining this project. The project currently has Capex4.6 approval. Table G5 and CIR Q4 show a total project cost of £9.389m. The Project Manager's LBE is £9.301m.

The Table G5 Opex impact was shown as £0.076m, corresponding to the Capex4.5 estimate, while the Project Manager's LBE is £0.070m, corresponding to the Capex 4.6 estimate.

The forecast Beneficial Use date in Table G5 is November 2009, corresponding to the Project Manager's LBE and CIRQ4.

We concluded that the forecast total coat and Beneficial Use date given in Table G5 were consistent with the project manager's LBE. The Table G5 Opex impact did not correspond to the LBE or latest Capex approval. The correct procedures had been followed for proportional allocation of costs.

<u>1273 Whiting Bay ST Facilities</u>

Whiting Bay is a very long-running project to eliminate several untreated discharges direct to sea from an extended coastal village with a population equivalent of 994 on the Isle of Arran. The proposed project consists of gravity collection sewers, two pumping stations and a rising main to a new WWTW.

Delays have been caused by difficulty in acquiring land and the majority of the sewerage system is already in place. The project is currently halted due to land difficulties and SW is pursuing a CPO, with the hearing imminent. The proposed site has planning permission, which expires in August 2009, and the CAR licence has been obtained. The project has a risk register, listing only site-specific risks. The single project driver is EC1/4 (UWWTD)

The most recent Capex approval is Capex4.1, but this was granted in February 2006 and relates to a different site from that currently proposed. The project manager's LBE of outturn cost, Table G5 and CIR Q4 correspond at £3.293m.

The Opex impact in Table G5 is £0.034m, corresponding to the February 2006 Capex4.1 and not due to be revisited by the Project Manager until the land issue has been resolved.

The Project manager's LBE of Beneficial Use date is July 2010, although Table G5 and CIRQ4 show September 2010.

We concluded that the forecast total cost and Beneficial Use dates given in Table G5 were not consistent with the project manager's LBE. The Table G5 Opex impact corresponded to a previous Capex4.1 submission and had not been updated. These should be updated at the next Capex submission. The correct procedures had been followed for proportional allocation of costs.

3300 and 37699 Alness and Invergordon WWTW Phases 1 and 2

Alness and Invergordon WWTW is a very long-running project (now split into two projects) to end discharges of sewage to the Cromarty Firth with only macerator treatment. The projects have had a long history of changes in scope and treatment works location due to difficulties in obtaining land and planning permission.

3300 - Phase 1

The original project 3300 was split into two phases due to the above difficulties, with Phase 1 consisting of the collection of Allness flows and pumping to Rosskean for untreated discharge down the existing long sea outfall. This project is now complete and acceptance is imminent. Expenditure has been allocated equally to the two quality project drivers (EC08 – Habitats directive) and EC09 – Dangerous substances) with no expenditure allocated to the other project driver (SG01 – Growth) as no upsizing is required to cater for the anticipated growth.

The project manager's LBE of Capex5 cost for expenditure in the Q&S3a period is £4.275m (including 2.5% SW overhead). The project also includes £1.890m of expenditure which was incurred in the Q&S2 period. Taking this into account, the LBE, Table G5 and CIRQ4 all agree in showing a total outturn cost of £6.165m.

Table G5 and CIR Q4 agree in showing an Opex impact of zero. Table G5 gives a Capex5 date of May 2009, which corresponds with the project manager's LBE. This reflects more up-to-date information than CIR Q4, which shows a Capex5 date of January 2011.

37699 – Phase 2

This phase consists of bringing all flows to the proposed treatment site at Bellport, treating them through a new secondary treatment works with extended aeration and including a sludge treatment centre, before returning flows to Rosskean for discharge down the existing long sea outfall. Expenditure has been allocated equally to the three project drivers of EC08 (Habitats directive), EC01 (Eliminate UID) and SG1 (Growth from 10528 p.e. to 11562p.e.). This is in accordance with the guidelines in use in the Q&S2 period. However the current rules for proportional allocation require that the proportion allocated to growth should be on the basis of the increase in p.e (i.e 1004 divided by 11562 = 8%) with the remaining 92% divided equally between the two quality drivers. We recommend that Scottish Water should consider amending the allocation of costs to drivers on this basis.

The risk register was examined. SW is taking a proportion of the identified risk, including the risk that further work is needed on the network to eliminate saline intrusion. Land purchase has been agreed, planning permission has been obtained and the draft consent has been agreed with SEPA.

The phase 2 cost has been internally audited. Work is now proceeding on site. The detailed construction programme was reviewed and this shows flows being turned by January 2010 and forecast completion by May 2010.

Capex3 (dated February 2009) and CIR Q4 show an outturn cost of £12.623m, which corresponds with the project manager's LBE. These post-date Table G5, which shows a total cost of £12.635m.

Table G5 and Capex3 agree in showing an Opex impact of £0.445m. The project manager's LBE of Capex5 date is April 2010, corresponding to CIR Q4 and Table G5.

We concluded that the total cost, Opex impact and completion date given in Table G5 were reliable and in line with the project manager's best estimate, although there are minor discrepancies between the LBE and Table G5 for total cost. The correct procedures do not appear to have been followed for proportional allocation of costs.

8.6 Table G6 – Q&S3 Project Analysis – Actual and Forecast

Commentary by REPORTER

Key Points

- Table G6 covers the Q&S3a programme. In the report year investment has increased significantly once more. Capital maintenance expenditure continues at a high level, with significantly increased expenditure on quality projects, especially for drinking water. The programme of water resources studies is virtually complete, while the UID study programme is well advanced and the construction of UID improvements gathering pace.

- We have been able to reconcile the total expenditure and the phasing of expenditure between Table G6 and Tables G1, G2 G4a and 4b and between Table G6 and the Capital Investment Report for 31st March 2009.

- Forecast overhang into the Q&S3b programme period has doubled, compared with that forecast at AR08, to £149m. A large number of projects remains to be completed during 2009-10 and there is potential for this figure to increase, delaying the delivery of outputs to beyond the current review period. Much of the overhang is concentrated in a small number of large projects, including UID projects in Ayrshire, one of which (37478 UID – Airdrie & Coatbridge Transfer) is on hold for a review of the solution owing to its high cost of £41m.

- For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project in the Q&S3a programme, totalling £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a). This project is coded to DW3 – drinking water quality – other parameters. However it is also known to cover a range of other outputs such as general items, water non-infrastructure capital maintenance, growth, sewer flooding, non-strategic UIDs and wastewater quality.

- Significant progress has been made during the past year on bringing projects to Capex3 approval. Over 85% of projects in Table G6 had reached or passed this stage by the end of the report year. However 608 Q&S3a projects had not reached Capex3 approval by 31st March 2009 and with one year to go to the end of the investment period there is a significant risk that some of these projects will not be completed in the year.

- Table G6 has been fully reconciled with Tables G1 and G2 and Table K56 of AR06.

- We noted that Scottish Water now employs a risk analyst who develops the risk management project and the information within it based on formal risk registers. This is a more structured approach than we have seen in years prior to 2007/8 and we believe that it is a beneficial development.

- From our audits of specific projects we conclude that the data given in Tables G5 and G6 are a fair and representative picture of the programme as it stood at 31st March 2009 and are valid and sufficiently accurate for the purposes of the other G Tables.

Audit Process

Table G6 contains detailed project information relating to Q&S3a projects and the Reporting Requirements require the Reporter to check its validity. In this section of the audit we:

- Compared and reconciled Table G6 with the Capital Investment Report for the quarter ending 31st March 2009 (CIR Q4), Tables G1 and G2 and Table K56 from the annual Return 2005-6
- By programme analysis, interviews with the relevant SW staff and the analysis of base data, reviewed programme issues including:
    - Progress in obtaining Capex3 approval
    - The treatment of inflation, risk reserves, programme adjustments and the SWS share allocation
    - Overhang into the Q&S3b investment period
    - Progress on the studies programme for water resources and UIDs
- Carried out audits of a range of projects selected from Table G6, interviewing the project managers and reviewing project documentation to confirm the validity of Capex costs, Opex costs, outputs and proportional allocation and review the treatment of risk

Methodology

Table G6 reports expenditure on the Q&S3a programme. The structure of the table follows the structure of Table C of the final business plans and Table K56 of the 2005-06 annual return.

Scottish Water has provided a detailed description of the content of each column in its commentary in the table. The sources of data for Table G6 are as described for Table G5 above.

Based on our audit and our experience from previous audits of the capital programme we have concluded that Scottish Water provides robust reports on project data and accurately carries this data into the annual returns. From our individual project audits and an analysis of Table G6 we noted that significant progress has been made during the past year on bringing projects to Capex3 approval. Over 85% of projects in Table G6 had reached or passed this stage by the end of the report year. This greatly reduces the potential for significant changes to projects as they are developed and have scope and estimates refined.

Comparisons with Other Submissions

Compatibility with the CIR.

CIR Q4 has been divided into completion of the Q&S2 programme and the Q&S3a programme. A comparison of the totals for the Q&S3a programme with Table G6 is set out below:

Comparison of Q&S3 Programme (Table G6) with the CIR

	2006-07	2007-08	2008-09	2009-10	Post 09/10
Table G6 expenditure profile	240.211	560.589	661.549	568.271	149.247
CIR Q4 expenditure profile	240.211	560.589	661.549	568.271	149.247
Difference CIR – Table G5	0.000	0.000	0.000	0.000	0.000

For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project no 40020 in Table G6, which at 31st March 2009 totalled £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a).

The total expenditure in the tables is set out below and compared to that allocated in Tables G1 and G2.

Comparison of Table G6 with Tables G1 and G2

	2006-07	**2007-08**	**2008-09**	**2009-10**	**Post 2010/09**
Table G1 (Q&S3)	126.387	329.155	406.375	389.693	83.224
Table G2 (Q&S3)	113.823	231.433	255.174	178.577	66.050
Table G1 & G2 (Q&S3)	240.210	560.588	661.549	568.270	149.274
Table G6	240.211	560.589	661.549	568.271	149.274
Difference (G6-G1&G3)	-0.001	0.001	0.000	-0.000	0.000

The slight differences in some columns are due to rounding error.

All expenditure on Table G6 is carried forward to Tables G1 and G2 for the relevant years. Tables G1 and G2 do not include the reported expenditure on the Q&S3 programme prior to 2006-07.

Consistency of Table G6 with Table K56 of the 2005-06 Annual Return.

Table K56 of the 2005-06 Annual Return set out the baseline investment programme for 2006-10. It included investment for Q&S3a only, presented in the same format as Table C of the final business plan and Table G6 of the current annual return.

During our audit we compared the content of Table G6 with Table K56. There have been numerous additions and deletions due to the aggregation and disaggregation of projects.

There has been aggregation of project lines for capital maintenance expenditure and management and general expenditure into holding lines in Table G6. Specific or area-based projects are being generated from these holding lines and budget allocated as this occurs.

Budget holding lines have also been developed for the various quality programmes. At the same time, individual project lines from Table K56 have been retained and their expenditure profile set to zero. As individual projects are approved and released for development, the approved budget is transferred to the individual project line and the holding line budget revised accordingly. The holding line budget may be adjusted to reflect Scottish Water's view of the overall programme. Actual expenditure is recorded against the individual project lines.

Because of the development of projects described above, reconciliation of Table K56 and Table G6 is not straightforward. However we were able to compare the outputs planned to be delivered by the two programmes. For virtually all output lines the outputs delivered in Table G6 were equal to or greater than those planned to be delivered by the K56 programme. Exceptions are listed below:

Outputs Where the Table G6 Delivery is Less Than the Table K56 Target

Output Code	Description	Units	Table K56	Table G6	Comments
CS2	Odour Management	Works	35	13	21 odour outputs are actually for Q&S3b. One Table G6 output to be delivered early in Q&S3b period.
EC03	Shellfish Water Directive	PE	10099.73	6499	It emerged during the audit that 3575.73 outputs had been omitted from valid project outputs in the Loch Leven area. The balance of 25 outputs is due to the agreed removal of Greentoft.
EC09	Dangerous Substances Directive	No	12	5	Target reduced to 5 with the agreement of the regulator.
EC12	IPPC Directive	No	61	4	Target reduced to 1 with the agreement of the regulator. Three projects had been incorrectly coded to EC12 and will be recoded.
RDC	Remove Development Constraints	PE	120000 (50/50 split water/ sewerage)	0	Outputs transferred from RDC to SG1 and WG1
SG1	Growth – Sewerage	PE	0 (60000 implied)	66027	
WG1	Growth – Water	PE	0 (60000 implied)	153948	

In addition to the above comparison, three output lines were audited. In each case Scottish Water provided a list of the projects delivering the outputs and this was checked with the totals in the table above. Sample Capex forms were seen to verify the numbers of outputs claimed. The following lines were audited:

EC03 – Shellfish. As can be seen from the table above, the outputs claimed in Table G6 were found to be understated by 3575.73 p.e. This is to be rectified by Scottish Water. The balance of 25 p.e. is accounted for by the agreed removal of Greentoft. The OMGWG change proposal for this removal was seen and verified.

SG3 – First-time Provision – Wastewater. The Table K56 output was 806 properties and the Table G6 output 1013 properties. Audit showed that 198 properties relating to a study only had been wrongly claimed and that the actual forecast delivery is 608. However net changes to the K56 target, due to agreed removals and additions of 198 properties in 7 projects, has reduced the target output to 608. A sample agreed removal was checked and the OMGWG change proposal verified.

SG1 – Growth - Wastewater. Table G6 showed 66969 p.e due to be delivered by 79 projects. One project (Castle Douglas) was shown as being complete during 2009-10 in Table G6 but is not now expected to deliver until after March 2010, leaving a forecast output of 66027 p.e. This still exceeds the Table K56 target. Table G6 was correct at the time of its preparation.

Details were checked for 6 projects and it was verified that no outputs had been claimed for projects deferred to SR10 and that claimed p.e. in Table G6 agreed with Capex paperwork.

From the above table we have concluded that Tables K56 and G6 have been satisfactorily reconciled on the basis of outputs to be delivered. We have not identified any specific quality projects in Table K56 which have not been retained in Table G6.

Programme Issues

Inflation

Tables G5 and G6 and the CIR are all at project outturn prices. Up to Capex3 stage no better estimate of cost is available and project costs are essentially Business Plan estimates at 2003/4 prices inflated by COPI to the projected mid-point of construction. From Capex3 stage onwards estimates are the project manager's estimate of outturn cost, comprising some actual past costs and also future costs, including tendered and framework rates, inflated using projected COPI to the midpoint of construction. Overall we were concerned that we had not been able to establish a clear approach to inflation in the various sub-programmes, in particular the calculation of spend in the various programme holding lines.

Allocation by Project Driver

Many projects have a single driver and 100% allocation is appropriate. In some cases, for example asset intelligence, property or health safety, the allocations are made as either a nominal 12.5% to each of the eight areas or 50% to two areas depending on the type of work being undertaken.

Current practice follows Scottish Water's guidance note on capital expenditure allocation. All projects are assessed for the percentages to different capital drivers at Capex1 stage. The guidance notes require that the allocation of project costs to drivers is revisited at each Capex stage, and this was found in practice to be the case during the audit of individual projects. 32% of Q&S3 projects (as reported in Table G6) have more than one driver and so have proportional allocation applied. The revisiting of drivers is not required for projects with values below £100000. This is because these small projects often progress directly from Capex1 stage to construction.

A sample of projects was reviewed to illustrate the application of the rules and gave an indication that costs had generally been correctly allocated to drivers, with costs being allocated to drivers in the proportion of the cost required to meet those drivers.

All projects in Table G6 have at least one driver allocated. Tables G1 to G4 were reconciled with Table G6 with regard to project drivers. We have also confirmed that all expenditure in Table G6 is reported in Tables G1 and G2. We have therefore concluded that the allocation of expenditure by investment type and output in Tables G1 to G4 is reliable within the confidence grades allocated to these tables.

Q&S3 Overhang

Scottish Water is projecting an overhang of expenditure from the Q&S3a programme of £149.274m. For the large majority of projects overhang consists of minor completion items for projects where construction work will be completed before the end of the current investment period. Numbers of projects showing overhang spend are as follows:

All projects with overhang exceeding:	Number	Total estimated overhang £m
Zero	803	149.274
£0.2m	44	137.980
£0.5m	25	132.019
£1m	18	126.731
£10m	5	89.267

It can be seen that the bulk of overhang cost is concentrated in a small number of projects with significant post 2009/10 expenditures and in particular in 31851 Glencorse New WTW and three UID improvement projects in Ayrshire.

Overhang figures given above however include two large negative adjustments, of -£42.232m for 40025 UIDs Holding Code and -£7.0m for 40032 Q&S3a Base Maintenance Overhang. The sums contained in these two projects are intended to be redeployed into other projects in the Q&S3b investment period at which time the remaining value of the holding code will be correspondingly reduced. These adjustments have been netted off the figures contained in the comparison table above. We recommend that these adjustments are removed as soon as possible from the programme by making sufficient estimates of the work they are intended to cover and allocating these to specific projects.

Q&S3 Study Programme Audits

During our audits of the Q&S3 programme we carried out reviews of study programmes to obtain an overview of the management and progress of the programmes and to understand how sub-programmes of work were represented in Table G6. From these audits we concluded the following:

UID Programme

Details of the UID programme dates is given in lines 41 to 49 of table G8.

We reviewed the management and progress on the strategic studies on the UID programme. We noted the structured approach to the management of the strategic programme both technically and in terms of programme management. We reviewed a small sample of supporting documentation.

The programme covers:

- 6 catchments in Glasgow and Portobello which is divided into 26 work packages and 73 outputs.
- 2 catchments (Meadowhead and Stevenson) which are divided into 6 workpackages with a total of 49 outputs.

The current situation on the programme is:

- The Portobello projects are complete.
- All the Glasgow projects are at CAPEX5 with a detailed design complete.
    - Airdrie and Coatbridge catchments are late with a programmed end date of December 2011. SW reports that it is concerned that flooding issues in the catchments may not be rectified by the current design and it plans to undertake a flooding study before commencing work on site.
    - All other projects will be complete by the end of SR06. All outputs are aesthetic and so can be completed rapidly provided that sufficient resources are provided. 37 outputs are planned for the year. Last year 61 outputs were completed and so SW is confident that the programme for this year is achievable without great difficulty.
- Meadowhead and Stevenston Workpackage 6 has been delayed and SW reports a new completion date of March 2011. The work comprises a 12.1km pipeline, 2 pumping stations and a 10,000m3 tank. Design has just been completed.

We concluded that the work was being well managed and that SW were making good progress with the aesthetic which we believe will be completed by the due dates noted in table G8. We note that the dates given in lines G8.48 and G8.49 relate to these outputs and do not relate to the two delayed work packages with dates in March and December 2011 respectively. These projects are different in nature with higher risks. The fact that designs are complete gives ground for optimism. If flood studies show that the current project in

Airdrie and Coatbridge catchments will not alleviate current flooding, the project could be at risk of further delays.

Water Resources Studies

This area was not audited in detail for AR09. The work has been progressed through joint workshops involving Scottish Water, SEPA and WICS. The programme consists of 78 studies. Of these, 41 consist of licence issues only. 37 locations require studies and the quantification of costs and it was confirmed that Scottish Water have met the target of confirming to WICS by 31st October 2008 the estimated cost of carrying out the required studies

The programme is the subject of an action plan with managers tasked to manage and monitor progress through Capex3 approvals. Where appropriate, the quality element of the project is being separated from other drivers to allow it to proceed. Where there is an obvious standard process solution, the Capex2 and 3 stages are being integrated to ensure project approval at an earlier stage. Where necessary, individual review meetings are held on projects which fall behind expected progress to understand and, where possible, work around any need for approval or additional assessment required to achieve Capex3.

Scottish Water expressed some cause for concern where the agreement of proposals was required by SEPA, owing to the time which this might take. This adds an element of uncertainty to the timing of some projects and the completion of the water quality programme as a whole.

Progress on delivery of individual outputs is described in more detail in the commentary on Table G7 (Q&S2 Output Delivery), G8 (Q&S3 Ministerial Objectives) and Table G9 (Q&S3 Ministerial Objectives – Serviceability)

Q&S3 Risk Allowance

Most risks are borne by SW's service providers under their framework contracts. However a number of risks that relate to third party issues are retained by SW. As well as third party issues SW's risks include for the effect of delays on inflation allowances, scope changes and abortive work.

For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project no 40020, which at 31st March 2009 totalled £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a).

Commencing in 2007 SW appointed a risk manager and became more proactive in managing its risks. In addition to the Risk Manager, SW manages its capital service providers via four programme leaders: two for Scottish Water Solutions (SWS); one for Scottish Water Delivery (SWD) and one for Capital Investment Delivery (CID). One programme leader for SWS manages the Q&S2 programme and one manages the Q&S3a programme. The four programme leaders work closely with the service providers' programme and project managers and keep risk registers of those risks that they believe are the responsibility of SW and are likely to be the subject of claims by the service providers. These risks are discussed with the Risk Manager on a monthly basis and form the overall risk register which comprises Project 40020.

SW applies a structured approach to identifying and managing third party risks, using a central resource of specialists in planning, land access, land acquisition, environmental issues, utilities and customer issues. Individual specialists are aligned with area teams and individual senior project managers to assist identify risks and ensure that they are managed centrally. The aim of these specialists is to anticipate and avert potential delays by timely action to obtain necessary permissions, supplies or other agreements in good time. To this end the planning team has access to the project management system P6 and runs a reminder system for project managers on these issues. Standard procedures are in place showing the key stages and sequence of actions required for key third party issues. Pro-forma documents are available for the completion of submissions.

From our discussions last year, we formed the opinion that Scottish Water had sound procedures in place to identify, address and manage third party risks. However, by their nature, third party risks cannot be fully controlled and it is likely that some projects will be delayed as a result. This remains an asymmetrical risk where successful delivery of most of the programme will not balance out the impact of the limited number of risks which materialise.

We discussed the risks making up the current register. For Q&S2 the majority of the risks are project specific but for Q&S3a many risks remain at a programme level and are less well defined. We reviewed the risk register of SWS as an example of the type of risks making up the Q&S3a register. Of the £23.87M making up the SWS risk register, some £4.0M related to delivery programme risks. These were well defined, comprising some 140 specific risks varying in amount from £38.0 to £1.5M. The remainder of the register comprised some 12 strategic and programme level risks that were fairly high level; in order to generate the final numbers both consequence and probability of failure were estimated.

We conclude that SW is actively recording and managing its risks. The final allowance of £32.38M covers both Q&S2 and Q&S3a risks despite being recorded in Table G6. We believe that SW understands the risks that it faces in completing its Q&S2 and Q&S3a capital programmes but inevitably some are at a fairly high level and are likely to be subject to significant uncertainty. We believe that it would be useful for SW to check its current risk estimates against historic levels of claims from its service providers in order to give it additional comfort. We accept that some on-going work may differ in detail from past programmes.

Progress Through Capex 3.

Significant progress has been made during the past year on bringing projects to Capex3 approval. Over 85% of projects in Table G6 had reached or passed this stage by the end of the report year. This greatly reduces the potential for significant changes to projects as they are developed and have scope and estimates refined.

However 608 Q&S3a projects had not reached Capex3 approval by 31st March 2009 and with one year to go to the end of the investment period there is a significant risk that some of these projects will not be completed in the year. As a result Scottish Water has reprofiled a number of these projects and 207 Q&S3a projects are programmed to reach Beneficial Use after 31st March 2010, resulting in a forecast expenditure of £149m on Q&S3a projects in the Q&S3b period. This is an increase of £75m on the position for AR08, when £74m of Q&S3a project expenditure was forecast to fall into the Q&S3b period.

Q&S3 Capex 5 Dates

In the Q&S2 programme Capex5 dates indicated beneficial use. In Q&S3a Capex5 dates are intended to signify quality regulator sign-off for appropriate projects, known as 'Acceptance'. Three months is now allowed by Scottish Water between beneficial use and quality regulator sign-off.

A formal and well-documented process is followed by Scottish Water to achieve and record regulatory sign-off. We have also noted that in the reporting of the achievement of regulatory outputs in Tables G7-9, delivery of the output is in most cases claimed when internal sign-off is achieved at 'acceptance' milestone 4, rather than sign off by the external regulator, which can take a further 3 months.

Checks on the Validity of Data in Table G6 – Q&s3a Projects

The Reporting Requirements ask the Reporter to undertake audits of a range of projects to check the validity of data in Table G6. A brief project description and key issues identified for each audit are summarised below. These audits presented an improved picture compared with last year's audit, with most projects proceeding to plan and a small proportion subject to risks of delay and further cost increases. Project drivers have generally been correctly allocated.

Key Points from Project-specific Audits

The following key points apply equally to Q&S2 projects in Table G5 and Q&S3a projects in Table G6:

- Information in Tables G5 and G6 corresponds to the Quarterly Investment Report for the end of year 2008/9 (CIR Q4).
- A sample of projects has been audited to check the validity of data in Tables G5 and G6.
- In previous years' audits we have noted that information in CIR Q4 and Tables G5 and G6 on estimated outturn cost and completion date usually corresponded to the latest Capex approval, even where the project manager was aware of factors likely to cause significant change to cost and programme. This year we are pleased to note that estimated outturn cost and completion date in general correspond to the project manager's latest best estimate (LBE), although exceptions were noted.
- In virtually every case the Opex impact stated in Tables G5 and G6, corresponded to the most recent Capex submission. This is because Opex impact is only revisited for Capex submissions.
- Proportional allocation of costs to outputs has, with only minor exceptions, been carried out in accordance with agreed guidelines and been revisited at each Capex stage.
- During our audits we continued to note that the focus of SWS staff involved in projects remains on contract cost, rather than overall project cost. We found some

examples where significant external risk factors (such as the need to agree consents or reach agreements with third parties) which could affect project completion dates were not included in project risk registers, which focus on costed risks. We recommend that project risk registers should be reviewed to ensure that they contain all risks, including those borne by Scottish Water, particularly where these could affect completion, but do not affect outturn cost.

- We conclude that the data given in Tables G5 and G6 are a fair and representative picture of the programme as it stood at 31st March 2009 and are valid and sufficiently accurate for the purposes of the other G Tables.

Audit Process

The Reporting Requirements require the Reporter to check the validity of the data in Table G6 for a variety of project sizes and types. In order to do this, a sample of 10 projects was audited. The purpose of these project-specific audits was to check on project Capex and Opex estimates, the project programme, drivers, risks and outputs and comment on their reliability. For each project the project manager was interviewed and project documentation was examined. Documentation reviewed included Capex approval forms and supporting information, project risk registers, engineering drawings and specifications.

For each project the Capex and Opex estimates and programme dates contained in Table G6 were compared with:

Information contained in Scottish Water's Capital Investment Report for the period ending March 2009 (CIR Q4)

Capex approval paperwork

The project manager's latest best estimate (LBE).

The allocation of drivers was also checked and where the project had more than one driver, the proportional allocation of costs to drivers was checked.

All projects have been developed by Scottish Water or Scottish Water Solutions within the context of its Capex reporting mechanisms and approval procedures. Information provided by SWS in Capex submissions is checked and approved through the Capex approvals procedure. Scottish Water also review project data in the preparation of each quarterly Capital investment report (CIR). Information input direct to CIMS by SWS by means of uploads from P3e remains briefly unchecked by SW until it reaches either a Capex submission or review for the CIR report.

The findings of project-specific audits are summarised below:

<u>30155 Coulter New WTW Upgrade</u>

Coulter New WTW is a sand-filter treatment plant fed from two surface water sources. Two-stage filtration is used with intermediate dosing and washwater is recovered using a lamella plate thickener. The project drivers are DW1 (lead), DW3.0 (colour), DW3.1 (coliforms), DW3.3 (manganese), DW3.6 (aluminium), DW4.1 (Cryptosporidium), DW13 (disinfection control) and WSN (capital maintenance). The upgrade project is required to provide adequate capacity to eliminate hydraulic overloading, address the quality drivers listed above, improve washwater recovery and return and carry out minor capital maintenance and health and safety work.

The upgrade project will install a dissolved air filtration (DAF) plant upstream of the existing plant, which will be retained, and provide a new lamella plate washwater recovery filter. The project is well advanced on site and currently undergoing dry commissioning. Beneficial Use is expected by the end of August 2009 and regulatory sign-off (Capex5) by December 2009.

The project risk register was reviewed. All external risks have been discharged, but £0.661m of undischarged contract risk remains, being included in the project estimate. The project manager believes that this is a realistic estimate of the likely cost arising from these risks.

Proportional allocation of cost to drivers was checked. At Capex3 stage the cost attributable to capital maintenance was assessed by estimating the actual cost of construction items directly attributable to capital maintenance. This figure was revised to 7% for Capex4c and this is the figure used in Table G6. However the project manager accepted at the audit that this figure required revisiting and that the correct capital maintenance percentage was 2%.

The project manager's latest best estimate (LBE) of total capital cost is £6.479m. Table G6 and CIRQ4 however show a total estimated cost of £6.554m.

The Opex impact figure given in Table G6 is £0.139m p.a. This corresponds to the estimate made at Capex3 stage, but is being reviewed and in the project manager's opinion, is likely to reduce. The project manager's forecast regulatory sign-off date (Capex5) of December 2009 corresponds with both CIR Q3 and Table G6.

We concluded that this project had been well-managed and that the total cost and completion date given in Table G6 were reliable and in line with the project manager's best estimate, although the Opex impact was overstated. The correct procedures had been followed for proportional allocation of costs, although the percentage allocation to capital maintenance was overstated.

<u>30190 Dalscone STW (Old) Refurb</u>

Dalscone STW consists of two separate, parallel streams on the same site, each with its own outfall and consent. The older stream (known as the old works) was built in the 1950s and consists of primary sedimentation tanks, percolating filters and humus tanks. The newer stream (the new works) was built in the 1970s and consists of primary sedimentation tanks, an aeration ditch and final tanks.

The project drivers are SG1 (growth) and WWNI (capital maintenance). Necessary capital maintenance is small and the main purpose of the project is to serve significant growth in the area and remove development constraints. The existing treatment streams serve a combined population equivalent of 6975, while extensions are required to cater for a further population equivalent of 3858. There is no significant change in the consent required, compared with the existing 20 SS/30 BOD.

The proposed works consist of a new inlet works for both streams, plus new primary sedimentation tanks and humus tanks, filter refurbishment and the conversion of the primary sedimentation tanks to storm tanks for the old works. Work was begun on site but then stopped due to the emergence of a flooding problem caused by backing up of river levels through the outfall and affecting the area of the new humus tanks. Work has been stopped on site during design changes to relocate the humus tanks to higher ground and introduce inter-stage pumping.

Proportional allocation of cost to drivers was checked. At Capex3 stage the cost attributable to capital maintenance was assessed by estimating the actual cost of construction items directly attributable to capital maintenance, with the remaining cost attributed to growth. This is in accordance with guidance agreed with WICS.

The project risk register was reviewed. Flooding by backing up had not been anticipated as a risk. Land purchase and a revision to the planning permission are both required but these are not seen as being problematic.

The total cost given in Table G6 and CIRQ4 is £6.361m, corresponding to the project manager's LBE for the original project with some minor additions. The project manager's view is that the cost of the revised project will be similar.

The Opex impact figure given in Table G6 is £0.044m p.a. This corresponds to the Opex impact given in the Capex3 submission for the original project. This figure will be recalculated following completion of the project redesign, when it is likely to increase due to the need for interstage pumping.

The forecast completion date (Capex5) given in Table G6 is December 2010. This is consistent with the project manager's latest best estimate. Although the flooding issue has caused delay, the revised project will be more straightforward to construct, resulting in forecast completion at the same date as for the original project.

We concluded that the forecast total cost and completion date given in Table G6 corresponded to the project manager's LBE. Some uncertainty remains over the final position, pending the completion and pricing of the revised design. Opex impact appeared to be understated, compared with the likely revised design. The correct procedures had been followed for proportional allocation of costs.

30408 Killylour WTW Upgrade

Killylour WTW is a pressure filter works with disinfection, fed from an impounding reservoir, serving a population of 35,000. The works uses 12 Bell pressure filters and there is also a disused bank of Paterson filters.

The project has drivers for DW3.1 (coliforms), DW3.6 (aluminium), DW4.1 (Cryptosporidium), DW13.1 (disinfection control), WG1 (growth) and WSNI (capital maintenance). The growth element is to cater for an additional population equivalent of 7152, corresponding to the Growth Model RAW figure for the area served. This gives an increase in throughput of 2.2 Ml/d.

The project currently has Capex2 approval, granted in June 2007 at an estimated cost of £12.150m, and a programmed beneficial use date of October 2009. Following option appraisal the proposed option is to provide a complete new works using dissolved air flotation and rapid gravity filters. Process design has been completed for this.

However the project is currently on hold pending resolution of a number of third-party issues. It will be necessary to purchase land for the new works. Two potential sites have been identified and the landowner is prepared to sell either. Planning permission will be required and there are potential problems on both sites. In addition SEPA have indicated that they are unwilling to issue a revised abstraction licence for the surface water source as the increased take significantly exceeds that currently licensed and also exceeds Scottish Water's estimate of sustainable yield. The project manager is awaiting resolution of these issues by CID. Options include the abandonment of the site and connection to the adjacent supply network. This has been discussed but not yet agreed with WICS as it would involve delaying the delivery of the quality outputs until the Q&S3b investment period.

The project risk register was examined. Risks are dominated by the external risk factors highlighted above.

Proportional allocation of cost to drivers was checked. The growth element was calculated in accordance with the proportions of new and total future capacity and the capital maintenance element was calculated from the estimated cost of identified capital maintenance items. The remaining cost was divided equally between the quality drivers. This calculation is in accordance with agreed guidelines for proportional allocation.

The project manager's LBE of cost for the project is £12.969m, corresponding to the Capex2 estimate with the addition of £0.750m to cover additional costs resulting from delay to date. This gives a figure of £13.293m which corresponds with both CIR Q4 and Table G6.

Table G6 shows an Opex impact of £0.179m, equal to the Capex2 estimate, which was calculated from the Opex Model. This figure is likely to rise when reassessed at later project stages, due to increased electricity costs.

Table G6 shows the forecast Capex5 date as June 2011, corresponding to the project manager's best estimate at the time of compilation of CIR Q3. However the project manager's view is that further delay is likely to the project, resulting in increased cost due to construction price inflation, as well as slippage into later years.

We concluded that the forecast total cost, Opex impact and completion date given in Table G6 corresponded to the project manager's LBE. Uncertainty remains over the shape of the eventual solution, cost and completion date due to the effect of third party issues. The correct procedures had been followed for proportional allocation of costs.

30578 Penwhirn WTW Upgrade

Penwhirn WTW is a 2-stage filtration works using sand rapid gravity filtration for primary filtration and GAC for secondary filtration, principally for manganese removal. The project has drivers for DW2.0 (THMs), DW3.1 (coliforms), DW3.2 (manganese), DW3.5 (iron), DW3.6 (aluminium), DW3.9 (turbidity), DW4.1 (Cryptosporidium), DW13.1 (disinfection control) and WG1 (growth).

The proposed project is to replace a number of process pumps and dosing pumps, provide new DAF saturators, replace filter media and provide a new chloramination plant. The growth element requires an increase in throughput from the current 16 Ml/d to 17.2 Ml/d. A temporary DAF unit is included, to allow work to take place on the permanent DAF units.

The proportional allocation of costs was checked. For this project it was possible to associate different plant items to the growth and disinfection drivers. The cost attributed to growth corresponds to the estimated cost of DAF saturators, modifications to the DAF recycle system and replacement media. The cost attributed to disinfection corresponds to disinfection modifications and the remaining cost was split equally between the quality drivers. This is in accordance with agreed guidance on proportional allocation.

The project risk register was examined. All external risks have been discharged. A total of £0.363m of risk cost is included in the Capex3 estimate.

The project has Capex3 approval at a cost of £4.113m and work has just begun on site. Table G6 and CIRQ4 however show a total capital cost of £4.196m, which corresponds to the project manager's LBE.

Table G6 shows a positive Opex impact of £0.060m p.a. This is a saving, due to the abandonment of 18 chlorinators in the network. Capex3 shows a positive Opex impact of £0.050m p.a.

Table G6 shows a forecast Capex5 date of September 2010, with corresponds with both Capex3 and CIR Q3, although staged construction will allow delivery of the quality drivers by the regulatory date of 31.3.2010.

The SWS project manager is currently awaiting guidance from Scottish Water as to whether an additional new DAF unit is required for operational reasons, to allow full flows to be maintained during unit maintenance. If this is required £1.070m will be added to the total project cost and one month to the programmed completion date.

We concluded that the forecast total cost and completion date given in Table G6 corresponded to the project manager's LBE, although there was a discrepancy regarding Opex impact. Uncertainty remains over the need for a further DAF unit which would increase final cost and cause a small delay to completion. The correct procedures had been followed for proportional allocation of costs.

31434 UID WP6.1 Kilmarnock Gravity Transfer Scheme

This project is to improve water quality in the River Irvine by closing an unsatisfactory UID in the centre of Kilmarnock and transferring flows downstream by gravity to existing tanks at Gatehead for transfer to Meadowhead WWTW. Project costs have been divided equally between the project quality drivers of EC01 (Bathing Waters), EC02 (Freshwater Fisheries) and EC10 (Water Framework Directive).

A risk register has been drafted for the project but not yet costed, as is consistent with a project at Capex2 approval. There are significant construction risks including river-crossing, mineworkings and archeological remains. The work has however been confirmed as permitted development, no land is required and no CAR licence is required.

Table G6 shows a forecast total cost of £11.724m, corresponding to CIRQ4, although the project manager's LBE, which is of later date, is £11.709m. The project has no Opex impact.

The Project manager's LBE of completion (Capex5) is May 2012, although Table G6 shows February 2012.

We concluded that the project had been well planned, although the forecast total cost and completion date given in Table G6 differed slightly from the project manager's LBE. The correct procedures had been followed for proportional allocation of costs.

31496 UID – Rear of Chriss Avenue

The project is to improve an existing, unscreened, unconsented combined sewer overflow which has no telemetry. The need for the work was identified during the Hamilton waterbody study, which covered a large number of CSOs. The description of need was taken direct from the Technical Expression, which was verified. The needs report for the project was prepared following site visits, sewer modelling and River Impact Optimisation Tool (RIOT) modelling of the receiving Meikle Burn. Modelling confirmed that the duration and volume of spills from the overflow were not great and that the Meikle Burn passed its 99 percentile river quality standard.

As a result of the study work it was concluded that the overflow needed screening and telemetry only. This was priced using ESS cost curves. Design is proceeding and the solution has been developed to improve the access and relocate the spill chamber.

The drivers for the project are EC01 (UWWTD), EC04 (Freshwater Fisheries) and EC10 (Water Framework Directive). Costs for the project are divided equally among these drivers. No risk register has yet been drawn up and this would not be expected for a project at this early stage. There are no significant external risk issues. The overflow is currently unconsented and requires a consent.

The project manager's LBE, based on ESS cost curves and contained in a recent Capex1 submission, is £0.410m. Table G6 and CIRQ4 show £0.170m, which was the initial estimate based on the Hamilton Needs Assessment and was correct at the time the data were prepared, predating the LBE. The project has no Opex impact.

The Project Manager's LBE of the Capex5 date is August 2010. However both Table G6 and CIRQ4 show December 2010.

We concluded that the project had been well planned and although the forecast total cost and completion date given in Table G6 agree with CIRQ4, both differed from the Project Manager's LBE. The correct procedures had been followed for proportional allocation of costs.

32008 Environmental First-time Provision - Kishorn

This project is for the first-time provision of sewage treatment to a remote coastal community in north-west Scotland. 66 existing properties are to be connected and provision made for growth of 13 properties (31 p.e.). The extent of properties to be connected has been agreed with SEPA and this was checked. The project currently has Capex2 approval at an estimated cost of £8.201m, based on a detailed pipeline and treatment M&E design and an almost-complete civils treatment design. The project consist of gravity collection to 4 pumping stations with rising mains to a treatment works providing submerged aeration and filtration followed by sand filtration and UV disinfection, required to achieve the agreed consent standard of 100 coliforms/100ml.

The project risk register was examined. Land purchase has been agreed for the WWTW site and 3 of the 4 pumping station sites. Issues remain with one pumping station site. Planning permissions have been sought and are not thought to be problematic. The consent has been agreed by SEPA.

Cost has been allocated entirely to driver SG3 (first-time provision). This will be amended at the Capex3 submission to show a small percentage to growth (SG1). The growth percentage has yet to be confirmed.

Table G6 and CIR Q4 agree in showing a forecast total capital cost of £8.084m. The project manager's LBE and Capex2, both of which are of later date, show a forecast total capital cost of £8.406m.

Table G6 shows an Opex impact of £0.042m. The project manager's LBE and Capex2, both of which are of later date, show an Opex impact of £0.039m.

Table G6 shows a forecast Capex5 date of November 2010, in accordance with the project manager's LBE, although Capex2 shows December 2010.

We concluded that the forecast total capital cost, Opex impact and forecast Capex5 date were consistent between Table G6 and the project manager's LBE at the time G6 data were downloaded. Proportional allocation of costs appears to have been correctly carried out. There is a remaining risk to completion due to the need to agree land purchase.

33288 STW Capital Maintenance - Torlundy

The project is to replace an existing rotating biocontactor which is overloaded and in poor condition. The design capacity of the RBC unit is 330 population equivalent, while the current loading has been estimated by a house-count survey to correspond to 412 p.e. Growth of 35 p.e. is required to be catered for.

The adopted solution is to provide treatment using septic tanks, interstage pumping, a submerged aeration plant and final settlement tanks. The project is now complete on site and acceptance is imminent. The SAF plant used is one which was bought using capital maintenance expenditure as part of Q&S2 project number 10228 and used to support treatment performance at a number of WTWs pending improvement works. This plant has a design capacity of 750 p.e. and is now surplus to requirements. It was provided free of charge to the project and its cost has not been charged to project 33288.

The project drivers are WWNI (capital maintenance) and RDC (removal of development constraint). Expenditure has been allocated to these drivers in the proportions 90% and 10% respectively. The agreed proportional allocation method would result in costs being allocated in the same proportion as the current and future total population equivalent, giving 92% and 8% respectively.

The project manager's LBE of outturn cost, Table G6, CIR Q4 and Capex5 estimate all agree at £0.645m. The Table G6 estimate of Opex impact is in agreement with the Capex4b estimate of £0.022m. The project manager's LBE of Capex5 date is September 2009, in agreement with Capex4, while Table G6 shows August 2008.

We have concluded that the Capex and Opex costs and forecast completion dates given in Table G6 are realistic and correspond with CIR Q4 and Capex paperwork. Proportional allocation appears to be slightly in error, compared with the agreed rules. The cost of the project appears to be understated due to the free issue to the project of the surplus SAF plant. However the cost of this has already appeared in the Q&S2 programme and been written off, so adding its cost to the cost of this project would result in double-counting.

35494 WOA000266 Milngavie M3

The project is for the rehabilitation of water mains in five areas fed by feeder main M3 in Glasgow city centre. These areas have been identified as being in need of rehabilitation from the burst history and through DOMS investigation. For three of these areas open DMA modelling has been completed, concluding that like-for-like replacement was required. For the remaining two areas it has been concluded that DMAs need to locked down and modelling completed before the work can be designed. As a result the whole project has been deferred, with the exception of a small area where work is proceeding at the request of the City Council in advance of streetscaping work.

The sole project driver is WSI (capital maintenance). No risk register has been completed for a project at this early stage.

The project manager's LBE for the work is £0.310m in Q&S3a, with the remainder being deferred into Q&S3b. This corresponds to the most recent Capex approval, Capex2b. Table G6 and CIRQ4 show a total cost of £0.877m, all in Q&S3a, which correspond to the previous Capex1 approval.

There is no Opex impact. Table G6 shows a forecast Capex5 date of June 2010. The Project Managers' forecast of Capex5 is under review but is likely to be later that shown in Table G6.

We concluded that the forecast total cost and completion date given in Table G6 both differ from the Project Manager's LBE. This appears to be because they have not been updated in line with the actual progress of the work.

37478 UID – Airdrie & Coatbridge Transfer

The project as currently proposed will improve 11 unsatisfactory combined sewer overflows in the centre of Airdrie and transfer flows by a new large-diameter tunnelled sewer to new storm tanks, with pumped emptying via a further large diameter outfall to watercourse.

The project currently has Capex2 approval, granted in August 2008, at an estimated cost of £25.561m, with a forecast beneficial use date of March 2010 and an Opex impact of £0.017m p.a. In the course of developing the project, it was priced up by framework contractors, resulting in an increase in estimated cost to £56m. As part of a value engineering exercise, 6 UIDs were deferred to Q&S3b, where they were originally programmed, and the size of storm tanks and tunnels was reduced. This reduced the project manager's LBE of cost to £41m. This project has been agreed by SEPA and a risk register has been prepared.

Proportional allocation has been carried out, allocating costs equally to the three quality drivers of EC01 (UWWTD), EC04 (Freshwater fisheries) and EC10 (Water framework directive). This is in accordance with agreed guidance.

Table G6 and CIR Q4 show a total project cost of £41.005m, corresponding to the project manager's LBE, with an Opex impact of £0.017m, corresponding to the Capex2 estimate. Table G6 shows a forecast Capex5 date of May 2012, which corresponds to the project manager's LBE.

However the project is still seen as being very expensive for the benefits delivered and in addition it does not address severe property and highway flooding which occurs in the vicinity of the UIDs. As a result the project is being reviewed as a result of which its content may change and forecast Capex, Opex and completion date are all likely to change.

8.7 Table G7 – Q&S2 Output Delivery

Commentary by REPORTER

Key points

- The Company has reported delivery of outputs in lines 1 to 9 against Beneficial Use dates.
- The reported quality outputs in lines 1 to 9 are consistent with the progress on the Quality and Standards 2 sign off reported in lines 13 to 17, the base data and Table G5.
- Progress has been made in achieving regulatory sign-off. However a number of cases remain where work on a particular site cannot be achieved because work is needed at a linked site. This is a factor in delays in sign-off and Scottish Water is now forecasting that 7 of the total 1161 projects will not be signed off by the end of the Q&S3a investment period.
- Data in lines G7.10 to G7.12 are consistent with the WIC 16 progress monitoring base data and Table G5.
- Scottish Water has a rigorous and well-managed process for identifying and submitting relevant projects for regulatory sign-off and monitoring progress. The data in lines G7.13 to G7.17 are consistent with the data in this system.
- Scottish Water is now forecasting that a total of 6 Q&S2 quality outputs will not be delivered until after 31st March 2010.
- Information in Table G7 (and also Tables G8 and G9) is heavily reliant on the completion by delivery partners and others of spreadsheets which require significant manipulation and careful version control. It is understood that Scottish Water is working on a system development (CISP) which will bring together investment programme monitoring, control and reporting in a corporate data repository. This may be expected to improve the reliability of the data.

Audit Process

During the audit we reviewed:

- Sources of data on Q&S2 output delivery for table lines with output delivery in the report year
- The methodology for compiling the output table
- Progress on a project-by-project basis against the WIC16 programme
- Sources of data and the methodology for agreeing the sign-off of regulatory outputs with regulators

- Progress on the sign-off of Q&S2 projects, including variations to the total needing sign-off

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

The Company has reported progress on outputs by Beneficial Use date, which corresponds to Milestone 4 in the Quarterly Capital Investment Report.

Progress with Q&S2 Outputs

To monitor progress Scottish Water maintains a spreadsheet updated periodically from CIMS data, listing the outputs delivered by each project and confirming its actual or forecast Beneficial Use date. Quarter-by-quarter targets for future years are set by reference to the expected Beneficial Use dates of projects due to be completed in that year. Data in lines G7.1 to G7.9 are abstracted from the spreadsheet.

WIC 16 Progress

Scottish Water maintains a spreadsheet listing all WIC 16 projects, updated periodically from CIMS data, listing actual and forecast Beneficial Use dates, from which data are abstracted to report progress in lines G7.10 to G7.12.

Q&S2 Sign-off Process

Information on progress against Q&S2 sign-off is collected from Investment Planning by means of a spreadsheet which is updated by IP with information on current progress, returned on a quarterly basis and used as the basis of data in Table G7 lines 1 to 9. This lists all projects requiring sign-off, including a reconciliation for those which have been removed from the target by agreement of the appropriate regulator, together with their current status. The stages listed are: completed to Beneficial Use status, submitted to regulator for sign-off and signed-off.

Procedures for regulatory sign off of projects with defined quality outputs, developed by DWQR, SEPA and Scottish Water, have been in place since before the AR07 return. Output sign-off is recorded on Output Delivery Sign-off forms which are signed on behalf of Scottish Water and the appropriate regulator.

Scottish Water offer projects for regulatory sign-off once it believes the regulated outputs have been achieved. Output delivery is identified and controlled within Scottish Water through completion of:

A "Wastewater Regulatory Output Approval Form" for wastewater quality projects; or

A "Water Into Supply Certificate" for drinking water quality projects.

The relevant forms are prepared by the Capital Investment Delivery team. They are reviewed and signed off as appropriate on behalf of Scottish Water by representatives of Strategy and Planning and Operations.

In addition to addressing on-going projects Scottish Water are working to address the backlog of sign-off for projects completed before the regulatory sign-off procedure was initiated. This has been significantly reduced during the report year. These projects may not have all the paperwork recently introduced by Scottish Water to identify delivery of an output. In these circumstances, the Output Delivery Sign-off form is prepared on the basis of the project records and circulated to relevant staff in Strategy and Planning and Operations for confirmation that the output is complete before submission to the relevant regulator for authorisation.

Regulators have opted to provide sign-off on projects and all the associated drivers and outputs at one time. In some cases Scottish Water may achieve some outputs on a project in advance of others which are not recognised by the regulatory sign-off procedure until all the project outputs are delivered.

In some cases the regulator is not prepared to sign off individual projects upon achievement of Beneficial Use because work is required on a linked site. Examples include projects where a drinking water quality driver is achieved by abandoning a source and connecting its supply area to another source to provide an alternative supply. If work is also required in the second supply area to meet quality criteria the regulator will usually refuse to sign off the project for the first area. This can involve significant delay.

Regulatory sign-off is based on the completion of a reasonable set of assets likely to deliver the associated outputs in the long term. Long term monitoring of asset performance may expose weaknesses in the assets which would have to be corrected to secure the outputs.

Regulatory sign-off is based on the performance standards set for Scottish Water in pursuance of a particular output or driver. For example, sign-off may be based on consent compliance rather than a river quality objective. It is possible that Regulators will impose more onerous consents on Scottish Water in pursuit of the same driver in the future which will require further investment in future Q&S periods.

In addition to a description of the improvements made, the Output Delivery Sign-off sheets include purpose codes, output driver codes and quantities, output codes and quantities.

Scottish Water tracks the completion of outputs including internal sign-off and regulatory sign-off. Regular meetings are held with regulators to manage the process and address issues arising. A process is in place for escalating issues which cannot be resolved at an operational level. In previous years we have concluded that the process was robust and accurate and record keeping was good.

We understand that regulators are signing off projects on the basis that the assets provided are likely to provide secure performance against the appropriate driver in the long term. In some instances (say orthophosphate dosing for lead control in water distribution) it will take some time after the assets are operational to achieve the lead standard.

Conclusions

Q&S2 Outputs

For lines where outputs are programmed to be delivered in the report year (lines G7.3, G7.5, G7.9), the base data in the output monitoring spreadsheet were checked. For each line the projects and outputs making up the target and the actual output in the base data were checked and seen to be consistent with the table lines. For each line a sample project was checked, the acceptance certificate seen and the data found to be consistent with the data held in Table G5.

WIC 16 Progress

The WIC16 progress monitoring spreadsheet was checked and found to be consistent with the data in lines G7.10 to G7.12. Data for a sample project were checked and found to be consistent with Table G5. The WIC16 completion date of 31/7/09 corresponds to the forecast Beneficial Use date for Lismore Primary (9638), which was verified in Table G5.

Q&S2 Sign-off

The Q&S2 Sign-off spreadsheet was reviewed. For each line the number of projects listed as being at that particular stage was consistent with the appropriate table line.

Comments by Line

Lines 3, 5 and 9 *Quality Outputs*

Quality outputs are reported for:

- Drinking water quality drivers (line 3)
- Continuous discharges (line 5)
- Unsatisfactory CSOs (line 9)

The Company has reported completion of outputs against Beneficial Use date. We have reviewed the report against the list of outputs in the Q&S2 sign-off process and found that the report is consistent with the sign off process reported in lines 13 to 17 and with Table G5.

It was noted that for line 3 the total of outputs delivered to the end of AR09 and future targets (592) is lower than the Ministerial target of 599. This is due to the removal from the target of outputs at Ballater (4), Blackpark (1) and Shieldaig (2). The delivery of one output is now forecast to be after 31st March 2010.

It was noted that for line 5, the total of outputs delivered to the end of AR09 and future targets (582) is lower than the Ministerial target of 589. This is was stated to be due to the removal from the targets of 4 outputs related to Loch Ryan improvements, where the remaining funding is inadequate to meet the cost of required improvements and further outputs at Lochgair (1), Cairndow (1) and Blackridge (1), removed with regulator agreement. Scottish Water stated that the four Loch Ryan outputs have been removed from the target, but this is not reflected in line G7.5 as the ministerial target 2002-6remains at 589 to reflect the fact that the Loch Ryan outputs still require funding. The delivery of 5 outputs is now forecast to be after 31st March 2010.

It was noted that for line 9, the total of outputs delivered to the end of AR09 and future targets (428) is lower than the Ministerial Target of 429. This is due to the agreed removal of one output for Edderton.

Lines 1 and 7 – First-time Provision of Water and Sewerage Services.

Line 2 – Removal of Properties from the Poor Pressure Register

Lines 4 and 8 – Rehabilitation of Water Mains and Sewers

Line 6 – Removal of Properties from the At-risk Flooding Register

For these lines, targeted delivery was equalled or exceeded before the start of the report year and there is no target for the report year or subsequent years. These lines were not audited:

Lines 10 to 12 – WIC 16 Progress

Data in these lines was found to be consistent with base data and with Table G5. The original Ministerial Target was 61 projects. Eight have been removed with the agreement of the regulator, leaving 53. Of these 53 all but 2 are at the Beneficial Use stage. These numbers agree with the data in lines 10 and 11.

The WIC16 completion date of 31/7/09 corresponds to the forecast Beneficial Use date for Lismore Primary (9638), which was verified in Table G5.

Lines 13 to 17 – Progress with Quality and Standards 2 Sign-off

We have reviewed the Q&S2 sign-off process in previous audits. Our comments on the methodology are set out above. During our audit we were able to confirm that the sign-off process was a rigorous and well-managed process with robust cross-checks by Scottish Water and the quality regulators. We suggest that consideration is given to moving future versions of the sign-off records to a database to overcome some of the potential weakness of spreadsheets as a secure source of data.

Confidence Grades

Scottish Water has claimed a confidence grade of A1 for lines 1 to 13. This is supported, (being based for the most part on auditable systems and accurately determined data), except for lines 3, 5 and 9, where there is uncertainty regarding the timing of future output delivery and a confidence grade of B2 is recommended. The allotted confidence grade of B2 is supported for lines 14 to 19.

8.8 Table G8 – Q&S3 Ministerial Objectives and Other Outputs – Quality

Commentary by REPORTER

Key Points

- Other than the installation of business and non-domestic meters, the delivery of Ministerial Objectives and Other Outputs – Quality has met or exceeded its cumulative targets for the first three years of Q&S3a.

- Scottish Water has a robust and well-managed process for agreeing changes to targets and confirming the delivery of outputs.

- Data in the table were confirmed as being consistent with base data and Table G6.

- The provision of strategic capacity and water and wastewater treatment works is based on projects completed in the year. The totals forecast to be delivered by the end of 2009/10 significantly exceed the original Ministerial Target, but we understand that a new target has been agreed. The figures claimed are based on the higher "RAW" data from the councils, unmoderated by the GROSS figures.

- The UID Strategic programme is on programme to deliver the bulk of the programme within the SR06 period. However the programme in two of the Glasgow catchments and some of the outputs in the Meadowhead and Stevenston catchments have been subject to delay and will not be completed until into 2011.

- Water quality outputs are well-defined. Wastewater quality outputs may be less well-defined, being defined for example by reference to improved water body quality. In these cases Scottish Water follows a process of agreeing in advance what solutions will be required to deliver the output.

Audit Process

During the audit we reviewed:

- The origin of the targets

- Sources of data on Q&S3a output delivery

- The methodology for compiling the output table

- Sources of data and the methodology for agreeing the sign-off of regulatory outputs with regulators, including change control procedures

- Progress on the sign-off of Q&S3a projects, including variations to the total needing sign-off

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

Scottish Water has appointed managers responsible for each line in the tables. It maintains tracking spreadsheets and meets project managers on a monthly basis to challenge and agree the delivery of benefits. In addition to taking data from CIMS, project managers are required to confirm regulatory acceptance using paperwork which also confirms the outputs delivered. No-build solutions may be included so long as the required benefits are delivered.

Scottish Water maintains a tracker spreadsheet for all Q&S3a quality outputs, listing for each project the site(s), drivers, population, SW region, changes to the Technical Expression, internal acceptance and progress on sign-off. This is based on WICS CIR Output Macro Sheet, with data abstracted by pivot tables. The tracker spreadsheet was reviewed and seen to be consistent with the data presented in Lines G8.50 – 8.54.

For the current investment period, completion is claimed upon internal acceptance. For SR10 completion cannot be claimed until the regulator has signed off the outputs and it will be necessary to build this delay into the programme, allowing three months for sign-off.

Targets were agreed for each quality output as part of the agreement of SR06. There is an agreed change process for targets where changes have to be signed off first by the quality regulator, then by the Outputs Monitoring Group and then by WICS. Quarterly targets within the year are agreed based on the scheduled completion of the relevant projects. Targets for 2009-10 have been set to bring the March 31st 2009 position up to the Ministerial Target by the end of March 2010, profiled as per the Business Plan. Samples were checked and seen to be consistent with CIMS.

Scottish Water uses sign-off sheets to confirm both sign-off and solution changes with the Outputs Monitoring Group Working Group (OMGWG). Examples were seen during the audit. OMGWG also maintains a register of change proposals and sign-offs, which is reviewed and updated on a monthly basis. The February 2009 report was reviewed.

Further comments are given where relevant against the individual table lines below.

Conclusions

Sample data were checked for the lines audited, which showed that lines in Table G8 were consistent with the base data and with Table G6. Where appropriate documentation was also seen confirming completion. Specific conclusions are given in our comments by line, below.

Consistency with Table G6

The date used for achievement of the output is the internal acceptance date (Milestone 4). This date does not appear in Table G6, so a direct comparison was not possible. However sample projects were checked and the date claimed was seen to be always before the Capex5 date given in Table G6, so the information appears consistent.

Progress with Q&S3a Sign-off

Most projects are signed off within 3 months. However a small number of sites are subject to delayed sign-off. All of these are sites where a drinking water quality output is planned to be delivered by connecting to an alternative supply zone and work is also required in the new zone. DWQR is not prepared to sign off until this work is also complete. The longest resulting delay is for a project completed in January 2008 and not yet signed off. A total population of 4921 is covered by projects affected by these delays.

Scottish Water maintains a robust process for agreeing output targets and changes, monitoring changes and sign-off.

Comments by Line

General

Outputs in this group have a common audit trail. This was followed for the lines reviewed from the base data to the table lines.

It is noted that while targets are stated in the table as cumulative totals, outputs are stated as individual totals for the year. This is confusing and it is recommended that WICS considers amending this requirement.

Line1 – Customer Service- Odours

Customer service outputs covers the number of wastewater treatment works where an odour problem is addressed. The Q&S3 programme envisaged improvements at 35 works with work on 14 to be completed in the Q&S3a period.

The odour management programme is monitored through the Scottish Odour Steering Group. Work is being carried out under the statutory Code of Practice. The Code of Practice encourages a staged approach to improvements so that the impact of initial work can be monitored before committing to additional works which might have less benefit. We understand that this approach was considered as the Business Plan was finalised and that there is a reasonable understanding of the scope of work to be delivered in Q&S3a.

Following the approval of odour management plans by SOSG, Scottish Water Solutions are developing the work identified in the odour improvement plan into detailed scopes of work and 2 projects (Pitlochry and Springfield) have been completed in the report year. The running total of 10 outputs exceeds the cumulative target of 9. Three sites are programmed for completion during 2009-10 (Kirkcaldy, Troqueer and Castle Douglas) and the odour output for Perth is also likely to be delivered during the year, reaching the Ministerial Target. Given progress so far, the stage of project development and the type of work, we believe that the proposed targets are reasonable and achievable.

Lines 2 to 11 – Water Quality

As part of the agreement of SR06 Scottish Water agreed with DWQR a target list of water quality projects. This included both 'green' and 'amber' projects. Green projects were to be robustly delivered by Scottish Water, while amber projects were to be delivered using operational measures or capital maintenance expenditure. The Company maintains a spreadsheet summarising progress on agreement with DWQR of the achievement of these outputs. The Company reports that for each works with quality improvements the disinfection system is investigated and upgraded as necessary as part of the overall quality scheme. The reported populations are those included in the business plan for the works.

Lines 2 –3 – Improve Drinking Water Quality and Disinfection Control

The output monitoring spreadsheet was checked for lines 2 and 3 and was seen to be consistent with Table G8 in terms of population and with Table G6 in terms of expenditure and completion dates. Three sample projects were checked and the project data seen to be consistent with Table G6 data.

In some cases works have been mained out and closed on completion of a Q&S2 water mains scheme. By reporting the population served from the Business Plan, the Company will ensure that the transfer of population served on works closure will not be double counted as other improvement works are undertaken.

Line 4 – Lead Pipes Replaced as a Result of Customer Requests

The Company reports that there have been 286 recorded customer requests for lead pipe replacement in the report year. Numbers are recorded in the OPRS system (Operational Activities Red/Green/Amber Status).

Information on requests originates with the PROMISE customer contact system. Information on replacements made is provided by Network Analysts, who make monthly paper returns, which are totalled for the Annual Return total. Scottish Water notes the need to review its methodology to ensure that requests and resulting works are accurately recorded for future years and is working on an electronic link between PROMISE and Ellipse to this end.

The SR06 was based on an estimated level of customer requests and can now be seen to have been a significant over-estimate. Targets for 2009-10 are based on the current run-rate of requests.

Lines 5- 7

These lines were not audited for AR09.

Line 8 – Backflow Prevention Devices Installed

The Ministerial Target for this line was defined following inspections carried out by bye-law inspectors to identify the worst risks in terms of the size of WWTWs and the population potentially affected. The target is to eliminate the worst 235 risks. 2008-9 output brings total output to the target level. Each site is independently certified by the Scotland and Northern Ireland Plumbers Federation (SNIPF). Sample certificates were seen. These are totalled to give line 8.

Line 9 Cross-connections Made Redundant

To agree the Ministerial Target a desk-top study was carried out to estimate the total number of cross-connections in existence. This was moderated by operational knowledge and sample site visits for the agreement of the SR06 target of 5500. Each year the next year's target is set based on run rate and knowledge of remaining connections. The definition of what constitutes a removal has been agreed with WICS. Production for 2008-9 of 2126 exceeded the target of 1689. Contractors are employed in area contracts to either confirm that connections do not exist or decommission them where they do. A progress-tracking spreadsheet is maintained and was reviewed. Contractors make weekly returns of work done. Samples were reviewed. These included photographs. A sample monthly report was checked and found to be consistent with the data in the progress spreadsheet, which was in turn consistent with figures reported in Table G8.

Line 10 Number of Sites with Increased Security

This line was not audited for AR09.

Line 11 Percentage of Population Covered by Water Safety Plans

Scottish Water has set up a programme management office to manage the production of these plans by three consultants. For each plan a desktop study is carried out to review risks and incidents, followed by a site audit covering the catchment and treatment. Risk workshops are held involving external stakeholders to identify risks and quantify likelihood and consequences. Improvement plans are drawn up to manage the most significant risks, including investment projects where appropriate.

The Ministerial Target (50% population coverage) was agreed as part of SR06. The programme for reviews was agreed with DWQR. A copy was examined. The populations in each area and in Scotland as a whole were agreed at the start of the Q&S3a period and are not revisited each year. Scottish Water provided a list of the areas completed during 2008-9. This was not audited in detail but was seen to be consistent with OARS data and line 11.

Line 12 – Number of UIDs Improved

The process for collection of data and sign-off is as described under Methodology above. The Technical Expression listed 277 UIDs. Scottish Water has agreed locations and the problem type (aesthetic, inland water quality or coastal water quality) with SEPA. The programme of studies is well advanced and optimum solutions have been agreed with SEPA for all major catchments. The programme of studies has clarified which problems are associated with which overflows and resulted in some substitution and changes to proposals. Removals from the list due to errors are not claimed as outputs, but removals following studies or works are so claimed.

Scottish Water maintains a progress monitoring spreadsheet showing cumulative information based on information provided by delivery partners. Spreadsheet data were checked and seen to be consistent with the total 2008-9 delivery of 109 UIDs. Three claimed completions were checked and verified by examining the SEPA sign-off documentation.

Lines 13 and 15 – WWTW Discharges Improved to Meet New and Existing Consent Requirements

The process for collection of data and sign-off is as described under Methodology, above. Targets are as agreed with SEPA for the Delivery Plan. The Ministerial Target has been reduced by 6 in total with the agreement of SEPA and the change documentation was seen. During the year 7 projects were delivered to meet new consents and 8 to meet existing consents. Four sample sites were examined, completions confirmed and the data seen to be consistent with Table G6.

Line 14 – Number of First Time Provision Projects To Meet Environmental Objectives

The Ministerial Target for this line was 14 projects. Five projects have since been removed with the agreement of SEPA. The change documentation was seen. This leaves a target of 9, consistent with Line G8.14. The process for collection of data and sign-off is as described under Methodology, above. Four outputs were delivered in the year (Cairndow, Kettletoft, West Loch Lomond and Belts of Collanach). One sample site was reviewed, the Capex paperwork seen and seen to be complete.

Line 16 – Number of Management and Monitoring Systems at Works to Meet IPPC Regulations

This line was not audited for AR09. The process for collection of data and sign-off is as described under methodology above. The original target for this line of 61 sites was based on SEPA's initial interpretation of legislation. This was challenged by Scottish Water and reduced to one site (Broadside), which was completed during the report year. 35 sites were removed as being below the threshold capacity, 10 on the grounds that land disposal was of sludge not waste, 10 on the basis that sludge was retained for less than one year and 5 sites are to be closed.

Line 17 – Number of Landfill Sites Contained, Monitored and Decommissioned.

The process for collection of data and sign-off is as described under Methodology above. The original target was 12. Five sites were added following reclassification from line 8.16 above, making a new target of 17 sites. Of these, 5 have been closed during the report year, equal to the annual target. A sample site was checked and seen to be complete.

Lines 18 – 19 – Development Constraints

The reported provision of strategic capacity at water and wastewater treatment works is based on proposed additional capacity (or reduced leakage) at a list of named treatment works. In the examples that we have reviewed generally acceptance certificates were available to show that the project had been physically completed. Last year we reported that *"the development constraint is released once the scheme is released for assessment of options (CAPEX1). The schemes included in the return have completion dates up to 31st March 2010.* This related to enabled growth which was adjusted last year by SW. We can confirm that only projects that have physically been completed are used in this year's return.

Capacity is delivered through the completion of identified growth projects or growth elements built into projects with a quality driver. Targets, set in the 2006 Business Plan, were based on statistical modelling, current works capacity and local authority growth predictions. The latter were moderated in the Growth Model and agreed by the Minister. Since the agreement of the original targets (40000 p.e. for wastewater and 16500 p.e. for water), Scottish Water has planned further growth projects such that forecasts (42,094 p.e for wastewater and 151,000 for water {reduced from a previous change of 174693 reported last year}) now greatly exceed the original targets. These figures and quarterly targets have been built into the annual Business Plans as revised targets. This leaves Scottish Water vulnerable to perceived under-delivery of outputs in case of slippage even though actual delivery is likely to greatly exceed the original target. Population equivalent relieved is calculated from p.e. data and local authority occupancy rates.

We have discussed the new targets with SW and have ascertained that they have been developed following a review of what is likely to be needed in the period. We remain unsure whether they have been agreed with WICS, but it appears likely that they are internal projections only.

Outputs claimed are either:

- "RAW" figures from the growth model; or
- The project team estimate.

The basis of the growth model is described fully in our report on the SR10 business plan. The growth model assigns estimates of new developments to 2018 prepared by local councils to treatment works (RAW data). When summed across Scotland these estimates are generally optimistic compared to the national statistics prepared by GROSS. The RAW figures are then moderated within the model to give the "REAL" estimates. Based on our sample audit the detailed considerations behind the growth estimate used in the project was not always clear. It appears that either the RAW estimate or a figure between the RAW and REAL estimate was used. SW states that the REAL estimate is a lower bound and that it has to behave conservatively to ensure that adequate capacity is provided. We understand SW's position but note that it does result potentially in plants incorporating local authorities' possibly optimistic view as to the developments in its area. Following discussion with SW we accept that the basis of the "targets" are consistent with the way that SW is reporting actual development constraints removed.

The figures claimed are generally based on the growth model at CAPEX1. We note that the growth model is subject to continual revision and that the later editions of the model generally give lower projections than those used due to the present downturn. Again use of the original model without updating may be acceptable as we accept that the target figures were derived on the same basis.

We note that leakage reduction is being claimed as removing development constraints. We believe that this is acceptable.

For wastewater constraints SW commissioned a study into current constraints of its wastewater treatment works. This study was called the "Development Capacity

Assessment Programme" (DCAP). The DCAP programme comprised 3 levels of study: Level 1 – a full load and flow study carried out on big works, Level 2 – 2 weeks of sampling with a desk study and Level 3 – basic site measurement plus information from SW's corporate systems, carried out on SW's smaller works. The DCAP study found that many works that previously had been flagged as imposing development constraints in fact had adequate capacity and so the original development constraints could be removed. This amounts to 13,921 outputs out of the 35091 being claimed this year. These are clearly not real constraints removed but again may have been included in the original revised WWTW estimate of 62,091 p.e.

In columns 60 and 80 of Table G8 current and original targets for the SR06 period are given. This is not consistent with the column headings and we remain unsure as to what is wanted in these columns.

Line 20 – Total new connections including regeneration

Comes direct form SW's Ellipse system and comprises all the new connections made in the year. The submission comprises <u>domestic</u> connections only.

Future projections are based on National Housebuilders Federation projections moderated by the historic relationship between these statistics and new connections.

Line 21 – Implied regeneration

Difference between lines 20 and 22. The figure includes for timing differences.

Line 22 – New increase/decrease in billed properties

Information from local authorities on the number of new properties being billed.

Line 23 – properties relieved from development constraints

Lines 18 plus 19 divided by 2.11 as an average occupancy rate across Scotland.

Lines 24 –29

These lines were not audited for AR09. However it was verified that Scottish Water presented its revised ELL calculation to WICS on 30.12 09, as claimed.

Lines 30 to 40- Water Resources Studies

A programme of 78 studies has been agreed with the quality regulator. Of these 41 consist of licensing issues only. 37 cases require investigative work. All of these are at the stage of study or option development. The work is being progressed in joint workshops with SEPA and WICS, a project management office and area activity teams have been set up and consultants have been engaged. These lines were not audited for AR09, but it was verified that Scottish Water submitted its estimates of cost for complex studies to WICS on 31.10.08, as claimed.

Lines 41-49 – UID Strategic Studies

For our comments on UID strategic studies see our narrative in table G6.

Lines 50 to 54 – Progress with Quality and Standards 3 Sign-off

We reviewed the Q&S3 sign-off process in our audit of the 2006-07 Annual Return. Our comments on the methodology are set out above. During our audit we were able to again confirm our view that the sign-off process was a rigorous and well managed process with robust cross-checks by Scottish Water and the quality regulators. We suggest that consideration is given to moving future versions of the sign-off records to a database to overcome some of the potential weakness of spreadsheets as a secure source of data.

Confidence Grades

Given the reporting and approval arrangements in place we believe that the confidence grades reported for actual performance and targets up to and including the current year are reasonable.

8.9 Table G9 – Q&S3 Ministerial Objectives - Serviceability

Commentary by REPORTER

Key Points

- The reported data draws from Scottish Water's OARS reports, which include data reported by the quality regulators and is consistent with the relevant lines in other Annual Return tables.

- In many cases reported actual performance has deteriorated from that reported for AR08 and remains below the target for the year-end. Performance on the number of microbiological failures at WTWs, number of properties with unplanned interruptions, bursts per 1000km of main, number of properties internally flooded due to other causes and number of unsatisfactory intermittent discharges has deteriorated from the position reported at AR08. Comparing actual performance for AR09 with the target position for the same date, performance on % compliant zones for iron and manganese, the number of unsatisfactory intermittent discharges and the number of pollution incidents remain below target.

- Initial experience of new reporting requirements for pollution incidents indicates that they have resulted in a step increase in the number of incidents reported. Scottish Water has revised the target levels accordingly, resulting in a new target significantly higher than the Ministerial Target.

- The reported serviceability performance assumes that targets will be met by March 2010. However the expenditure programme already includes an overhang beyond 2009/10 and this has doubled in size from that reported at AR08. Some of this overhang relates to key quality programmes of water quality, wastewater quality and UIDs which have a bearing on the delivery of serviceability indicators. It is therefore not possible to confirm that the necessary outputs will be achieved by March 2010 in all cases.

Audit Process

During the audit we reviewed:

- The origin of the targets
- Sources of data on Q&S3a serviceability output delivery
- The methodology for compiling the output table
- Consistency with other lines in the Annual Return, where relevant

We also audited each line of the table to confirm the audit trail back to the base data. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems.

Methodology

The Ministerial Target and annual Delivery Plan targets are taken from Scottish Water's Delivery Plan. Sample lines were checked and seen to be consistent between Table G9 and the Plan. The reported data on performance are drawn from Scottish Water OARS data, which are also used to compile other lines on serviceability in the Annual Return. OARS is an acronym for Objectives Activity RAG reports. This is a report covering many aspects of operational performance, initiated during the report year 2007-8 and produced on a monthly basis to allow SW to monitor and manage these issues.

Information is taken from OARS and downloaded into a spreadsheet for the compilation of Table G9. Data for Table G9 were abstracted from the OARS data report for 31st March 2009. During the audit some minor discrepancies were noted between OARS and data compiled from other systems for other lines in the Annual Return. However these were corrected in time for the final submission.

Scottish Water has agreed with the relevant regulator a guidance document confirming how each serviceability measure will be assessed.

Where necessary, we have commented further on the methodology against the individual lines below.

Scottish Water has reported identical figures for all lines for the 2009-10 total forecast and Post 2009-10 total target. In two cases (internal flooding due to other causes and number of failing WWTWs) reported actual performance is already significantly better than these forecast levels, but for the remaining lines significant challenges remain in reaching the target levels.

Conclusions

Comparisons with OARS data demonstrated that in every case data in lines G9.1 to G9.11 were consistent with OARS data and where relevant, with other lines in the Annual Return tables. The reporting of pollution incidents is consistent with the definition introduced for AR08. The number of properties internally flooded during the year refers to flooding arising from causes other than hydraulic overloading on main sewers, laterals and private pipes and has risen since March 2008.

Comments by Line

Lines 1-3: Performance is reported for the 2008 calendar year so the figure reported for March 2009 is actually the figure recorded for December 2008. Performance has deteriorated for all three lines so that in every case it remains below target. Information on failures comes from LIMS. Only regulatory samples are used. A single failed sample in a zone results in a failed zone for that year. As the number of failures is likely to increase as the year goes on, quarterly performance figures give the impression of good performance at the start of the year with a deterioration as the year progresses. The forecast of future performance is based on a rolling 3-year record of performance, taking into account any investment planned.

Line 4: Reported performance of 2974 is well ahead of the target of 11382 and represents a further significant improvement in performance. This is due to a continuing programme of pressure logging and investment to remove low pressure problems. Initial data on properties affected comes from PROMISE. All reports are investigated and only entered onto the register after logging. The low-pressure log holds much historical information on spreadsheet, including 322 properties in around 125 WSZs with no addresses recorded. It is not known where these properties are or how valid the problems are. Pressure-logging is continuing to identify these properties.

At present, there is no reason to believe that performance should revert to the higher target levels in future years. The post 2009/10 target of 120 appears challenging.

Line 5: Reported performance of 5819 has deteriorated significantly from AR08, although it remains well ahead of the target of 15886. The number of short unplanned interruptions and the property numbers affected are broadly similar to last year, but there has been a significant increase in the number of properties affected by interruptions of over 12 hours. This is due to a small number of incidents affecting large numbers of properties at Ballieston, Kirkintilloch and Helesburgh.

There has been an additional focus on this performance measure, in part to meet OPA targets. Data originates with customer complaints recorded on PROMISE. All complaints are investigated and after restoration of supply, information on the incident is provided by operators either on paper or hand-held recorders for input to corporate data systems. Guidance notes are used by operators to define the start and finish of an interruption. The number of properties affected is estimated using information on network operations to resolve the incident. Scottish Water has put in place an improvement team to investigate procedures and documentation in this area. At present, there is no reason to believe that performance should revert to the higher target levels in future years but achievement remains vulnerable to single incidents affecting large numbers of properties.

Line 6: Reported performance of 204 bursts/1000 km is equal to the target figure, a deterioration from AR08. Bursts are recorded in WAMS, both reported (via PROMISE) and unreported (found through active leakage control). WAMS data distinguishes between the type of pipe affected and guidance notes are used to define these.

Line 7: Reported performance of 383 is well ahead of the target of 1400 and represents a further improvement on the figure for AR08. The target was set as part of the preparation for the SR06 Business Plan, based on extrapolation of a single month's data and now appears high compared with recent actual floodings. The longer-term target post 2010 is set at the lower and more challenging level of 341 properties.

Future performance is based on an average rate of additions of 6 per month, less improvements due to investment. Significant variation should be expected in the numbers of incidents occurring year on year. After work is carried out to resolve reported problems PROMISE is updated with a resolution code. The fact that some WAMS jobs have no resolution code stated and that it can be difficult to decide whether a flooding arises from a sewer, lateral or house connection is reflected in the confidence grade for this line. Scottish Water has recently instituted a flooding investigation team to investigate all floodings and review the at-risk register and PROMISE data to determine cause. At present, there is no reason to believe that performance should revert to the higher target levels in future years.

Line 8: The number of properties internally flooded due to other causes includes flooding incidents caused by lateral sewers which are the responsibility of Scottish Water. This approach is consistent with the targets. The number of floodings has reduced from AR07 but at 948 is above the level for AR08 and well above the target figure of 366. Significant variation should be also expected in the numbers of incidents occurring year on year. Floodings are investigated as described for line 7 above.

Procedures for recording and investigating internal flooding have been the focus of attention, resulting in improvements and this measure is included in OPA measures. We have audited these procedures and our findings are given in our commentary on Table B3, where we concluded that improvements had been made and supported an improved confidence grade for AR09. At present, there is no reason to believe that performance should revert to the higher target levels in future years although the Ministerial target of 366 looks very challenging.

Line 9: The number of failing wastewater treatment works is the number of works failing at the end of March 2009 based on the regulatory monitoring carried out by SEPA. It includes PPP treatment works. The reported number of 24 is below the target of 39. The number of failing works will, in part, reflect external circumstances such as weather conditions and trade effluent discharges in the year and some variation around the target should be expected year on year.

Line 10: At 935, the number of UIDs remains very similar to the AR08 figure of 931. This is because studies have identified both additions and removals, made with the agreement of SEPA, in addition to UIDs removed by investment projects. Records of SEPA sign-off are retained. We recommend that consideration is given to how these changes are reflected in the serviceability targets. UIDs can only be removed from the register if SEPA agree that following investigation the problem is not substantiated, if work is done as part of a UID project, or a UID is removed as part of another project, such as a flooding project.

Scottish Water reviewed the number of unsatisfactory intermittent discharges for AR07 and restated the baseline position. The original target was based on a reduction of 277 UIDs over the Q&S3 period. The revised target is based on addressing 315 UIDs over the Q&S3 period, 38 more than planned. The number of outputs to be delivered in the final year of Q&S3 has increased to reflect the revised milestone dates for completion of studies, design and receipt of tenders.

SW has a target of 37 aesthetic UIDs for the current year against the 61 for the report year. The work is well advanced and we believe that SW will achieve these targets. Work on two major projects in Airdrie and Coatbridge and Meadowhead and Stevenston have been delayed and now have projected completion dates of December 2011 and March 2011 respectively. Both are designed. However, SW reports that the project at Airdrie and Coatbridge may not solve recent flooding problems experienced in the catchments. SW is undertaking flood studies. If these show that a significantly different project is needed then it may be more difficult to complete the work by the revised date.

Line 11: The number of pollution incidents is reported against definitions realigned with practice in England and Wales. Data are held on a spreadsheet which draws information from SEPA's ELMS system for recording all pollutions and Scottish Water's PROMISE system. Incidents are recorded on the spreadsheet if internally verified even if they are not witnessed by SEPA. There is not currently a robust system for ensuring that all pollution incidents are identified from PROMISE and operational data. As noted in our report for AR07, it appears that the new standards have caused a step change in the number of reported incidents. Scottish Water have restated the Delivery Plan target at 815, significantly up from the 555 contained in the Ministerial Target.

Comments by Confidence Grade

Confidence grades are largely unchanged from those given in AR08 data, except that the confidence grade for numbers of pollution incident has improved to C3. This reflects work done to improve processes for pollution incidents and the greater period covered by data collected against the new definitions. The claimed confidence grade

9. SECTION H: ASSET INVENTORY

9.1 Overview

Key Points

- The reported gross MEAV for Scottish Water assets has increased from £36.2 billion at AR08 to £43.8 billion at AR09. The greater part of this increase is due to a rise of £6.0 billion in the value of infrastructure assets. This is due to changes in inventory, revisions to cost curves and on-costs (including land for non-infrastructure assets only), a revised methodology for assessing the cost of sewer manholes and COPI indexing. Most of the changes arose between AR08 (and 1st draft business plan) and the 2nd draft business plan where the asset inventory was valued at £42.5billion. In this section of the report we discuss changes since AR08 rather than changes since the 2nd draft business plan. For further information on the situation at the 2nd draft business plan the reader is directed to our report on the 2nd draft business plan.

- The increase in valuation for infrastructure assets from AR08 is principally accounted for by the reassessment of sewer valuation which adds £5.2 billion to the AR08 infrastructure valuation. This figure includes £3.5 billion related to a reassessment of the valuation of sewer manholes

- Scottish Water has made a complete return of its current asset inventory in Tables H1 to H6. Redundant and decommissioned assets are excluded.

- During our audits we were able to compare the asset data in Ellipse, GIS and other relevant asset databases with both the H tables and the databases used for manipulation and calculation of MEAV. These were found to be fully consistent.

- We are satisfied that Scottish Water has sufficient processes in place to ensure consistency of assessment across its business and asset base and to limit the subjectivity of judgements. The responsibility for accessing and processing data and compiling the Annual Return tables is concentrated in a single section of the business.

- Scottish Water has presented its asset valuation on a Modern Equivalent Asset Value (MEAV) basis with revised cost curves used for valuation. Cost curves have been significantly updated during the year to retire old cost data and introduce further data based on actual Scottish Water Q&S3a programme costs.

- For the first time in AR09, the changed format of the H tables does not require the reporting of MEAV by condition and performance grades. We have previously stated our view that this analysis did not add significantly to the understanding of the assets.

- There are no changes in the methodology used or procedures applied for the compilation of the H tables, compared with AR08 and the 2nd draft business plan.

- Changes in inventory from AR08 are limited to changes arising from investment projects, sites becoming non-operational and minor data improvement.

- Scottish Water has continued to improve data capture and storage. Some new data were collected as a result of an amnesty on old data not yet updated into GIS and as part of the APAM (Approaching Proper Asset Management) project.

- We again note that Scottish Water's predictive model for water mains condition grading indicates a significantly poorer condition than that derived from reported burst frequency. We believe that further work is required to reconcile the predictive model with burst frequency. We recommend that the results of the renovation programme are used to validate the current assessment of condition and performance grade reported in the asset inventory.

- Asset data would benefit from improvement in the following areas: pumping station capacity; numbers of reservoirs; yields of reservoirs and intakes; lengths of laterals; off-inventory sewers; the capacity of CSOs and other sewer structures. SW reports that it has started to investigate these areas of the asset stock.

- For pipelaying, surface type was chosen from the GIS field. We note that if there are errors in surface type held in GIS the Gross MEAV will alter significantly as there is a large difference in cost between pipes laid in grassland and pipes laid in highways.

- The largest costed diameter on the WAML cost curve for pipes is 600mm. The costing of pipes of greater diameter is therefore subject to some uncertainty due to extrapolation.

- All assets have been valued using cost curves based mainly on Scottish Water's own unit cost data, but partly on industry standard unit costs. Some ESS cost curves have been updated using more up-to-date project cost information.

- Scottish Water has reassessed the depths assigned to sewer manholes of unknown depth (which make up 39% of the total number). This has led to a significant increase in the uplift applied to sewer costs to account for manholes and an increase of 19% in the assessed MEAV of sewers, compared with AR08.

- In the first draft business plan and AR08, no cost curve was provided in the costing database for sewers in grassland, so these were not priced and omitted from the valuation. This was rectified for resubmission of AR08 in September 2008, the second draft business plan and AR09 and added £52m to the valuation.

- Scottish Water has few records of laterals. The length of laterals, included within non-critical sewers, is assessed based on property type, using sample surveys. A total of 16403 km of laterals are included in the reported figure for non-critical sewers. This figure changes each year as the assessment of the total numbers of houses of different types change.

- For AR08 the valuation of land was based on a percentage of non-infrastructure assets which attract on-cost. For AR09 land valuation is calculated using net construction cost without on-cost. For AR09 aqueducts have been priced using the cost curves for critical sewers, including siphon sections. We recommend that siphon sections within aqueducts are priced using the curves for water mains.

- A COPI factor of 162.5 has been applied to AR09 valuations.
- The net effect of the above factors is that the overall AR09 MEAV valuation shows a 21% increase compared with the AR08 MEAV. This increase is principally attributable to changes in the valuation of sewers, as noted above.
- Scottish Water has generally retained the confidence grades of the asset valuations at those previously reported. We comment further in the individual table commentaries.
- We have not identified any general comments relating to asset serviceability in the Annual Return. Scottish Water has not made any assertion as to the relationship between the condition and performance assessments for any asset group, nor any statement regarding the capacity of asset groups to fulfil their specified role regardless of relative condition or performance. Scottish Water is developing its processes for asset management including the development of its Common Framework assessment for Q&S3b. We believe that Scottish Water has developed a method for the majority of its proposed capital maintenance programme which is compliant with the Common Framework. This was described more fully in our commentary on the second draft business plan. We recommend that the future of the H Tables is considered in the light of these developments.
- It would be practicable to report Support Services valuation with a water/wastewater split. Scottish Water is moving towards a new business model with a functional split so it may be possible to report more support services assets by service in future. On the whole we do not think that such a split would add much to a general understanding but acknowledge that it may be needed for comparative purposes based on current practice. In our view support services can best be compared with other water and wastewater companies as a stand alone item.
- The use of MEAV or similar valuation allows a proper representation of the data and so we believe that it should be maintained. The MEAV valuation presented is an improvement on the EARC valuation presented in previous asset valuation for the Annual Return and has removed the anomaly whereby very large values of assets were previously indicated as requiring replacement within two years. However MEAV remains an accounting view of the assets and because assets are grouped at a high level there is not enough detail to provide useful information for asset management. If data were available at a sub-asset level, this could provide data to improve the asset management of certain kinds of assets. This could be done as a management aid, but we see no justification in more detailed regulatory reporting.

Audit Process

The asset inventory was audited in detail both for Scottish Water's First Draft Business Plan and the Annual Return 2008. This year's audit of Table H updates our report on AR08, being restricted to a review of data, methodology and the table lines, concentrating on changes, which we have highlighted in our commentary in the following sections.

A similar approach was taken to the audit of Tables H1 – H6.

During the audit we reviewed:

- Sources of data on asset inventory
- The methodology for collecting and processing data and compiling the tables
- Changes to of cost curves
- The calculation of gross and net MEAV
- The assessment of remaining age
- Changes in numbers reported from AR08

We also audited each line of the table to confirm the audit trail back to the base data, including making sample checks on the compilation of the data to reproduce the totals given in the tables. The audit was carried out by interviewing members of Scottish Water staff responsible for the compilation of the tables and with direct, unrestricted access to data held on Scottish Water information systems. We also examined specific issues as required by the Reporting Requirements. Our comments are given in the remainder of this overview.

Reporting Requirements

The reporting requirements ask the Reporter to comment on specific issues. Separate sub-sections below cover the following issues:

- Consistency of Scottish Water's asset inventory with previous submissions.
- Fluctuations in MEAV and split by condition and performance grades
- Changes to inventory
- Changes to condition and performance assessment.
- Guidelines on condition and performance grading.
- Changes to confidence grades
- Allocation of EARC by a condition performance matrix
- Commentary relating to asset "serviceability"
- Changes in the proportions of redundant and decommissioned assets
- Reporting asset inventory for Support Services on a water/wastewater basis
- Overall judgement on the suitability of the MEAV measure

Issues Arising from the Reporting Requirements

Consistency of Scottish Water's Asset Inventory with Previous Submissions.

The guidance to Reporters in Information Requirement H notes that: *The Reporter should assess the consistency of Scottish Water's asset inventory with previous submissions and how the necessary data capture and storage is implemented across its business.*

This year Scottish Water has presented its asset valuation on a Modern Equivalent Asset Value (MEAV) basis. This is consistent with the presentation in the Annual Return for 2008, which replaced the previous Equivalent Asset Replacement Cost (EARC) basis. The data presented for AR09 exclude redundant and decommissioned assets. These assets have therefore not been revalued for the current submission as was the case with AR08.

All assets have been valued using cost curves based mainly on Scottish Water's own unit cost data, but partly on industry standard unit costs, as for AR08. The principal changes relates to the valuation of sewers in grassland, which were omitted from AR08, and to the enhancement of the valuation of sewers to take account of manholes, where a revision of the assessed depth for unknown-depth manholes has resulted in an increase of 19% in the assessed MEAV of sewers, compared with AR08.

Asset data are gathered from a variety of sources, including asset surveys, record drawings, mains and sewer records and operational experience. Further data on performance are gathered from operational records, telemetry and monitoring and customer contacts. The data are variable in coverage and accuracy and reference should be made to the individual sections of this report for comments on each asset type. Generally speaking Scottish Water has robust systems for the storage and retrieval of these data, although some areas, such as reservoirs and communication pipes, continue to rely on standalone spreadsheets or dedicated databases. This report identifies where this is the case. Scottish Water has recognised the need to bring asset data into corporate database systems and is working to achieve this objective.

Fluctuations in MEAV

The guidance to Reporters in Information Requirement H states that: *Specifically, the Reporter should check that Scottish Water has provided clear reasons for any significant fluctuations in the total Modern Equivalent Asset Value (MEAV).*

The reported gross MEAV for Scottish Water assets has increased from £36.2 billion at AR08 to £43.8 billion at AR09. The principal change relates to the valuation of sewers, where changes to cost curves and an enhancement of the valuation of sewers to take account of manholes of unknown-depth has resulted in an increase of 19% in the assessed MEAV of sewers, compared with AR08. Sewers in grassland, omitted from AR08, have been added. These are currently valued at £52m.

There have also been some minor revisions to cost curves and the valuation of land and COPI indexing has been applied. These changes have been described in Scottish Water's commentary.

Inventory Changes

The guidance to Reporters in Information Requirement H states that: *The Reporter should verify any similar 'additions' to the assessed inventory in Scottish Waters revision of its total MEAV. The Reporter should note any information provided by Scottish Water as to the refinement of estimated asset numbers, units or lengths. Any such information should be presented in a manner consistent with the data and commentary in Section D.*

Comparing AR08 with AR09, inventory changes are restricted to new assets and asset changes resulting from investment projects, sites becoming non-operational and minor data improvement.

Changes to Confidence Grades

The guidance to Reporters in Information Requirement H states that: *The Reporter should also note changes to the associated confidence grades, both in terms of accuracy and reliability, and examine the reasons attached to any movement in these assessments themselves.*

Confidence grades are assigned on the basis of WIC guidance. Comparing AR08 with AR09, the only changes to inventory confidence grades are

- A reduction from B3 to B4 for line 11 (Intake pumps) and line 13 (Booster pumps)
- An improvement from B4 to B3 for line 12 (source pumps)

These changes are due to a reassessment of the accuracy of the base data.

Processes and Consistency

The guidance to Reporters in Information Requirement H states that: *The Reporter should ensure that Scottish Water has sufficient processes in place to ensure consistency of judgement across its business and asset base and to limit the subjectivity of judgements.*

We have concluded that Scottish Water has sufficient processes and procedures in place to ensure consistency of judgement across its business and to limit subjectivity as far as is possible. The asset inventory is compiled by a single central team drawing on data from across the business. Judgements are objectively made and any inaccuracy is due mainly by the quality of base data. Further information is given in the individual table commentaries below.

Commentary Relating to Asset Serviceability

The guidance to Reporters in Information Requirement H states that: *The Reporter should highlight any commentary relating to asset 'serviceability' and Scottish Water's assessment of the capacity of asset groups to fulfil their specified role regardless of relative condition or performance.*

We have not identified any general comments relating to asset serviceability in the Annual Return. Scottish Water has not made any assertion as to the relationship between the condition and performance assessments for any asset group, nor any statement regarding the capacity of asset groups to fulfil their specified role regardless of relative condition or performance. Scottish Water's view is that serviceability is a function of condition and performance. SW aspires to a position where data on the reliability of assets is held and processed at a sub-asset level, taking into account maintenance needs to determine the optimum maintenance and replacement regime.

Scottish Water is developing its processes for asset management including the development of its Common Framework assessment for Q&S3b. We believe that Scottish Water has developed a method for the majority of its proposed capital maintenance programme which is compliant with the Common Framework. This was described more fully in our commentary on the second draft business plan.

Changes in the Proportion of Redundant and Decommissioned Assets

The guidance to Reporters in Information Requirement H states that: *The Reporter should comment on any observed change in the proportion of redundant and decommissioned assets, and how these contribute to Scottish Water's overall valuations.*

From AR08 Scottish Water has excluded redundant and decommissioned assets from the asset valuation. We noted in our commentary on AR08 that the removal of redundant and decommissioned assets from the valuation resulted in a reduction in MEAV valuation of 3%, comparing AR07 and AR08 MEAV valuations.

Reporting Asset Inventory for Support Services

The guidance to Reporters in Information Requirement H states that: *The Reporter is asked to consider the potential for reporting the asset inventory for Support Services on a water/wastewater basis. The Reporter should seek to establish the code changes needed to facilitate such a split under the existing reporting mechanism.*

From our work elsewhere we are aware that many companies allocate values of support services simplistically, either on a 50/50 split or on the basis of staff employed. We do not think that such a split would add much to a general understanding but acknowledge that it may be needed for comparative purposes based on current practice. In our view support services can best be compared with other water and wastewater companies as a standalone item.

It would be practicable to report Support Services valuation with a water/wastewater split. Scottish Water is moving towards a new business model with a functional split so it may be possible to report more support services assets by service in future.

We believe that the code changes required to facilitate the split are simple. The introduction of a matching set of asset codes for water and wastewater with separate tables for each service area would be sufficient. Many support service assets (such as offices and IT) are currently multifunctional and support both services. A split is therefore possible only on the basis of a high-level measure, such as the proportion of employees engaged in each service. Due to the fact that many common assets are used to support both water and wastewater services we recommend that a clear business need to split the data is determined before separation is introduced.

The confidence grade of the support assets allocated between service areas will be lower than the confidence grade for the asset inventory and valuation as a whole.

Overall Judgement on the Suitability of the MEAV Measure

The guidance to Reporters in Information Requirement H states that: *Overall, the Reporter should make some judgement of the suitability of the MEAV measure for assessing the asset base, and how condition and performance gradings are assigned on this basis. The Reporter should consider this methodology in relation to those used in other utility businesses, specifically the water industry in England and Wales.*

The use of MEAV or similar valuation (EARC) allows a proper representation of the data and so we believe that it should be maintained. We suggest that reporting on condition and performance, now eliminated from the H tables for the Annual Return, should be restricted to less frequent updates, as part of the Business Planning process.

The MEAV valuation presented is an improvement on the EARC valuation presented in previous Annual Returns and has removed the anomaly whereby very large values of assets were previously indicated as requiring replacement within two years. However MEAV remains an accounting view of the assets and is not used for either the management of the assets or for investment planning. It is therefore not clear what value the MEAV presentation adds to Scottish Water's management of its assets or performance.

We understand that Scottish Water is developing it processes for asset management including the development of its Common Framework assessment for Q&SIIIB. We understand that these developments are being monitored by WIC. We recommend that the future of the H Tables is considered in the light of these developments.

Comparison with Practice in England and Wales

Scottish Water's MEAV methodology differs for infrastructure and non-infrastructure. Infrastructure assets account for around 80% of the final MEAV. Infrastructure pipe assets are valued using per km rates differentiated by diameter, surface type, infrastructure type and depth.

Non-infrastructure assets account for around 20% of the final MEAV. The majority of non-infrastructure assets are valued by assessing the replacement asset at unit level (i.e. each component, such as a filter or a detritor) and building up the value of the site based on the sum of the components. There are two exceptions to this rule for non-infrastructure assets:

1. Some very small assets are valued at site level. These may contain more than one unit, but are generally replaced in their entirety.

2. For any asset that is clearly scheduled for complete replacement before 2014, valuation is at the site level rather than at the unit level. This is to align the valuation with the engineering solution – a complete site-level modern replacement rather than a one-for-one replacement of the constituent units with their modern equivalents.

It is possible to view the options for valuing assets as a spectrum. One end of the spectrum is to take the existing asset base and cost it assuming the replacement of each element without any rationalisation at site or unit level. This would be close to the traditional EARC, with any variance arising only from recent changes in technology or manufacturing techniques relevant to any individual unit. This would not take account of any new design technology that could use different units to deliver the same service.

At the other end of the spectrum is the costing of a notional asset base starting from scratch to produce an optimal solution to serving current customers, both at site and unit level. This would be a totally rationalised asset base. The former ignores modern design technology, while the latter ignores aspects of the actual asset base that Scottish Water operates. The valuation methodology used moves away from the EARC, as requested by the Commission, but is not so extreme as to adopt total system rationalisation.

The derivation of this methodology takes into consideration the purposes for which the MEAV will be used, the Regulatory Accounting Rules, the practicalities of completing the exercise, and a belief that a general alignment of the methodology with other UK water companies is desirable. The methodology strongly aligns the valuation of the asset base with the actual engineering basis on which assets are replaced or renewed. In general, assets are not replaced in their entirety but at a unit level and will be valued accordingly. This methodology is broadly in step with the other UK water companies; although there is not total methodological alignment between those companies.

Conclusions

During our audits we were able to compare the asset data in Ellipse, GIS and other relevant asset databases with both the H tables and the databases used for manipulation and calculation of MEAV. These were found to be fully consistent.

We concluded that the asset data is of variable quality, requiring significant infilling of data for many asset types. This is properly reflected in the confidence grades assigned.

There have been significant movements in and MEAV for some classes of asset, but these have been satisfactorily explained. Changes to cost curves and the application of on-cost affect the MEAV of most asset classes.

The most significant increase in MEAV relates to the valuation of sewers and sewer manholes, resulting in an increase in the assessed MEAV for sewers overall of £5221m. This figure was not audited in detail but the basis of the calculation is accepted.

Detailed conclusions on each asset type are given in the commentary on Tables H1 to H6 below.

9.2 Table H1: Asset Inventory and System Performance – Summary

Commentary by REPORTER

Key Points

- Table H1 is a summary of Scottish Water's asset inventory presented in Tables H2 to H6. The audit of the asset inventory is reported against the individual tables.
- The basic sources for asset data are:
  - Dams and impounding reservoirs, raw water intakes, raw water aqueducts (excluding pipe sections), water treatment works, water storage, water and wastewater pumping stations, CSOs and sewer tanks, wastewater treatment works and sludge treatment facilities – data from Ellipse
  - Meters – data have been transferred from the CMA into Ellipse for AR09
  - Water mains and pipe sections of raw water aqueducts, sewers (including some laterals), locations of raw water intakes, CSOs and sewer tanks – data from GIS
  - Communication pipes – data from the communication pipes inventory
  - Management and general assets – data from corporate databases and spreadsheets
- The reported gross MEAV for Scottish Water's assets has increased from £36.2 billion at AR08 to £43.8 billion at AR09. The greater part of this increase is due to a rise of £6.0 billion in the value of infrastructure assets. This is due to changes in inventory, revisions to cost curves and on-costs (including land for non-infrastructure assets only), a revised methodology for assessing the cost of sewer manholes and COPI indexing.
- The increase in valuation for infrastructure assets is principally accounted for by the reassessment of sewer and sewer manhole costs, which adds £5.2 billion to the AR08 valuation for sewers.
- Other assets showing large percentage increases in MEAV from AR08 include water storage, water pumping stations, sea outfalls and sludge treatment facilities. Further details are given in the relevant sections below.

Methodology

This is detailed in the commentaries relating to Tables H2 to H6.

Conclusions

During our audits we were able to compare the asset data in Ellipse, GIS and other relevant asset databases with both the H tables and the databases used for manipulation and calculation of MEAV. These were found to be fully consistent.

Water Non-infrastructure Assets

We concluded that asset data on water non-infrastructure assets are of reasonable quality. There is good information on operational status. Capacity data for pumping stations has been subject to significant infilling. There are some shortcomings in the quality of condition and performance data. Cost curves were not audited for AR09. We have noted Scottish Water's explanations for the changes in cost curves and the corresponding increases in MEAV.

Water Infrastructure Assets

There is significant uncertainty in the numbers of dams and reservoirs which are Scottish Water's responsibility and in the yields of reservoirs and intakes. There are significant gaps in data on the length, material and diameter of raw water mains. No extrapolation has been undertaken to lengths of mains, although infilling of diameter and material has been undertaken. SW reports that it has started to investigate this area of its asset stock.

We concluded that asset data on water resources assets is of variable quality. This is properly reflected in the confidence grades assigned.

There have been significant movements in both inventory and MEAV for some classes of asset, but these have been satisfactorily explained. Changes to cost curves and the application of on-cost affect the MEAV of most asset classes.

Wastewater Infrastructure Assets

There is significant infilling of data on material, depth and surface type for sewers and pumping mains. The length of laterals included in the reported figure for non-critical sewers is based on a statistical assessment of lateral lengths for different property types. A nominal addition of 1000 km has again been made to reflect Scottish Water's opinion that sewers are under-reported in the asset stock.

We concluded that there are few asset data on lateral sewers and that data on other sewer structures assets are of variable quality. This is properly reflected in the confidence grades assigned.

During the year a significant reassessment of the valuation of sewer manholes was made. This led to a significant increase in the assessed MEAV of sewer manholes, which has risen to £3553m. The uplift applied to critical and non-critical sewers to account for manholes rose to 24.1% and 18.0% respectively.

There have been significant movements in both inventory and MEAV for some classes of asset, but these have been satisfactorily explained. Changes to cost curves and the application of on-cost affect the MEAV of most asset classes.

Wastewater Non-infrastructure Assets

We concluded that asset data on wastewater non-infrastructure assets are of reasonable quality. There is good information on operational status. Capacity data for pumping stations were not always present and have been subject to significant infilling. Cost curves were not audited for AR09. We have noted Scottish Water's explanations for the changes in cost curves and the corresponding increases in MEAV

Comments by Line

Our comments are given in the detailed commentaries relating to Tables H2 to H6.

Comments by Confidence Grade

Scottish Water has documented the approach to be taken to the assessment of confidence grades in a Technical Guidance Note. The derivation of confidence grades for each line in the H tables has been documented.

As with previous years, the asset valuation continues to rely on:

- Incomplete asset information which has been extended by assumption or extrapolation. The extent of assumption and extrapolation remains considerable for some classes of asset;
- Valuation, in some cases, of limited samples of assets;
- Some cost functions which rely in part on data from other companies or for the water industry as a whole, for which a clear audit trail is not always available.

Scottish Water generally reports a C4 confidence grade for the allocation of MEAV value between replacement periods. Given the continuing refinement of asset data and cost functions and the change from AR08 to a MEAV basis for reporting, this grade is accepted.

9.3 Table H2: Current Asset Inventory – Water Non-Infrastructure

Commentary by REPORTER

Key Points

- Scottish Water has submitted a complete return of its water non-infrastructure asset inventory.
- Only operational assets are reported. Redundant and decommissioned assets are excluded.
- The assets have been valued using a Modern Equivalent Asset Valuation (MEAV) approach, with revised cost curves used for valuation. Cost curves have been significantly updated during the year to retire old cost data and introduce further data based on actual Scottish Water Q&S3a programme costs.
- Changes in asset data in the year are restricted to changes due to investment and operational status with limited data improvement.
- We concluded that asset data on water non-infrastructure assets are of reasonable quality. There is good information on operational status. Capacity data for pumping stations has been subject to significant infilling
- Scottish Water has allotted confidence grades broadly similar to those given in AR08. Base data are still subject to some infilling and estimation, particularly relating to pumping capacities and the overall grade of C4, unchanged from last year, is accepted.

Methodology - Asset Data and Inventory

Asset Surveys

Most non-infrastructure assets have been surveyed. The surveys fall into three main groups: those surveyed prior to 2006/7, the large majority surveyed during 2006/7 as part of the Non-infrastructure 2006/7 (NIS 07) project, and sites surveyed as part of the Works Operational Manual (WOM) update project. Sites scheduled for survey as part of the planning for NIS 07 were determined following a review of data already held on Ellipse at that time. Where surveys had already been carried out or existing Ellipse data from sources such as WOMs were judged to be of good quality, no survey was programmed in NIS 07. Where data gaps were perceived in Ellipse data, partial surveys were programmed. Where inadequate data were present in Ellipse, full site surveys were programmed. Un-surveyed sites are believed to be mainly small and remote.

Sites were graded for condition, performance and health and safety issues using grading pro-formal based on the WRc methodology. A sample of site surveys was checked by site visits for our report on AR08 and updated for the 2nd draft business plan. In our narrative for the 2nd draft business plan we concluded: *The wastewater asset lists continue to be generally satisfactory. The water lists were adequate, but had process units missing.*

Overall, the spreadsheet gives a reasonable picture of the assets audited. However, as the spreadsheet is used for a computer generated calculation of asset values, the inconsistencies in size and age data make the resulting asset life calculations questionable. The errors could lead to inaccuracy of the Gross MEAV. The Gross MEAV for all non-infrastructure items is based directly on the asset database yardsticks and the cost curves, therefore, any inaccuracy in the database will lead to errors in the Gross MEAV.

Ellipse Data Coverage

The Ellipse system holds attribute data, information on the asset hierarchy, data on condition and performance and data on date of installation or refurbishment where known. No cost data are held. Ellipse holds only real asset data. Where gaps exist these are filled during the preparation of the valuation.

Capacity Data

Capacities are taken as design capacities. These are taken from works drawings or manuals. If these are not available then capacities are checked by surveys. Capacities were checked during the Non-infrastructure Survey 2006-7 and business-as-usual changes are also made from time-to-time. For water treatment works a monthly water balance check is made, comparing water in, operational use and water out (Distribution Input) to check consistency with the Water Resources Plan.

Condition and Performance

Condition and performance data are held at sub-asset and asset level, determined from site surveys or recorded in Ellipse, as described above. From our previous audit of asset surveys we believe that Scottish Water has undertaken surveys in a systematic and well managed manner, but that there are some shortcomings and inconsistencies in the quality of condition and performance data. It is recommended that Scottish Water continues to take steps to improve the quality of these.

Asset Age

Ellipse holds the following asset age data, where these are known:

- Refurbishment date - sub-asset level
- Installation date - sub-asset level
- Refurbishment date - asset level
- Installation date - asset level

Works Type

Works type is a defined field in survey pro-forma. Confirmation of treatment type is done from the assets present on site, using a menu approach. WIC definitions are used. Validation of works type is done by the Asset Planner in conjunction with the Water Resources team (for WTWs) and Operations (for other asset types).

Operational Status

Ellipse records the operational status of assets as operational, non-operational and redundant. Non-operational assets are those which are not in use, but capable of being returned to use ('mothballed'). Redundant assets are those incapable of being returned to operational use without capital investment. Only operational assets are reported in Table H.

Transfer of Survey Data into Ellipse

Survey data are uploaded into the Ellipse system by the Ellipse team. Updated data for Ellipse comes from surveys, project completions, routine data-cleansing and from updates passed to the asset data help-desk. In previous audits we concluded that it was difficult to define the source of the data adopted for Ellipse and to define the audit trail. We continue to recommend that Scottish Water consider how the audit trail is recorded for assets and asset data in Ellipse, to improve confidence in their reliability.

Controls over Ellipse Data Updating

Ellipse data have been updated during the last year to reflect new sites as a result of investment projects, data improvement and other 'business as usual' changes, including sites becoming non-operational, notified principally by operators. All data changes are made in accordance with a defined procedure (NI – ADC/PRC/01) and can only be made by the 7 members of the Ellipse team. Three types of Ellipse update can be made: a creation script (for a newly-entered asset or sub-asset), a modification script (for modification to an existing asset or sub-asset), or a changed parent script (where an asset or sub-asset is assigned a revised place in the asset hierarchy). The type of change is recorded in a history file and the source of the data is also noted. The Ellipse system was viewed live and a number of data amendments checked. The data held in the system were in every case seen to be consistent with the change notification.

Updates to the asset stock resulting from project completions are now provided by the project manager on CD. These must be provided before CAPEX 5 approval is given and final payments are released, providing an incentive to project managers to provide timely information. Data cleansing exercises are carried out from time-to-time, involving Ellipse staff and Asset Planners to review and cleanse data on asset types which may be highlighted by either party. Finally, the asset data help-desk receives updates, mainly from operational and maintenance staff on changes in status of assets. Ellipse staff have been aligned with asset planners and operators for particular asset types to facilitate data improvement.

For all of the above categories of update, revised data are placed first in an off-line spreadsheet for checking with stakeholders. Logic checks are also made before amending Ellipse data. Ellipse is a live system, but a formal process is in place to track and record changes. Ellipse holds only real data. If information is unknown then a gap is shown and any infilling needed for asset inventory purposes is done outside the system.

The Ellipse team now receive project data at CAPEX 3 (design) stage to provide advance warning of impending changes due to construction. These are checked and entered at the CAPEX5 stage following project completion.

Validation of the works type is done by the Asset Planner responsible, in conjunction with the Water Resources team.

We believe that this work is well done.

Methodology - Calculation of MEAV

The Ellipse system is the sole source of asset data for non-infrastructure assets and the basis of the Master asset data file. Ellipse holds only real asset data. Where gaps exist these are filled during the calculation of the valuation. Information on data changes is held in a separate free-standing spreadsheet.

Calculation of Gross MEAV

The methodology used for the calculation of gross MEAV for Table H3 follows that outlined in the Jacobs UK Limited report 'Scottish Water, Modern Equivalent Asset Valuation – Technical Approach, Non-infrastructure Assets H2 Water and H5 Wastewater', with the exceptions that:

- Non-operational assets are not reported
- A MEAV will always be calculated, with no default to EARC valuation

The methodology used by Scottish Water works at a sub-asset level. Cost curves have also been developed for other site assets (such as roads) which were previously assessed by adding a proportion of site valuation.

Gross MEAV is calculated at a sub-asset level by applying the relevant cost curve to a capacity yardstick (known as an 'X-factor') for the sub-asset type. The classification of yardsticks is as follows:

- Level 1 yardstick – a known capacity giving a direct Ellipse rating (such as a tank capacity, or a screen rating). Where this is not available then the process defaults to:
- Level 2 yardstick – dimensional information is used to calculate capacity, giving an Input parameter. This applies mainly to tanks. Where this is not available then the process defaults to:
- Level 3 yardstick – capacity information is not known at sub-asset level, but only at asset or site level. The X-factor is determined from the asset or site-level data.

There is a small proportion of sites where no capacity data are known. These include water storage sites and water pumping stations. In these cases the input parameter is calculated from any known data, such as a WTW population served. Such sites are generally small. Capacities are known for all other water non-infrastructure asset types.

For mixed assets (those with both M&E and civil components) the sub-asset valuation is sub-divided between civils and M&E on a standard percentage basis for each type rather than by separately calculated values for civils and M&E. The standard percentages were produced by Jacobs Ltd. as part of the MEAV project. These percentages have been reviewed during the report year as it was considered that the M&E proportions of some assets had been overstated. As these components deteriorate more rapidly than civils, the overall effect was to lead to more rapid depreciation for assets with a high proportion of M&E sub-assets.

To produce the final MEAV for each sub-asset, an uplift factor (for construction overheads) and COPI indexing are applied to the figure calculated as described above. Land assets are also created to hold an appropriate value in relation to the total site value.

Calculation of Net MEAV

Net MEAV data given in Table H has been produced by taking Gross MEAV, multiplied by Assessed Remaining Life and divided by Expected Life. Expected asset lives are expected book lives. These were revised for the second draft business plan and were listed in an appendix to our commentary on that plan.

Asset Age and Calculation of Remaining Life

Ellipse holds the following data relevant to the calculation of remaining life:

- Refurbishment date - sub-asset level
- Installation date - sub-asset level
- Refurbishment date - asset level
- Installation date - asset level
- Condition data

Remaining asset life for the H Tables is calculated in accordance with the following rules:

Level 1a – Apply 'date refurbished' at sub-asset level

Level 1b – Apply 'date installed' at sub-asset level

If data is not available at sub-asset level, then default to:
Level 2a – Apply 'date refurbished' at asset level

Level 2b – Apply 'date installed' at asset level

If data is not available at asset level, then default to:

Level 3 - Use condition grade at sub-asset level to determine the remaining life from the following matrix, which assigns a % remaining life according to condition grade:

Condition Grade	[Remaining Life % of Service Life]
1	87.50%
2	62.50%
3	37.50%
4	12.50%
5	0.00%

This table gives results based on standard design lives and ignores the condition of the asset where refurbishment or installation dates are known. This discounts the possibility that some assets may outlive their book lives. However it is equally possible that some assets will not reach their book lives and so this is a reasonable assumption for the purpose of aggregate MEAV asset valuation.

In all cases, MEAV is calculated on the basis of total replacement at the end of assessed remaining life, rather than repair or the replacement of components only.

The calculation of remaining life could be improved by taking a risk-based approach and looking at the reliability history of individual assets and sub-assets. This would however generate a very large data-gathering exercise, which is not seen to be justified for the purpose of MEAV valuation.

Short, Medium and Long-life Assets

The allocation of asset lives to short, medium and long-life categories is on the basis of expected asset lives. These were revised for the second draft business plan and were listed in an appendix to our commentary on that plan.

Quality of Age Data

Data collected by Scottish Water since its formation from predecessor authorities are considered to be of good quality and have been collected on a consistent basis. Data collected before April 2002 are of unknown quality, originating from legacy systems. It is not currently possible to plot asset age for specific sub-asset and asset types. It is recommended that this capability should be developed to identify data anomalies and shed further light on confidence grades.

Mixed (Civil/M&E) Assets

Mixed assets and sub-assets have both civil and M&E components. This is the case for most treatment assets. In these cases standard allocation percentages are used. These percentages have been reviewed during the report year as it was considered that the M&E proportions of some assets had been overstated. As these components deteriorate more rapidly than civils, the overall effect was to lead to more rapid depreciation for assets with a high proportion of M&E sub-assets.

Land Valuation

The land associated with each group of assets is valued as a site level as an asset associated with that site and a value of 3.5% of the total value of assets on the site is attached to it. For AR09, the value of assets on the site is taken as the construction costs, with no addition of on-cost. Land is not valued for this purpose on the basis of a specific land valuation. This would represent a major exercise and may not be considered worthwhile for the purpose of MEAV valuation. However it is recommended that regional factors should be applied to assessed land values in future, recognising the increased value of sites in some regions of Scotland.

Conclusions

During the audit, sample data checks were made during which the inventory numbers for all of the lines in Table H2 were reconciled with the base data in Ellipse.

For water treatment works (lines 1 – 8) three sample lines were examined and the numbers in the table reconciled with site names and status. Status change requests were also viewed and reconciled with the table.

For water storage sites (lines 9 – 10) four sample sites were examined where operational status had changed during the year and the changes reconciled with change requests. These included one mothballed site.

For water pumping sites (lines 11 – 13), operational status was seen to be recorded for all sites. Four sample sites were examined and their status reconciled with change requests. It was noted that two sites had no capacity data.

We concluded that asset data on water non-infrastructure assets are of reasonable quality. There is good information on operational status. Capacity data for pumping stations has been subject to significant infilling. There are some shortcomings in the quality of condition and performance data.

Cost curves were not audited for AR09. We have noted Scottish Water's explanations for the changes in cost curves and the corresponding increases in MEAV.

Comments by Line

Lines 1 to 8: The gross MEAV valuation for Water Treatment Works has risen from £1870m at AR08 to £2256m at AR09. The change is principally due to revision of cost curves to reflect data from Scottish Water's current investment programme. During the year around 50 water treatment works have been given revised WIC grades due to capital works and a data cleansing exercise prior to a DWQR submission. There has been no significant underlying change in the assets.

Lines 9 to 10: The gross MEAV valuation for Water Storage has risen from £939m at AR08 to £1309m at AR09. The change is principally due to revision of cost curves to reflect data from Scottish Water's current investment programme. There has been no significant underlying change in the assets.

Lines 11 to 13: The gross MEAV valuation for Water Pumping Stations has risen from £220m at AR08 to £405m at AR09. The change is principally due to revision of cost curves to reflect data from Scottish Water's current investment programme. There has been no significant underlying change in the assets.

Comments by Confidence Grade

Confidence grades for water non-infrastructure assets have remained broadly as reported in AR08. Changes relate to lines 11 and 13, where the AR08 grade has been downgraded from B3 to B4 and line 12, where B4 has been upgraded to B3. These changes are due to a reassessment of the accuracy of the base asset data. The overall MEAV confidence grade is unchanged at C4. Despite the improvements made to the process for valuation and improvements in data, significant uncertainties remain. In our previous report we noted that the extent of data infill and extrapolation make a confidence grade difficult to assess but we accept the grades allocated by Scottish Water.

We recommend that Scottish Water undertakes a robust analysis of the uncertainty in the various data sources which contribute to its new MEAV valuation to estimate the uncertainty in the reported values. This analysis would inform the assessment of confidence grades.

9.4 Table H3: Current Asset Inventory – Water Infrastructure

Commentary by REPORTER

Key Points

- Scottish Water has submitted a complete return of its water infrastructure asset inventory.

- Only operational assets are reported. Redundant and decommissioned assets are excluded.

- Changes in inventory from AR08 are generally limited to changes arising from investment projects, sites becoming non-operational and minor data improvement. Numbers of water meters reported have risen due to Scottish Water's non-domestic meter installation programme.

- Discrepancies remain concerning the numbers of reservoirs which are the responsibility of Scottish Water and in the yields of reservoirs and raw water intakes. This is properly reflected in the confidence grades assigned. We recommend that Scottish Water takes steps to improve its asset data for these assets.

- No extrapolation has been undertaken to lengths of mains, although infilling of diameter and material has been undertaken.

- We continue to note that Scottish Water's predictive model for water mains condition grading indicates a significantly poorer condition than that derived from reported burst frequency. We believe that further work is required to reconcile the predictive model with burst frequency. Scottish Water is undertaking a significant programme of mains investigation and renovation based on its knowledge of condition and performance of its water mains. We recommend that the results of this renovation programme are used to validate the current assessment of condition and performance grade reported in the asset inventory.

- During our audits we were able to compare the asset data in Ellipse, GIS and the communications pipes database with both the H3 tables and the databases used for manipulation and calculation of MEAV. These were found to be fully consistent.

- The assets have been valued using a Modern Equivalent Asset Valuation (MEAV) approach, with revised cost curves used for valuation and amendments to the application of on-costs. Cost curves have been significantly updated during the year to retire old cost data and introduce further data based on actual Scottish Water Q&S3a programme costs.

- The assessed gross MEAV of £8738m for mains - potable for AR09 has risen from the £8235m reported for AR08 due to an increase in inventory, updates to cost curves and changes in on-costs. Mains – potable are one of the largest components of Scottish Water's overall MEAV.

- Scottish Water has allotted confidence grades identical to those given in AR08 for both inventory and MEAV. Base data are still subject to varying degrees of infilling and estimation and the grades, ranging from B2 to C5 are accepted.

Methodology – Inventory and Asset Data

Sources of Data

The principal source of data for infrastructure assets is the GIS system. GIS contains data on condition and performance for each asset, but this is separately compiled and uploaded to GIS on an annual basis immediately after the end of the financial year.

GIS contains data on and distinguishes between type for raw water mains and aqueducts, distribution mains, trunk mains and non-potable mains. There are very limited data on communication pipes. GIS also contains data on consumer meters, downloaded from Ellipse, which is the basic source.

Raw water aqueducts and mains are known to have incomplete data in GIS, where both route and asset data are missing in some cases. Where routes are unknown, the route is held on GIS as a logical link, i.e. a straight line between known start and finish points. There is a backlog of data entry to GIS relating to mains for developer sites.

Information on the following infrastructure assets is held in Ellipse:

- Raw water intakes
- Dams and reservoirs
- Large mains chambers

Operational Status

Operational status is established by reference to a flag in the GIS system as: operational, isolated (for mains), redundant, or abandoned. Redundant and decommissioned assets are not reported.

GIS Updating and Controls

Corporate GIS data were developed by integrating the data of the three former authorities. The quality of the data were been improved by the process of screening and review undertaken as it was integrated into one system. The data are subject to continuous checking in use. The updating process includes validation checks and there are routines in place to chase missing data, including crosschecks with Ordnance Survey map updates.

Systems for updating the data for development, renovation and new construction have previously been audited. Procedures have been formalised for updating records and for rehabilitation work contractors have direct access for updating following the completion of work. Quality assurance procedures are followed, version control records changes and validation routines are imposed before information becomes the accepted version. There is no longer a backlog of data entry for rehabilitation projects, which are updated by the project engineers, using QA-controlled scripts. For new developments, developers provide details of proposed new mains. Data are entered by Scottish Water and recorded as proposals until as-laid details are confirmed. Quality assurance procedures are followed. Routines are in place to chase missing as-laid information, including cross-checks with Ordnance Survey map updates.

For new construction, service providers enter data directly onto GIS and procedures are the same as for rehabilitation work. For minor works carried out on the network by Scottish Water and data arising from investigations or events, data are notified by Scottish Water to the GIS section who enter data using quality assurance systems and data validation. Site checks are carried out where anomalies are evident from information on all types of record. Information Data Reporting (IDR) procedures cover all aspects of GIS updating and history files record when each piece of data was changed and by whom. However the provenance of new data and the reason for a change are not recorded.

Dams and Reservoirs

Compared with the data used for AR08, there have been few significant changes for AR09. Data refinement is continuing, accessing better data from asset planners, Reservoirs Engineers, operations and limited site surveys. Numbers have reduced by 8 due to abandonments.

The Ellipse database was interrogated during the audit. Numbers of dams and reservoirs were seen to be consistent with line H3.1. Data were seen to be held on location, size bands corresponding to WIC grades and x-factor (yield). Some yields were seen to be given as zero.

Three sources of data were used to identify the list of dams and impounding reservoirs for the first MEAV valuation in AR08. These were Reservoir Engineers' records (for Reservoirs Act dams), Ellipse and a database compiled by Farrer Wallwin. Discrepancies were found between the lists which could not be reconciled by discussions with operators and the Farrer list was used. Good information was available for Reservoirs Act dams, but poorer data on the remaining, smaller dams. 37 dams had full record drawings. 78 had partial drawings, 66 had some records and 220 had no records at all. Although a large number of sites had no asset data, this applied mainly to smaller dams and their assessed MEAV (at AR07 prices) was only £30.1m, just over 2% of the total MEAV for dams and impounding reservoirs.

Physical data was taken from records where available. Where no records were available, GoogleEarth was used to provide aerial photographs which were scaled to provide partial dimensional information. This provided sizing data for approximately 100 further sites. No site visits were carried out to check the data estimated in this way. Some inaccuracy is inevitable when scaling photographs, but this is not significant in the light of the whole MEAV valuation. Around 25% of dams had no dimensional information.

It is recommended that Scottish Water undertakes a programme of dam surveys to collect asset data for sites where this is unknown, beginning with the larger sites.

For the valuation, yields were taken from the Farrer database and from Ellipse as no better data existed. For AR08 these figures were compared with information on yields from the Water Resources Plan for a small sample from which it appears that the yields used in asset valuation cannot be individually relied upon. It is not possible to say what effect these discrepancies may have on the overall asset variation. It is recommended that further work is carried out to check intake yields in conjunction with the Water Resources Plan and also to confirm the operational status of the reservoirs listed in the database.

Raw Water Intakes

The Ellipse database was interrogated during the audit. Numbers of intakes were seen to be consistent with line H3.2. Data were seen to be held on location, size bands consistent with WIC grades and x-factor (yield). Yields, where known, are taken as design yields. Many yields were seen to be held as zero. Ellipse lists abandoned sites but checks showed that these had not been included in the inventory. The number of intakes reported has fallen from 369 at AR08 to 361 for AR09.

Intake yield is a key factor in the asset valuation exercise. A significant proportion of yields was unknown and had been extrapolated for 139 of the total 351 sites for the valuation. As the sites for which yields were unknown were generally small, yields were infilled on the basis of the average of all known-yield sites, after the elimination of sites having known yields over 10Ml/d. Yield data were infilled on this basis for 160 out of the total of 329 operational intakes. No site visits were undertaken to check the assessment of infilled yields. For a small sample of sites the yields used were compared with Water Resources Plan yields. Significant discrepancies were evident in this small sample. As with reservoirs it appears that the yields used in asset valuation cannot be individually relied upon, but it is not possible to say what effect these discrepancies may have on the overall asset variation.

Discrepancies were also noted in the operational status of the intakes and the reliability of this designation is open to question. Redundant and decommissioned assets are excluded.

It is recommended that further work is carried out to check intake yields in conjunction with the Water Resources Plan and also to confirm the operational status of the intakes listed in the database.

Raw Water Aqueducts

No further asset surveys were carried out in the report year for this asset type and these assets were not audited in detail. GIS holds physical data, condition and performance grades for aqueducts. However there are significant data gaps and much of the total length of aqueducts required data infilling on diameter, material and age. In addition the condition and performance grades of aqueducts are assumed to be 3, unless there is better data from surveys or project completions, which applies to only a small proportion of the total length of aqueducts. As in previous years Scottish Water noted its concern that better asset data is not held on these critical assets and informed us that they are included in its programme of work to improve asset information.

Data are held in GIS in two categories; aqueducts (not usually circular) and raw water mains (circular pipes). The methodology for the latter is that described for water mains. The reported length of aqueducts has reduced by 14 km from AR08 due to abandonments linked to rationalisation.

For the preparation of the valuation, GIS data were downloaded into a database. This was examined during the audit and found to agree with the totals in line H3.3 and with GIS. Data were seen to be held on location, size bands consistent with WIC grades, material, type, and diameter. Where diameter was unknown the default value of 150mm is used. Surface type was given but was always assumed to be grassland.

Data infilling for raw water aqueduct pipes and non-potable mains is carried out as for water mains, described below, except that there are no house age data to allow infilling of age. A significant proportion (approximately 25%) of aqueduct lengths are assessed as being non-operational and there may be a small risk of under-recording of raw water aqueduct lengths due to incomplete information on operational status.

Mains, Potable and Other - Inventory

The same methodology is used for raw water mains (H3.3), mains potable (H3.4) and mains other (H3.5). Scottish Water has developed an Integrated Network Management System (INMS) which compiles and provides the information necessary to manage its water network. This system produces the information for the potable mains data in Table H3.

The length of main is taken from the corporate GIS data. The data was developed by integrating the data of the three former authorities. The quality of the data was improved by the process of screening and review undertaken as it was integrated into one system. It is subject to continuous checking in use. The updating process includes validation checks and there are routines in place to chase missing data, including cross-checks with Ordnance Survey map updates.

Data were extracted from GIS in four categories; aqueducts, raw water mains, service pipes and water mains. These are sorted into raw water aqueducts - pipes (H3.3), mains potable (H3.4) and mains other (H3.5).

Systems for updating the data for development, renovation and new construction have been audited in previous years. Procedures have been formalised for updating records and for rehabilitation work contractors have direct access for updating following the completion of work. Quality assurance procedures are followed, version control records changes and validation routines are imposed before information becomes the accepted version. For new developments, developers provide details of proposed new mains. Data are entered by Scottish Water and recorded as proposals until as-laid details are confirmed. Quality assurance procedures are followed. Routines are in place to chase missing as-laid information, including cross-checks with Ordnance Survey map updates.

For new construction, service providers enter data directly onto GIS and procedures are the same as for rehabilitation work. For minor works carried out on the network by Scottish Water and data arising from investigations or events, data are notified by Scottish Water to the GIS section who enter data using quality assurance systems and data validation.

For all types of record, changes site checks are carried out where anomalies are evident from information received.

For the preparation of the Annual Return it is necessary to infill missing data on GIS which is used to define and value the asset inventory. This data infill relates mainly to age, material and surface type, with diameter being recorded in virtually all cases.

GIS holds only real data. Any necessary data infilling is done outside GIS, to produce the Infrastructure Asset Data Master file. Condition and performance data are held in GIS, but updates are held in a separate file and uploaded to GIS annually at the year end.

There are no changes to the methodology for data infilling, which was audited during the audit of H tables for AR07. Data infilling is carried out in accordance with Scottish Water Technical Guidance Notes. Data infilling for pipe age is based on property age and pipe tracing to adjacent pipes of known age. Diameter infilling for pipes is carried out by pipe tracing to pipes of known diameter. Where this is inconclusive, engineering judgement is used. For the current report only a small length required data infilling of diameter, with all unknown diameters being infilled at 150mm diameter, the commonest category. Pipe material infilling is based on the age of adjacent property, together with pipe tracing to pipes of known material. Surface type infilling is carried out by reference to Ordnance Survey Carriageway (OSCAR) data. Where data are inadequate to infill on this basis, default values are used, with the default age being 50 years and the default material spun iron.

Age is assessed using housing age and where there is no other information pipe material is inferred from pipe age. Surface type is assessed using the Ordnance Survey Carriageway Alignment Register (OSCAR), which includes road construction data.

For the calculation of MEAV, data are downloaded from GIS into a stand-alone database, where missing data are infilled. During the audit, the database was reviewed and the physical quantities reported in Table H3, lines 4 and 5 were seen to be consistent with the database. Abandoned mains were not included and all of the data seen were specific to lengths. All pipe band sizes seen were consistent with WIC definitions.

Mains – Other (line H3.5) are mainly fire mains. Many of the records seen had unknown materials, ages and diameters, resulting in a default to 150 mm diameter.

Communication Pipes

Few communications pipes are shown on GIS and there is very little information on the geographical location of communication pipes. The asset inventory is prepared on a statistical basis using the communications pipes Oracle database. Calculated numbers are based on customer information, allocating a communication pipe to each property, with a rules-based approach to numbers of pipes allocated to properties in multiple occupancy. Communication pipe material is assessed on the basis of property age from census data, supplemented by the results of 600 street-level lead surveys.

Scottish Water does not have a corporate inventory of communication pipes. Data ate held in the communication pipes database. The return is based on a range of sources and assumptions including:

- The OS AddressPoint data set used to identify all addresses in the supply area.
- The OS AddressPoint data used to identify stacked properties assumed to be multiple-occupancy. The number of communication pipes to a multiple-occupancy property was determined from a survey of properties undertaken in the former East of Scotland Water area and a rules-based approach has been derived to allocate numbers of comm. pipes to numbers of stacked properties.
- Assumptions on material type.
- Communication pipe replacement data.

Lead communication pipe replacements are identified through WAMS and asset inventory is updated.

The assessment of material is based on the following assumptions:

- Galvanised iron for larger supplies including multiple occupancy >16, some public sites and larger business supplies.
- Lead for other communication pipes installed in 1963 or before and where LIMS data indicates lead.

The inventory for lead communications pipes has reduced by approximately 1% due to information from lead surveys and lead pipe replacement at customer request. The inventory of other communication pipes however has increased by 2% due to more up-to-date AddressPoint information and transfers from the lead inventory.

During the audit the communications pipes database was viewed for table lines H 3.6 and 3.7 in each case the table data were seen to be consistent with the database. In line H3.7 galvanised iron communication pipes are reported at in Band 0 and other materials (not including lead) in Band 1.

Meters

The number of meters reported has increased significantly in the last year. This is due to Scottish Water's programme of non-domestic meter installation, which added 22385, balanced by 3304 meters becoming non-operational. The number of meters reported corresponds to the number of meters read.

The number of water meters was been taken from Ellipse, this data having moved to Ellipse from the CMA system. For the preparation of the MEAV data are down loaded into a stand-alone database. During the audit, the database was interrogated and seen to be consistent with Ellipse and Line H3.8.

Methodology – Calculation of MEAV

Dams and Impounding Reservoirs

Some refinement has taken place to cost curves, but otherwise the calculation of MEAV is unchanged from AR08. Redundant assets were excluded. Cost curves were derived on the basis of actual costs for dams constructed in other English and Welsh WASCs, with some Scottish Water data. However new dam construction is uncommon, so few data points were available.

To calculate the valuation for a dam, cost curves were applied to a number of physical criteria, depending on whether the dam in question was an earth embankment or concrete dam. Physical data were taken from records where available. Where no records were available, GoogleEarth was used to provide aerial photographs which were scaled to provide partial dimensional information. No site visits were carried out to check the data estimated in this way. Some inaccuracy is inevitable when scaling photographs, but this is not significant in the light of the whole MEAV valuation. Around 25% of dams had no dimensional information and the average MEAV figure from the smallest 100 calculated sites was applied to them.

Raw Water Intakes

The asset valuation used a yardstick of intake yield and applied cost curves to generate the net MEAV. The asset data are the same as for AR08, but with some refinement. Redundant assets are excluded. Cost curves were derived on the basis of calculated costs for a small number of existing Scottish Water intakes and were refined for AR09 based on data from the Scottish Water investment programme.

Raw Water Aqueducts

Data are held in GIS in two categories; aqueducts (not usually circular) and raw water mains (circular pipes). The methodology for the latter is that described for water mains.

MEAV valuation for aqueducts is based on size, length and ground type. The latter is assumed to be grassland and regional factors are applied. Unit costs are based on revised cost curves based on work carried out by Jacobs for AR08.

The Gross MEAV was calculated using the SEPL cost function developed from the EES. These are the water main laying and sewer pipe laying functions. There are three versions of the SEPL function used: grassland, rural and suburban highways and urban highways. SW has assumed all large aqueducts are laid at medium depth (2 to 4m depth). SW developed a software code to determine which algorithm was applied to each asset. The cost function was determined based on surface type and diameter. The diameter is "snapped" to a common currently available diameter prior to applying the function which is reasonable. The snapped value also assumes all assets are pipes where some will be box culvert of brick and stone construction. It is reasonable to assume these box culverts could be replaced with circular pipe for the MEAV calculation.

The surface type was chosen from the GIS field. We note that if there are errors in the surface type held in GIS the Gross MEAV will alter significantly as there is a large difference in cost between pipes laid in grassland and pipes laid in highways.

For aqueducts mains, there are few data on larger diameters. This creates significant uncertainty in the valuation for aqueducts which have diameters up to 3000 mm. The rates for raw water aqueducts have been further enhanced to account for tunnels and pipe bridges.

The SEPL function is used. Our conclusions are unchanged from our report on AR08, where we concluded that the gross MEAV calculated for aqueducts was reasonable, subject to the reliability of the two base functions.

Mains, Potable and Other

The Gross MEAV was calculated using the WAML cost function developed from the EES for water main-laying. The cost function was determined based on surface type and diameter. The diameter is "snapped" to a common currently available diameter prior to applying the function which is reasonable.

The surface type was chosen from the GIS field. We note that if there are errors in the surface type held in GIS the Gross MEAV will alter significantly because there is a large difference in cost between pipes laid in grassland and pipes laid in highways.

The WAML function is used. The largest data point on the WAML function curve is a 600mm diameter pipe. Therefore this is a reasonable limit for using this curve. This 600mm data point is known to be overvalued because the particular pipe was priced at 1.9m depth and not the 900mm standard minimum cover. The data point also only applies to the grassland function.

For our audit of AR08, we were provided with the partial but representative database used for line H3.4 and confirmed that the total MEAV value was reasonable for the functions and uplift applied. We concluded that the Gross MEAV calculated for potable water mains is reasonable subject to the reliability of the two base functions.

Communication Pipes, Lead and Non-lead

The MEAV value for communication pipes is based on the replacement cost, using Scottish Water-derived unit costs. All lead services are shown as having a remaining life of 1-2 years.

The Gross MEAV was calculated using the COMP cost function developed from the EES. This function comes from Q&S2 contractor framework rates. It is not based on either current rates or an outturn cost. This is a function to cost the replacement of communication pipes. SW has applied their standard averaged uplift for infrastructure.

For our audit of AR08 we were provided with a partial but representative database of both the lead and none-lead communication pipes used for line H3.6 and H3.7 and confirmed the total MEAV value was reasonable for the functions and uplift applied. The Gross MEAV calculated for communication pipes is reasonable subject to the reliability of the base function and the assessment of the number of communication pipes.

Water Meters

The Gross MEAV was calculated using the COMM cost function developed from the EES. This is a function to cost the replacement of water meters. SW has applied their standard averaged uplift for infrastructure. The COMM cost function is for commercial water meters only. There is a separate cost function WAHM for domestic household meters. SW has chosen to apply the COMM function to both types of meter.

We have confirmed the COMM equation used is the same function being used for the business plan. For our audit of AR08 we were provided with a partial but representative database of the water meters used for line H3.8 and confirmed the total MEAV value was reasonable for the functions and uplift applied.

The Gross MEAV calculated for water meters is reasonable subject to the reliability of the base function and the assessment of the number of water meters and subject to there being no appreciable difference in value between a commercial meter and a household meter.

Conclusions

During our audits we were able to compare the asset data in Ellipse, GIS and the communications pipes database with both the H3 tables and the databases used for manipulation and calculation of MEAV. These were found to be fully consistent.

There is significant uncertainty in the numbers of dams and reservoirs which are Scottish Water's responsibility and in the yields of reservoirs and intakes. There are significant gaps in data on the length, material and diameter of raw water mains. No infill has been undertaken to lengths of mains, although infilling of diameter and material has been undertaken.

We continue to note that Scottish Water's predictive model for water mains condition grading indicates a significantly poorer condition than that derived from reported burst frequency. We believe that further work is required to reconcile the predictive model with burst frequency. Scottish Water is undertaking a significant programme of mains investigation and renovation based on its knowledge of condition and performance of its water mains. We recommend that the results of this renovation programme are used to validate the current assessment of condition and performance grade reported in the asset inventory.

There have been significant movements in both inventory and MEAV for some classes of asset, but these have been satisfactorily explained. Changes to cost curves and the application of on-cost affect the MEAV of most asset classes.

We concluded that asset data on water resources assets is of variable quality. This is properly reflected in the confidence grades assigned.

Comments by Line

Line 1: The assessed gross MEAV of £1441m for dams and reservoirs for AR09 has risen from £1341m at AR08. This increase is principally due to amendments to the cost curves.

Line 2: The assessed gross MEAV of £23.2m for raw water intakes for AR09 is very similar to the £22.9m reported at AR08 after allowing for COPI indexing.

Line 3: The assessed gross MEAV of £1139.6m for raw water aqueducts for AR09 is similar to the £1112m reported at AR08 after allowing for COPI indexing.

Lines 4 - 5: The assessed gross MEAV of £8738m for mains potable for AR09 has risen from the £8235m reported for AR08 due to an increase in inventory, updates to cost curves and changes in on-costs. The same is true of mains – other, where the AR09 figure of £25.3m compares with an AR08 figure of £18.3m.

Line 6: The assessed gross MEAV of £292m for lead communication pipes for AR09 is a reduction from the AR08 figure of £331m, resulting from the reduction in inventory, updates to cost curves and changes in on-costs.

Line 7: The assessed gross MEAV of £412m for other communication pipes for AR09 is a reduction from the AR08 figure of £453m. This is the net result of an increase in inventory and change to cost curves and on-costs.

Line 8: The assessed gross MEAV of £46.0m for meters for AR09 is significantly increased from the AR08 figure of £41.9m. This is due to a significant increase in the number of meters installed.

Comments by Confidence Grade

For AR08, Scottish Water undertook an analysis of the uncertainty in the various data sources which contributed to its new MEAV valuation to estimate the uncertainty in the reported values. This analysis informed the assessment of confidence grades and resulted in a number of changes. Compared with AR08, there have been no further changes in the confidence grades allocated by Scottish Water to either asset inventory or MEAV and we support the grades allocated.

Mains potable are one of the largest components of Scottish Water's overall MEAV and we believe that an overall confidence grade of B4 is appropriate for them.

9.5 Table H4: Current Asset Inventory – Wastewater Infrastructure

Commentary by REPORTER

Key Points

- Scottish Water has submitted a complete return of its wastewater infrastructure asset inventory.

- Only operational assets are reported. Redundant and decommissioned assets are excluded.

- Changes in inventory from AR08 are generally limited to changes arising from investment projects, sites becoming non-operational and minor data improvement. Numbers of short sea outfalls have risen due to data refinement following surveys during AR08 and additions due to investment.

- During our audits we were able to compare the asset data in Ellipse, GIS and the outfall length database with both the H4 tables and the databases used for manipulation and calculation of MEAV. These were found to be fully consistent.

- A nominal addition of 1000 km has been made to reflect Scottish Water's opinion that sewers are under-reported in the asset stock. 950 km of these sewers have been assumed to be non-critical and distributed across size bands 1, 2 and 3 in proportion to the provision of sewers in recent developments. The figure of 1000 km is repeated each year and not reduced by the length of any new discoveries.

- Scottish Water has few records of laterals. The length of laterals included within non-critical sewers is assessed based on property type, based on sample surveys. A total of 16403 km of laterals are included in the reported figure for non-critical sewers. This figure changes each year as the assessment of the total numbers of houses of different types changes.

- As in AR08, Scottish Water has included the length and the estimated MEAV value of laterals as part of Line H4.2 – non-critical sewers. The inclusion of laterals within the non-sewerage stock is a potential source of confusion both within the report and when drawing comparisons with data from England & Wales. We continue to recommend that Table H4 should be amended to include a separate category for laterals.

- Manholes are not separately costed but instead an uplift is applied to the cost of the sewers. During the year a significant reassessment of the valuation of sewer manholes was made, changing the apportionment of unknown-depth manholes to sewers in different depth bands for pricing. This assessment led to a significant increase in the assessed MEAV of sewer manholes, which has risen to £3553m. Manholes were apportioned to critical and non-critical sewers using a set of rules relating criticality to depth. The process has led to a reassessment of the percentage on-cost which should be applied to critical and non-critical sewers, which has risen from 2.6% and 2.4% to 24.1% and 18.0% for critical and non-critical sewers respectively. This, together with changes to cost curves, led to a significant rise in the overall MEAV calculated for sewers.

- Surface type for sewers and rising mains was chosen from the GIS field. This is often interpreted from OSCAR data. We note that if there are errors in the surface type held in GIS the Gross MEAV will alter significantly as there is a large difference in cost between pipes laid in grassland and pipes laid in highways.

- At AR08, SW accidentally omitted to include the Gross MEAV for sewage and sludge pumping mains laid in grassland. This has been rectified for AR09.

- The assets have been valued using a Modern Equivalent Asset Valuation (MEAV) approach, with revised cost curves used for valuation and amendments to the application of on-costs. Cost curves have been significantly updated during the year to retire old cost data and introduce further data based on actual Scottish Water Q&S3a programme costs.

- There have been significant movements in both inventory and MEAV for some classes of asset, but these have been satisfactorily explained. Changes to cost curves and the application of on-cost affect the MEAV of most asset classes.

- Scottish Water has allotted confidence grades identical to those given in AR08 for both inventory and MEAV. Base data are still subject to varying degrees of infilling and estimation and the grades, ranging from B2 to D5 are accepted.

Methodology – Inventory and Asset Data

Sources of Data

The principal source of data for infrastructure assets is the GIS system. GIS contains data on condition and performance for each asset, but this is separately compiled and uploaded to GIS on an annual basis immediately after the end of the financial year.

GIS contains data on and distinguishes between type for critical and non-critical sewers and rising mains. It also contains data on the locations of CSOs and outfalls, although CSO asset data are held in Ellipse and outfall lengths in a separate Information Data and Reporting (IDR) database. Data on other sewer structures are held in Ellipse.

GIS Updating and Controls

Corporate GIS data were developed by integrating the data of the three former authorities. The quality of the data were been improved by the process of screening and review undertaken as it was integrated into one system. The data are subject to continuous checking in use. The updating process includes validation checks and there are routines in place to chase missing data, including cross-checks with Ordnance Survey map updates.

Systems for updating the data for development, renovation and new construction have previously been audited. Procedures have been formalised for updating records and for rehabilitation work contractors have direct access for updating following the completion of work. Quality assurance procedures are followed, version control records changes and validation routines are imposed before information becomes the accepted version. There is no longer a backlog of data entry for rehabilitation projects, which are updated by the project engineers, using QA-controlled scripts. For new developments, developers provide details of proposed new sewers. Data are entered by Scottish Water and recorded as proposals until as-laid details are confirmed. Quality assurance procedures are followed. Routines are in place to chase missing as-laid information, including cross-checks with OS map updates.

For new construction, service providers enter data directly onto GIS and procedures are the same as for rehabilitation work. For minor works carried out on the network by Scottish Water and data arising from investigations or events, data are notified by Scottish Water to the GIS section who enter data using quality assurance systems and data validation. Site checks are carried out where anomalies are evident from information on all types of record. IDR procedures cover all aspects of GIS updating and history files record when each piece of data was changed and by whom. However the provenance of new data and the reason for a change are not recorded.

Operational Status and Area

Operational status is established by reference to a flag in the GIS system as: operational, redundant, or abandoned. Redundant and decommissioned assets are not reported. The allocation of assets to operational areas is done by GIS, by comparing known locations with GIS polygons.

Sewers - Asset Data

Scottish Water based its assessment of depth, material and size of sewers, both critical and non-critical, on the following key sources of information:

- Sewerage records on the corporate GIS;
- Information returns from DAS studies - data from hydraulic models, CCTV and manhole surveys;
- Scottish Water's corporate CCTV database;
- A survey of a random selection of laterals;
- A digital terrain model for unknown cover levels.
- Wastewater connected property numbers
- Ordinance Survey data

Scottish Water has reduced the backlog of data input from new developments into GIS. Scottish Water's drainage area study programme generates an improved understanding of its asset stock and these improvements are entered into the corporate GIS. GIS holds only real data. Any necessary data infilling is done outside GIS. Condition and performance data are held in GIS, but updates are held in a separate file and uploaded to GIS annually at the year end.

To complete the return, Scottish Water infilled missing data using a series of rules based on experience of sewerage networks. Data were initially in-filled from CCTV surveys, a digital terrain model and STC25 data (Standing Technical Committee, which recommended rules for recording sewerage information). The remaining gaps were then in-filled by an automated process based on connectivity. For example, for material and size, missing data was in-filled based on adjacent pipes. Manual sense checks on connectivity and diameter were also made on the data. Where no depth information was available, this was infilled using a procedure where sewers of unknown depth are allocated a range of depths in the same proportion as sewers of known depth. Data infilling is carried out in accordance with Scottish Water Technical Guidance Notes. There is significant infilling of data on material and depth.

There is very limited information on surface type in the asset data and most surface type data are inferred. The proportion of grassland or pavement surface type has a significant impact on the MEAV valuation. Scottish Water has used digital mapping (based on the Ordnance Survey Carriageway Alignment Register (OSCAR) to allocate surface type to individual sewers based on proximity to carriageway centre lines. As in the previous report year, we recommend that Scottish Water reviews a sample of the data generated against actual surface types to confirm that the method and parameters used are reasonable.

In previous years Scottish Water undertook surveys of laterals identified at random to estimate the length of lateral in Scotland. This took into account property type, extrapolating from sample data for the town of Wick, where laterals are included in sewer records. Lateral lengths were calculated for different property types (such as detached, semi-detached flats etc). This approach gives an average length of lateral of 6.76 m. An assessment was carried out across Scotland to determine the number of properties of each type from the proportions determined in the 2001 census data and hence their total lateral length. A total of 16403 km of laterals are included in the reported figure for non-critical sewers. This figure changes each year as the assessment of the total numbers of houses of different types changes.

A nominal addition of 1000 km has been made to reflect Scottish Water's opinion that sewers are under-reported in the asset stock. 950 km of these sewers have been assumed to be non-critical and distributed across size bands 1, 2 and 3 in proportion to the provision of sewers in recent developments. The figure of 1000 km is repeated each year and not reduced by the length of any new discoveries.

The lengths of critical and non-critical sewer reported have risen slightly from AR08 due to new construction.

Sewers - Size Bands

The allocation of sewers to size bands has been amended in line with WIC guidance to eliminate potential confusion regarding pipe sizes where the actual diameter is very close to the threshold value.

Sewers - Critical and Non-critical Designation

Sewers are categorised as critical or non-critical through an industry standard decision process which aims to determine whether pre-emptive rehabilitation is appropriate (critical sewers) or whether sewers should be maintained on a reactive basis (non-critical sewers).

In AR05 Scottish Water applied a methodology for the assessment of critical sewers which resulted in a significant increase in the length of critical sewer identified. The same methodology with some changes was applied in AR06. In AR07 the same general methodology was applied, with a slight difference for sewers which were added in that report year. Sewers that were described by the process as critical or non-critical in each year have kept that description, so there is some inconsistency in the definitions used to categorise sewers as critical, depending on when the categorisation was made. New sewers that have been added to GIS from AR07 on have been categorised by the following process. They are deemed critical if:

- They are masonry or brick;
- They are foul sewers with diameter > 450;
- They are storm sewers with diameter > 600;
- They are at a depth > 4m.

Otherwise they are non critical. All lateral sewers are deemed to be non-critical.

Rules set out in the Sewer Rehabilitation Manual for identifying critical sewers include; those relating to traffic flow, including the proximity of hospitals and industrial sites; ground conditions, including soil type and water levels; sewers under railways, canals, rivers and motorways; sewers under buildings other than garages; sewers where access could be difficult for repair following collapse; sewers in main shopping streets, promenades or areas of high tourist attraction; sewers under or adjacent to high risk installations (gas electricity, etc.); and sewers where collapse could cause serious pollution to grade 1 or grade 2 rivers Scottish Water was not able to access structured information which would allow these factors to be included in the analysis and they were omitted from the analysis from AR07 onwards.

While the current rules are not unreasonable they are not as fully representative of the Sewer Rehabilitation Manual as the method used in AR06. Different assumptions would lead to a different assessment. We recommend that a more detailed cross check should be undertaken for a representative sample of the data to provide confidence that the assessment carried out for this return is reasonable.

Sewer depth is a key factor influencing the designation of a sewer as critical. A number of sewer lengths have been classed as critical on the basis of infilled depth information. Infilling was carried out on the basis of logical tracing to upstream and downstream pipes of known depth.

Sewer Laterals

As previously, sewer laterals continue to be reported within the length of non-critical sewer. GIS contains virtually no information on sewer laterals and the reported length of laterals has been assessed on a statistical basis. It is assessed on the basis of surveys which measured the actual length of laterals for different property types in sample surveys. The numbers of properties of different types are assessed from census data and the average lateral length for that property type is applied to give a total assessed lateral length. A total of 16403 km of laterals are included in the reported figure for non-critical sewers. This figure changes each year as the assessment of the total numbers of houses of different types changes.

The profile of condition and performance grades for laterals is assumed to be the same as that observed in CCTV survey for pipes under 150mm in diameter. No information is recorded on manhole frequency for laterals.

Sewer Manholes

GIS records 785289 sewer manholes, of which 434399 had a depth recorded. Where no depth to invert is recorded the profile of unknown depths is assumed to be the same as the profile of known depths for sewers. This is a change from AR08 where an "average depth" of 1.9m was assumed. This change in approach has led to a very significant valuation of sewers. Sewer manholes are not separately valued, but included as an uplift to the valuation of sewers. For valuation purposes, manholes are attached to critical and non-critical sewers using rules connected with known or assessed invert depth.

We have not audited the calculations undertaken by SW to re-assess its sewer costs for this annual return but, given the large number of unknown manhole depths, we believe that the revised approach is the most logical method of estimating the cost of such manholes.

Sewage and Sludge Pumping Mains

Data on sewage and sludge pumping mains are held in GIS. Condition grade information in GIS is based on the worst of; the assessment based on corrosion modelling from pipe samples (for external corrosion only), and the assessment from burst data. Performance data are based solely on the frequency of blockages. Hydraulic inadequacy is not assessed or recorded for performance assessment.

Scottish Water has determined the size and length of sewage pumping mains from information on the corporate GIS. A new process was undertaken this year for infilling missing data. The rising main lengths were traced and if a diameter and material was known at any point along the main, this diameter and material was applied to the whole rising main. If no diameter and material were known, a default value was infilled. All rising mains with no nearby information were infilled as 150mm.

As with AR08, the assessment of condition and performance grades of sewage and sludge pumping mains was based on age and material.

We understand that at present Scottish Water cannot relate bursts and blockages on sewage pumping mains to individual pumping mains to provide an assessment of condition and performance grade based on the definitions in the Reporting Requirements.

The lengths of sewage and sludge pumping mains reported have risen from AR08 due to new construction and inventory improvements.

Combined Sewer Overflows and Emergency Overflows

Location data for CSOs are recorded in GIS, where changes as a result of capital investment are also recorded. Difficulties remain because it is not always clear whether it is the weir location or the outfall location which is recorded. CSO asset data are held on Ellipse, which also records whether outfalls are screened or not. Updating of Ellipse from the CSO register is now complete. The assessment of condition is based on visual inspection using written grading guidelines. This information is collected from visits made for other purposes and there has been no CSO survey programme. It is recommended that the benefits of such a survey programme should be considered.

Performance is assessed on the basis of the number of spills per year. The number of spills recorded is based on customer complaints, telemetry triggers and numbers of screen operations, although not all screens have telemetry, so the number of spills may be under-recorded. The performance grade is assessed by reference to trigger levels for numbers of spills. CSO capacity is taken from the CSO Tactical Application. Design capacities are used and the information was seen during the audit to be site-specific.

There has been a small reduction in the number of CSOs reported due to the CSO programme which has led to abandonments and to better information.

Other Sewer Structures

There has been no updating of sewer tank data from last year. Location data are held in GIS. Capacities originating from drainage area studies are known and stored in Ellipse for all tanks. Condition and performance grades are unknown and are simply allocated in equal numbers to the sewer tank stock (i.e. 20% to each band). The GIS and Ellipse data sets have not been harmonised and Scottish Water acknowledge that further work is required on these asset data.

Sea Outfalls

Data are presented for two length bands: short (up to 500m) and long (over 500m). Data on location are held in GIS, which records the last manhole and the outfall point. The length of long sea outfalls has been assessed from record drawings, augmented by a full programme of physical surveys during AR08. Length was measured from the last manhole to the actual outfall position, which was verified by divers. Diameter was also checked. Assessed outfall lengths are held in an IDR database.

Condition and performance were assessed on the basis of visual external surveys, including underwater lengths by diver, together with reports of external damage. No assessment of hydraulic performance or internal condition was carried out, although internal CCTV pictures were used to confirm integrity. The same assessed remaining lives have been used as in previous years.

In our report on AR08 we noted that from outfall surveys the recorded lengths of outfalls had changed, but where the length was found to be less than 500m (i.e. short not long), outfalls had not been reallocated from H4.7 to H4.6. We therefore concluded that the long sea outfalls inventory was substantially overstated and the short sea inventory understated. This adjustment has now been made and with the addition of both long and short outfalls from the investment programme, results in an increase in inventory for short sea outfalls, with a small reduction in inventory for long sea outfalls.

Methodology – Calculation of MEAV

Critical and Non-critical Sewers

The Gross MEAV was calculated using the SEPL cost functions developed from the EES. These are the sewer pipe-laying functions. There are nine versions of each: grassland, rural and highway; each at shallow (<2m depth), medium (2 to 4m depth) and deep trench (>4m depth). SW developed a software code to determine which algorithm was applied to each asset. The cost function was determined based on surface type, diameter and depth. The diameter was "snapped" to a common currently available diameter prior to applying the function which is reasonable.

The surface type was chosen from the GIS field. We note that if there are errors in the surface type held in GIS the Gross MEAV will alter significantly because there is a large difference in cost between pipes laid in grassland and pipes laid in highways.

The average depth used is depth to crown of pipe. Where there is no average depth provided from the GIS database then an algorithm created for unknown depth is used. We have not audited these unknown depth algorithms.

Manholes are not separately costed but instead an uplift is applied to the cost of the sewers. During the year a significant reassessment of the valuation of sewer manholes was made. GIS records 785289 sewer manholes, but only 434399 have a depth recorded. It is necessary to apportion the unknown-depth manholes to sewers in different depth bands for pricing using Scottish Water ESS costs. This assessment led to a significant increase in the assessed MEAV of sewer manholes, which has risen to £3553m.

It is also necessary to apportion manholes to critical and non-critical sewers. This was done using a set of rules relating criticality to depth. The process has led to a reassessment of the percentage on-cost which should be applied to critical and non-critical sewers, which has risen from 2.6% and 2.4% to 24.1% and 18.0% for critical and non-critical sewers respectively. This assessment was not audited in detail.

The Gross MEAV calculated for critical and non-critical sewers was reasonable subject to the reliability of the base functions and dimensional data.

Sewage and Sludge Pumping Mains

The Gross MEAV was calculated using the WAML cost functions developed from the EES. These are the water main pipe laying functions which are similar in construction to sewage and sludge rising mains and therefore applicable. SW has used the cost curve for sizes ranging up to 1500mm diameter. The largest data point on the WAML curve is a 600mm pipe and therefore it is unlikely to be accurate at these larger sizes. Pipes greater than 600mm diameter account for 16% of the MEAV of the current database. SW developed a software code to determine which algorithm was applied to each asset. The cost function was determined based on surface type only. The diameter is "snapped" to a common currently available diameter prior to applying the function which is reasonable.

The surface type was chosen from the GIS field. We note that if there are errors in the surface type held in GIS the Gross MEAV will alter significantly because there is a large difference in cost between pipes laid in grassland and pipes laid in highways.

During the compilation of pumping main MEAV for AR08, no cost curves were provided in the database for pumping mains in grassland, so these were accidentally omitted. This has been rectified for the second draft business plan and for AR09, adding £52m to the asset valuation. It was not possible to audit this change as the inventory has further changed since AR08. However the total valuation for pumping mains in grassland now stands at £55m, so this appears consistent.

The Gross MEAV calculated for rising mains is reasonable subject to the reliability of the base functions and dimensional data. We are not confident in the valuation at sizes greater than 600mm diameter which is a significant proportion of the rising mains.

Combined Sewer Overflows

The Gross MEAV was calculated using the CSOX cost functions developed from the EES. This cost function uses the "X factor" from the Ellipse database which we understand is the pass forward flow at first spill. SW have converted this flow into a volume which is used in the algorithm. SW have not demonstrated how this volume is applicable to a CSO. The Gross MEAV value is reasonable for the functions, uplift and size data applied; although we are not satisfied the cost function has been used appropriately. This calculation was used for the AR08 report and has not been updated for AR09.

Other Sewer Structures

The Gross MEAV was calculated using the DETA cost functions developed from the EES to value storm water detention tanks. This cost function uses the "X factor" from the Ellipse database which we understand is the maximum storage volume. It is not clear if the X factor is the water storage volume or the gross volume of the storage tank; top water level may not be at the top of the tank. The majority of the volume data retrieved from Ellipse is a standard volume. We understand that the volume is not known for a large proportion of these structures and that this volume has been input as a gap model.

Short and Long Sea Outfalls

The asset valuation exercise used length and diameter as the cost yardsticks and applied cost curves to generate the net MEAV. Data were presented for two length bands: short (up to 500m) and long (over 500m).

SW has used an algorithm derived by Jacobs in their report "MEAV Technical Approach Sea Outfalls" February 2008 to value the Gross MEAV for short (up to 500m) and long (over 500m) sea outfalls, based on length and diameter. This equation has been applied to both classes of outfalls. The valuation includes all on-costs. There are no further additions.

In our report on AR08 we noted that from outfall surveys the recorded lengths of outfalls had changed, but where the length was found to be less than 500m (i.e. short not long), outfalls had not been reallocated from H4.7 to H4.6. We therefore concluded that the long sea outfalls inventory and MEAV were substantially overstated and the short sea inventory and MEAV understated. This adjustment has now been made and with the addition of both long and short outfalls from the investment programme, results in an increase in inventory and MEAV for sea outfalls.

Conclusions

During our audits we were able to compare the asset data in GIS, Ellipse, GIS and the CSO database with both the H4 tables and the databases used for manipulation and calculation of MEAV. These were found to be fully consistent.

There is significant infilling of data on material, depth and surface type for sewers and pumping mains. A total of 16403 km of laterals are included in the reported figure for non-critical sewers. This figure is based on a statistical assessment of lateral lengths for different property types changes each year as the assessment of the total numbers of houses of different types changes, which cannot be a realistic reflection of the length of laterals in the ground.

A nominal addition of 1000 km has been made to reflect Scottish Water's opinion that sewers are under-reported in the asset stock. 950 km of these sewers have been assumed to be non-critical and distributed across size bands 1, 2 and 3 in proportion to the provision of sewers in recent developments. The figure of 1000 km is repeated each year and not reduced by the length of any new discoveries.

During the year a significant reassessment of the valuation of sewer manholes was made. A significant proportion of manholes have no depth recorded and the unknown-depth manholes were allocated to sewers in different depth bands for pricing using Scottish Water ESS costs. This assessment led to a significant increase in the assessed MEAV of sewer manholes, which has risen to £3553m. It was also necessary to apportion manholes to critical and non-critical sewers. This was done using a set of rules relating criticality to depth. The process led to a reassessment of the percentage on-cost which should be applied to critical and non-critical sewers, which rose from 2.6% and 2.4% to 24.1% and 18.0% for critical and non-critical sewers respectively.

During the compilation of sewer MEAV for AR08, no cost curves were provided in the database for sewers in grassland, so these were accidentally omitted. This has been rectified for the second draft business plan and for AR09, adding £52m to the asset valuation.

A number of sea outfalls have been reallocated from the long to short category which, with the addition of both long and short outfalls from the investment programme, results in an increase in inventory and MEAV for short sea outfalls, with a reduction in MEAV for long sea outfalls.

There have been significant movements in both inventory and MEAV for some classes of asset, but these have been satisfactorily explained. Changes to cost curves and the application of on-cost affect the MEAV of most asset classes.

We concluded that asset data on non-critical sewers (in particular laterals) and other sewer structures assets are of variable quality. This is properly reflected in the confidence grades assigned.

Comments by Line

Line 1: The assessed gross MEAV of £9320m for critical sewers for AR09 has risen very significantly from £7208m at AR08. This increase is principally due to the significant increase in assessed uplift relating to manholes and also due to changes in inventory. Critical sewers are one of the largest components in Scottish Water's overall asset valuation.

Line 2: The assessed gross MEAV of £13680m for non-critical sewers for AR09 has risen very significantly from £10621m at AR08. This increase is principally due to the significant increase in assessed on-cost relating to manholes and also due to changes in inventory. Non-critical sewers are the largest single component in Scottish Water's overall asset valuation.

Line 3: The assessed gross MEAV of £238m for sewage and sludge pumping mains for AR09 has risen from £189m at AR08. This is due to increases in inventory and the application of new cost curves and oncosts.

Line 4:	The assessed gross MEAV of £162m for combined sewer overflows and emergency overflows for AR09 is significantly reduced from £288m at AR08. This is due to the closure of a number of CSOs, due to the CSO investment programme and the removal from the inventory of a number of chambers which were found on investigation to be bifurcation chambers.
Line 5:	The assessed gross MEAV of £175m for other sewer structures for AR09 is significantly increased from £75.6m at AR08 due to a significant change in the cost curve and oncosts.
Line 6 - 7:	The assessed total gross MEAV of long and short sea outfalls of £576m AR09 is significantly increased from £312m at AR08. This increase is due to a significant increase in inventory, the application of revised cost curves and on-costs.

Comments by Confidence Grade

For AR08, Scottish Water undertook an analysis of the uncertainty in the various data sources which contributed to its new MEAV valuation to estimate the uncertainty in the reported values. This analysis informed the assessment of confidence grades and resulted in a number of changes. Compared with AR08, there have been no further changes in the confidence grades allocated by Scottish Water to either asset inventory or MEAV and we support the grades allocated.

Non-critical sewers are the largest component of Scottish Water's overall MEAV, but data are subject to a significant level of extrapolation for length (particularly for laterals) and of infilling for other parameters and we believe that no better confidence grade than C5 can be justified.

9.6 Table H5: Current Asset Inventory – Wastewater Non-Infrastructure

Commentary by REPORTER

Key Points

- Scottish Water has submitted a complete return of its wastewater non-infrastructure asset inventory.
- Only operational assets are reported. Redundant and decommissioned assets are excluded.
- The assets have been valued using a Modern Equivalent Asset Valuation (MEAV) approach, with revised cost curves used for valuation. Cost curves have been significantly updated during the year to retire old cost data and introduce further data based on actual Scottish Water Q&S3a programme costs.
- Changes in asset data in the year are restricted to changes due to investment and operational status with limited data improvement.
- The methodology adopted by Scottish Water means that where a works capacity is unknown, factors such as population equivalent determine the asset value. It is possible for investment to create additional sub-assets without increasing either capacity or population equivalent served. In these circumstances asset investment will have increased the asset base without having any impact on the MEAV valuation.
- We concluded that asset data on water non-infrastructure assets are of reasonable quality. There is good information on operational status. Capacity data for pumping stations has been subject to significant infilling. There are shortcomings in the quality of condition and performance data
- Scottish Water has allotted confidence grades broadly similar to those given in AR08. Base data are still subject to some infilling and estimation, particularly relating to pumping capacities and the overall grade of C4, unchanged from last year, is accepted.

Methodology - Asset Data and Inventory

Asset Surveys

Most non-infrastructure assets have been surveyed. The surveys fall into three main groups: those surveyed prior to 2006/7, the large majority surveyed during 2006/7 as part of the Non-infrastructure 2006/7 (NIS 07) project, and sites surveyed as part of the Works Operational Manual (WOM) update project. Sites scheduled for survey as part of the planning for NIS 07 were determined following a review of data already held on Ellipse at that time. Where surveys had already been carried out or existing Ellipse data from sources such as WOMS were judged to be of good quality, no survey was programmed in NIS 07. Where data gaps were perceived in Ellipse data, partial surveys were programmed. Where inadequate data were present in Ellipse, full site surveys were programmed. Unsurveyed sites are believed to be mainly small and remote.

Sites were been graded for condition, performance and health and safety issues using grading pro-formal based on the WRc methodology. A sample of site surveys were checked by site visits for our report on AR08. We concluded that the methodology applied to wastewater non-infrastructure data collection was comprehensive and suitable for collection of the data required. Spreadsheet data for the wastewater sites audited were generally correct. Because the survey was independent of operations some condition and performance grades were wrong and some refurbished plant had not been identified as such. Some dimensional data, particularly for height, were missing and remaining asset life calculated values seemed inconsistent with actual site conditions. Further sites were visited for the 2nd draft business plan where we noted that *"The wastewater asset lists continue to be generally satisfactory"*

Ellipse Data Coverage

The Ellipse system holds attribute data, information on the asset hierarchy, data on condition and performance and data on date of installation or refurbishment where known. No cost data are held. Ellipse holds only real asset data. Where gaps exist these are filled during the compilation of the valuation, as described below.

Capacity Data

Capacities are taken as the design capacity. These are taken from works drawings or manuals. If these are not available then capacities are checked by surveys. Capacities were checked during the Non-infrastructure Survey 2006-7 and business-as-usual changes are also made from time-to-time.

Condition and Performance

Condition and performance data are held at sub-asset and asset level and determined from site surveys.

Asset Age

Ellipse holds the following asset age data, where these are known:

- Refurbishment date - sub-asset level
- Installation date - sub-asset level
- Refurbishment date - asset level
- Installation date - asset level

Works Type

Works type is a defined field in survey pro-forma. Confirmation of secondary and tertiary WWTW type is done from the assets present on site, using a menu approach. WIC definitions are used. Validation of works type is done by the Asset Planner in conjunction with Operations.

For sewage pumping stations, stations were in the past allocated as terminal stations if located within the boundary of a WWTW. This method gives rise to a small possibility of error, where a terminal station is located outside a WWTW boundary. In the report year Scottish Water has made an effort to identify such stations.

Sludge treatment assets usually occur within WWTW sites. The distinction is made between the types of asset as follows. In a WWTW sludge is dewatered to a point where transport is economical, but there is no change in the nature of the sludge. In a sludge treatment centre (STC) the nature of the sludge is changed prior to disposal, for example by digestion.

Capacity

Size bandings for table H5 are based on the nominal design capacity of the works

Asset Ownership

Some sludge assets in use are not within Scottish Water ownership, but are owned and run by Public/Private Partners (PPP). These assets are recognised in Table E3A of the Annual Return. No sludge is disposed of to assets owned by other contractors.

Operational Status

Ellipse records the operational status of assets as operational, non-operational and redundant. Non-operational assets are those which are not in use, but capable of being returned to use ('mothballed'). Redundant assets are those incapable of being returned to operational use without capital investment. Only operational assets are reported in the H Tables.

Transfer of Survey Data Into Ellipse

Survey data are uploaded into the Ellipse system by the Ellipse team. Updated data for Ellipse comes from surveys, project completions, routine data-cleansing and from updates passed to the asset data help-desk. It is difficult to define the source of the data actually adopted for Ellipse and to define the audit trail. It is recommended that Scottish Water consider how the audit trail is recorded for assets and asset data in Ellipse, to improve confidence in their reliability.

Controls Over Ellipse Data Updating

Ellipse data have been updated during the last year to reflect the results of asset surveys, project completions, and other 'business as usual' changes, including sites becoming non-operational, notified principally by operators. All data changes are made in accordance with a defined procedure (NI – ADC/PRC/01) and can only be made by the 7 members of the Ellipse team. Three types of Ellipse update can be made: a creation script (for a newly-entered asset or sub-asset), a modification script (for modification to an existing asset or sub-asset), or a changed parent script (where an asset or sub-asset is assigned a revised place in the asset hierarchy). The type of change is recorded in a history file and the source of the data is also noted. The Ellipse system was viewed live and a number of data amendments checked. The data held in the system were in every case seen to be consistent with the change notfication.

The Ellipse team now receive project data at CAPEX 3 (design) stage to provide advance warning of impending changes due to construction. These are checked and entered at the CAPEX5 stage following project completion.

Validation of the works type is done by the Asset Planner responsible, in conjunction with Operations.

Methodology - Calculation of MEAV

The Ellipse system is the sole source of asset data for non-infrastructure assets. Ellipse holds only real asset data. Where gaps exist these are filled during the compilation of the valuation.

Cost Curves

The valuation of sewage treatment works and sludge treatment facilities has increased significantly due to the reassessment of cost curves for all components. The principal change arises from a change in the valuation of control and monitoring equipment. This was previously assumed to be the same for all sizes of works. More data are now available from Scottish Water's current investment programme and control and monitoring equipment is now valued as a function of the total site construction cost.

Calculation of Gross MEAV

The methodology used for the calculation of gross MEAV for the H Tables follows that outlined in the Jacobs UK Limited report 'Scottish Water, Modern Equivalent Asset Valuation – Technical Approach, Non-infrastructure Assets H2 Water and H5 Wastewater', with the exceptions that non-operational assets are not reported. This methodology works at a sub-asset level. Cost curves have also been developed for other site assets (such as roads) which were previously assessed by adding a proportion of site valuation.

Gross MEAV is calculated, at a sub-asset level by applying the relevant cost curve to a capacity yardstick (known as an 'X-factor') for the sub-asset type. The classification of yardsticks is as follows:

- Level 1 yardstick – a known capacity giving a direct Ellipse Rating (such as a tank capacity, or a screen rating). Where this is not available then the process defaults to:

- Level 2 yardstick – dimensional information is used to calculate capacity, giving an Input Parameter. This applies mainly to tanks. Where this is not available then the process defaults to:

- Level 3 yardstick – capacity information is not known at sub-asset level, but only at asset or site level. The X-factor is determined from the asset or site-level data.

There is a small proportion of sites, where no capacity data is known. These include sewage pumping stations and sewage works. In these cases the input parameter is calculated from any known data, such as a WWTW population treated. Such sites are generally small. Capacities are known for all other asset types.

For mixed assets (those with both M&E and civil components) the sub-asset valuation is sub-divided between civils and M&E on a standard percentage basis for each type rather than by separately calculated values for civils and M&E. The standard percentages were produced by Jacobs Ltd. as part of the MEAV project. These percentages have been reviewed during the report year as it was considered that the M&E proportions of some assets had been overstated. As these components deteriorate more rapidly than civils, the overall effect was to lead to more rapid depreciation for assets with a high proportion of M&E sub-assets.

To produce the final MEAV for each sub-asset, an uplift factor (for construction overheads) and COPI indexing are applied to the figure calculated as described above. Land assets are also created to hold an appropriate value in relation to the total site value.

Calculation of Net MEAV

Net MEAV data given in Table H have been produced by taking Gross MEAV, multiplied by Assessed Remaining Life and divided by Expected Life. Expected asset lives are expected book lives. These were revised for the second draft business plan and were listed in an appendix to our commentary on that plan.

Asset Age and Calculation of Remaining Life

Ellipse holds the following data relevant to the calculation of remaining life:

- Refurbishment date - sub-asset level
- Installation date - sub-asset level
- Refurbishment date - asset level
- Installation date - asset level
- Condition and performance data

Remaining asset life for the H Tables is calculated in accordance with the following rules:

Level 1a – Apply 'date refurbished' at sub-asset level

Level 1b – Apply 'date installed' at sub-asset level

If data are not available at sub-asset level, then default to:
Level 2a – Apply 'date refurbished' at asset level

Level 2b – Apply 'date installed' at asset level

If data are not available at asset level, then default to:

Level 3 - Use condition grade at sub-asset level to determine the remaining life from the following matrix, which assigns a % remaining life according to condition grade :

Condition Grade	[Remaining Life % of Service Life]
1	87.50%
2	62.50%
3	37.50%
4	12.50%
5	0.00%

This table gives results based on standard design lives and ignores the condition of the asset where refurbishment or installation dates are known. This discounts the possibility that some assets may outlive their book lives. However it is equally possible that some assets will not reach their book lives and so this is a reasonable assumption for the purpose of aggregate MEAV asset valuation.

In all cases, MEAV is calculated on the basis of total replacement at the end of assessed remaining life, rather than repair or the replacement of components only.

The calculation of remaining life could be improved by taking a risk-based approach and looking at the reliability history of individual assets and sub-assets. This would however generate a very large data-gathering exercise, which is not seen to be justified for the purpose of MEAV valuation.

Short, Medium and Long-life Assets

The allocation of asset lives to short, medium and long-life categories is on the basis of expected asset lives. These were revised for the second draft business plan and were listed in an appendix to our commentary on that plan.

Quality of Age Data

Data collected by Scottish Water since its formation from predecessor authorities are considered to be of good quality and have been collected on a consistent basis. Data collected before April 2002 are of unknown quality, originating from legacy systems. It is not currently possible to plot asset age for specific sub-asset and asset types. It is recommended that this capability should be developed to identify data anomalies and shed further light on confidence grades.

Mixed (Civil/M&E) Assets

Mixed assets and sub-assets have both civil and M&E components. This is the case for most treatment assets. In these cases standard allocation percentages are used. These percentages have been reviewed during the report year as it was considered that the M&E proportions of some assets had been overstated. As these components deteriorate more rapidly than civils, the overall effect was to lead to more rapid depreciation for assets with a high proportion of M&E sub-assets.

Land Valuation

The land associated with each group of assets is valued as a site level as an asset associated with that site and a value of 3.5% of the total value of assets on the site is attached to it. For AR09, the value of assets on the site is taken as the construction costs, with no addition of on-cost. Land is not valued for this purpose on the basis of a specific land valuation. This would represent a major exercise and may not be considered worthwhile for the purpose of MEAV valuation. However it is recommended that regional factors should be applied to assess land values in future, recognising the increased value of sites in some regions of Scotland.

Conclusions

During the audit, sample data checks were made during which the inventory numbers for lines H5.1 – 5.2 were reconciled with the base data in Ellipse.

For these lines changes in operational status were examined and verified and the numbers in the table reconciled with site names and status, although no reason for the change was given in 4 of the 5 cases examined where Scottish Water stations became non-operational. Three stations were reclassified as non-Scottish Water and the change requests seen. Three of the 83 new pumping stations (mainly adoptions) were reviewed and change requests seen. None of the new sites had the size banding recorded on Ellipse.

We concluded that asset data on wastewater non-infrastructure assets are of reasonable quality. There is good information on operational status. Capacity data for pumping stations were not always present and have been subject to significant infilling. There are some shortcomings in the quality of condition and performance data.

Comments by Line

Lines 1&2:	The gross MEAV of sewage pumping stations has risen from £730m at AR08 to £799m for AR09. The change arises principally due to the increase in pumping station numbers. It is not clear whether legacy data on capacities refers to individual pumps or to total station capacity. Scottish Water intends to improve cost curves by collecting new data, but this will take some time as few new stations are built each year.
Lines 3-7	The gross MEAV of sewage treatment works has risen from £1993m at AR08 to £2504m at AR09. The change is principally due to revision of cost curves to reflect data from Scottish Water's current investment programme. There has been no significant underlying change in the assets.
Lines 8 - 13	The gross MEAV of sludge treatment facilities has risen from £61m at AR08 to £105m at AR09. The change is principally due to revision of cost curves to reflect data from Scottish Water's current investment programme. There has been no significant underlying change in the assets.

Comments by Confidence Grade

Confidence grades for wastewater non-infrastructure asset inventory have remained unchanged from AR08. The overall MEAV confidence grade is unchanged at C4. Despite the improvements made to the process for valuation and improvements in data, significant uncertainties remain. In our previous report we noted that the extent of data infill and extrapolation make a confidence grade difficult to assess but we accept the grades allocated by Scottish Water. We recommend that Scottish Water undertakes a robust analysis of the uncertainty in the various data sources which contribute to its new MEAV valuation to estimate the uncertainty in the reported values. This analysis would inform the assessment of confidence grades.

9.7 Table H6: Current Asset Inventory – Support Services

Commentary by REPORTER

This table was not audited for AR09. There have been no changes in the methodology for the preparation of the MEAV and it is understood that any changes relate only to changes in inventory, cost curves and the application of on-costs. There is little change in the overall MEAV for support services assets and confidence grades are unchanged from AR08.

Appendix A

The Reporter's team

APPENDIX A: THE REPORTER'S TEAM

General

The Annual Return 2009 has been audited and reported on by an Independent Reporter. Mr D Arnell, a Technical Director of Black & Veatch (B&V), is the appointed Independent Reporter for Scottish Water.

For this submission the Reporter was assisted in his work by a team of experienced engineers and other professionals. The organisation, structure and personnel used by the audit team are described below.

Organisation and Structure

The organisation and structure of the Reporter's team for the audit of this Submission is set out on Figure A.1.

Individual members of the audit team report directly to the Reporter. The Reporter has access to support services at Black & Veatch including administrative assistance, quality assurance procedures and specialist advice. The Reporter is responsible for links with external bodies including the Company, WIC, SEPA and DWQR. The Reporter also acts as a Independent Reporter in Wales and has access to other reporters and regulators in England and Wales. The Reporter carried out audits on Levels of Service, the water balance and Security of Supply Index.

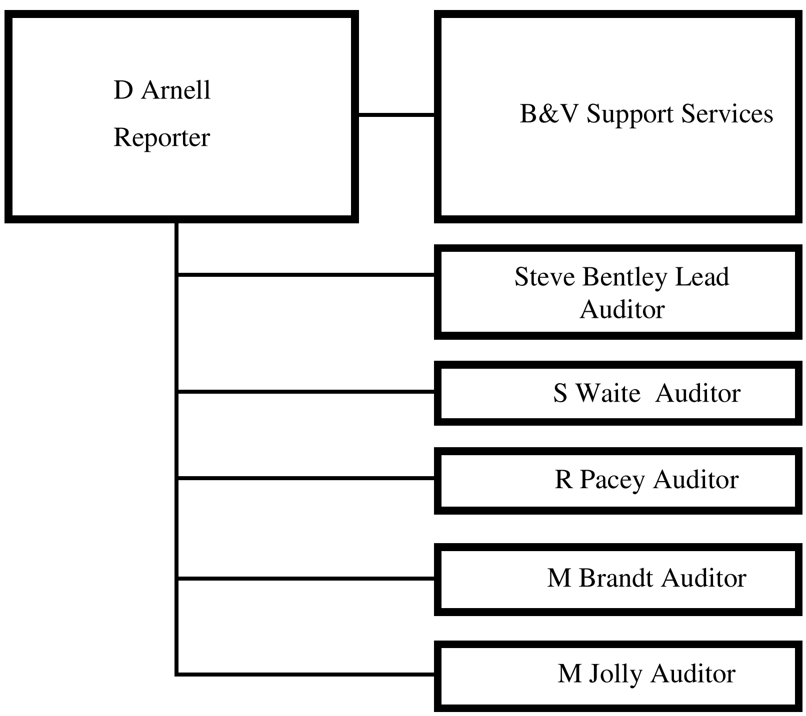


Figure A.1 Structure of the Reporter's Team

Personnel used by the Reporter

For this Submission the Reporter was assisted in his work by the following team:

Mr S Bentley, Lead Auditor: Mr Bentley is a consultant with Black & Veatch. Mr Bentley undertook reviews on asset related levels of service (water pressure, interruptions to supply and flooding), the asset inventory and the capital programme

Ms S Waite, Auditor: Ms Waite is a consultant to Black & Veatch. Ms Waite reviewed work on operating costs.

Mr R Pacey, Auditor: Mr Pacey is a consultant with Black & Veatch. Mr Pacey undertook reviews sewerage outputs, explanatory factors and parts of the asset inventory.

Mr M Brandt: Mr Brandt is a Divisional Director with Black & Veatch and undertook work on population, flows, the water balance and the security of supply index.

Mr M Jolly: Mr Jolly is a Technical Director with Black & Veatch and undertook work on PPP information.

The Reporter's team operates completely independently of the Company. Members of the Reporter's team are not engaged in consultancy studies or other service contracts associated in any way with the preparation of submissions for the Company during the period in which certification responsibilities are required.

Appendix B

Quality Assurance procedures

APPENDIX B Reporter's Quality Assurance procedures

General

In the Reporter's Protocol it is noted that the Reporter should annex the quality assurance procedures used in relation to certification of the Company's submission to his report. The applicable quality assurance procedures are outlined below and consist of the following:

- The relevant section of the quality assurance procedures of Black & Veatch;
- The current version of the Project Plan prepared under the quality assurance procedures of Black & Veatch which summarise information, the scope of work and procedures relating to reporting on the Company's submissions to WIC; and
- The audit plan for this Submission which was prepared and submitted to WICS and Scottish Water as required in the Reporter's Protocol

The Quality Assurance System of Black & Veatch

The work has been carried out under the Quality Assurance system of Black & Veatch.

Black & Veatch has an established Quality Assurance system certified by an accredited agency to meet the requirements of BS EN ISO 9001:2000 for the provision of consulting engineering services to the water industry and other sectors. The documentation of the system comprises a Quality Manual and a comprehensive set of procedures. Associated with these procedures are documents giving guidance on the application of the procedures to particular projects, thereby achieving a uniformly high standard of product by Black & Veatch.

Documentation and records relating to the Quality Assurance procedure may be inspected by arrangement at the offices of Black & Veatch.

The Project Plan

To focus the application of the Quality Assurance system for individual projects a Project Plan is prepared. The purpose of this plan is to define the objectives to be obtained in the execution of work in the project. The plan identifies the standard procedures that shall apply to the project and defines any special procedures that may be required. In addition, it gives details of the staff responsible for undertaking work on various aspects of the project including checks and reviews.

A project plan has been prepared relating to reporting of June Returns and a copy is available for inspection if required.

Appendix C

Specific documentation that supports the Reporter's report

APPENDIX C Documentation supporting the Reporter's report

The Reporter's team undertakes its work by means of meetings and reviews of supporting information provided by Scottish Water. This information may be reviewed at the time but some information is requested for later delivery. Information may either be in electronic or paper form. Handwritten meeting notes are taken at each meeting. These are not typed up.

All meeting notes and any supporting information in a paper form are filed in sectionalised lever arch files. These are available for inspection at any time.

Appendix D

Summary of meetings, inspections and audit trails

APPENDIX D Summary of meetings, inspections and audit trails

Date	Location	Personnel	Subject
27/04/09	Fairmilehead Office	JS, IT, TR, DA	DA/1: Tables B4 & B7 Customer Services
28/04/09	Fairmilehead Office	DM, IT, AJ, DA	DA/2 Table B4, telephone contacts
29/04/09	Balmour Road Office	LD, IT, DA	DA/3 Table B7 GMS payments
5/05/09	Castle House	PH, DA	DA/4: Table E1 Infrastructure depreciation charge
6/05/09	Castle House	IT, DA	DA/5: Message manager and calls abandoned
6/05/09	Castle House	EM, TH, DA	DA/6: New obligations
7/05/09	Castle House	SF, FG, DA	DA/7: ABM, Facilities Department
7/05/09	Castle House	GW, EM, TH, DA	DA/8: Tables G5 & 6, Investment plan risk items
9/05/09	Castle House	BM, DA	DA/9: DMA stock
14/5/09	Castle House	DMG, DA	DA/10: Employee numbers
14/5/09	Castle House	PD, BMG, DA	DA/11: Governance
19/5/09	Castle House	BMC, RC, NB, KD, CC3, DA	DA/12: Development Constraints
19/5/09	Castle House	CC4, IL, GG, DA	DA/13: UID Strategic Studies
29/5/09	Edinburgh	BO, DA	DA/14: Audit Committee
27-28/04/09	Fairmilehead Office	BB, KM, JR, MW, WC, RH, PL, DM, MB	MB/1: Water Balance for OPA and A tables
11-13/05/09	Fairmilehead Office	CO, PC, RL, JR, NA, JML, MB	MB/2: A1, A2, and part E6, E7 and H Tables
14/01/09	Juniper House	RS, IC, CC, CJ, GMC, MB	MB/3: SOSI calculation and B tables
20/4/09	Castle House	SEB, IP, KM	SEB/1 – Sewage Flooding Incidents
20/4/09	Castle House	SEB, ST, AMcK	SEB/2 – Sewage Flooding Risk Register
21/4/09	Castle House	SEB, MR, AJ, MP	SEB/3 – Interruptions to Supply
22/4/09	Castle House	SEB, MP, CL	SEB/4 – Low Pressure
23/4/09	Castle House	SEB, DMcB	SEB/5 – Drainage studies
24/4/09	Castle House	SEB,RM, LJ, GI	SEB/6 – H Tables - general
24/4/09	Castle House	SEB, LJ, GI	SEB/7 – Tables H1,2,3
28/4/09	Castle House	SEB, MH, MW	SEB/8 – Tables D1,2,3
29/4/09	Castle House	SEB, LJ, RM, MC	SEB/9 – Tables H1,3,4
30/4/09	Castle House	SEB, IP, MW	SEB/10 – Tables D7,8
6/.5/09	Watermark House	SEB, SBo, EG, AD, SD	SEB/11 – Coulter New WTW Upgrade
6/5/09	Watermark House	SEB, SBo, EG, DH, RM	SEB/12 – Dalscone (Old) Refurb
6/5/09	Watermark House	SEB, SBo, DL	SEB/13 – Killylour WTW Upgrade
7/5/09	Watermark House	SEB, GM, TF, MMcG	SEB/14 – Penwhirn WTW Upgrade
7/.5/09	Watermark House	SEB, BN, EC, PS, EG, AF	SEB/15 – UID Airdrie and Coatbridge Transfer
7/.5/09	Watermark House	SEB, BW, BM	SEB/16 – Kenmore ST
7/.5/09	Watermark House	SEB, JR, EC, BN	SEB/17 – UID WP6.1 Kilmarnock Gravity Transfer Scheme
8/.5/09	Leven House	SEB, RB, SR, SC, JT	SEB/18 – Bowmore ST

Date	Location	Personnel	Subject
8/5/09	Leven House	SEB, JC	SEB/19 – Whiting Bay ST
8/5/09	Leven House	SEB, EC, EG, IMcG, LK, CC	SEB/20 – UID Rear of Chriss Avenue
8/5/09	Leven House	SEB, TR, SW, EG, SBo, IH	SEB/21 – WOA000266 – Milngavie M3
12/5/09	Castle House	SEB, MH, PD	SEB/22 – G Tables Reconcilliation
12/5/09	Castle House	SEB, MH, MW	SEB/23 - G Tables Reconcilliation
12/5/09	Castle House	SEB, MH, PH	SEB/24 – Infra Charges, Grants and Contributions
13/5/09	Castle House	SEB, JRo, RM, GI	SEB/25 – Reconcile E & H Tables
13/5/09	Castle House	SEB, DMcL, SH	SEB/26 – Development Constraints
25/5/09	Castle House	SEB, RB	SEB/27 - Reconcile Outputs with Expenditure
25/5/09	Castle House	SEB, MF, IP	SEB/28 - Reconcile Outputs with Expenditure
26/5/09	Castle House	SEB, TS, DMcI	SEB/29 – Table G8
26/5/09	Castle House	SEB, MB	SEB/30 – Outputs Monitoring
26/5/09	Castle House	SEB, DP, AC, CC	SEB/31 – Tables G7,8
26/5/09	Castle House	SEB, SC, JT	SEB/32 – Table G7
27/5/09	Henderson Drive	SEB, GL, SBo	SEB/33 – Alness and Invergordon WWTW
27/5/09	Henderson Drive	SEB, SBo, SS, JB, CR	SEB/34 – Env FTP - Kishorn
27/5/09	Henderson Drive	SEB, SBo, NMcK, JF, Ssi, EG	SEB/35 – STW Capital Maintenance - Torlundy
27/5/09	Henderson Drive	SEB, PD	SEB/36 - Water Safety Plans
28/5/09	Watermark House	SEB, MH, MW	SEB/37 – Reconcile opex by purpose and driver
29/5/09	Watermark House	SEB, MH, BMcC, DP	SEB/38 – Reconcile K56 and G6
29/5/09	Castle House	SEB, ST	SEB/39 – Confirm Base Opex in G Tables
21/4/09	Castle House	AM & RAP	RP/1 Table B8 Other service indicators - intermittent discharges
22/4/09	Castle House	PD & RAP	RP/2 Table B8 Other service indicators - water mains bursts
16/4/08	Castle House	MB, JR & RAP	RP/3 Table B8 Other service indicators - WTW Turbidity
23/4/ 08	Castle House	SB, MR, KM & RAP	RP/4 Table B8 Other service indicators - sewer collapses and failures, blockages
24/4/09	Castle House	CO'N, TB, RL & RAP	RP/5 Surface & Roads Drainage
29/4/09	Castle House	SB, ES & RAP	RP/6 Table B8 Sewerage Equipment Failures
30/4/09	Castle House	SH, SMcC, JH, JS, PD & RAP	RP/7 Hand held devices, job completions and asset records
30/4/09	Castle House	SW & RAP	RP/8 STW Performance
1/5/09	Castle House	ST & RAP	RP/9 Table E6 Water assets - population and area by Region
07/5/08	Castle House	MH, RM, DS & RAP	RP/10 Tables D5 Mains asset balance
5/5/09	Castle House	DM, GS & RAP	RP/11 Tables A2, B4 Septic tank and other tanker loads
5/5/09	Castle House	DW, PD & RAP	RP/12 CCTV of Critical sewers
6/5/09	Castle House	GS & RAP	RP/13 Tables A2, E6, E8, E9, E11 Sewage Loads and Volume of Sewage
7/5/09	Castle House	MH, RM, DS & RAP	RP/14 Tables D5 Mains asset balance

Date	Location	Personnel	Subject
7/5/09	Castle House	MH, RM, DS & RAP	RP/15 Tables D6 Sewer balance
8/5/09	Castle House	PD, JR & RAP	RP/16 Peak demand and Pumping head
11/5/09	Castle House	GS & RAP	RP/17 Tables E7 Drained area
11/5/09	Castle House	AM & RAP	RP/18 Table E11 Asset Data M&G IT Assets
12/5/09	Castle House	GS, DM & RAP	RP/19 Tables E10, H1, H6, D6 Sludge treatment and disposal
13/5/09	Castle House	DM, GS, EL, AO, FB & RAP	RP/20 Tables A2, H1, H5, P11, P12 Sludge & Audit 13 Tables A2, B4 Septic tank and other tanker loads
13/5/09	Castle House	GS & RAP	RP/21 Tables E8, H1, H5 Asset data - wastewater treatment & Audit 54 Tables E8, E9, C4 Wastewater treatment works
13/5/09	Castle House	AM, PW & RAP	RP/22 Table E11 Asset Data M&G IT Assets
14/5/09	Castle House	PW, DR & RAP	RP/23 Table E11 Asset Data M&G IT Assets
14/5/09	Castle House	RS & RAP	RP/24 Tables A1, P11 Trade Effluent & Audit 11 Tables A1, A2 Trade Effluent

Reporter's team

DA David Arnell, Reporter
SW Sally Waite
SB Steve Bentley
RP Roger Pacey
MB Malcolm Brandt
MJ Martin Jolly

Company and Supplier staff

BO Belinda Oldfield
SA Stephen Armstrong
MB Michael Baird
LB Laura Birch
SB Stuart Byfield
HC Helen Cameron
MC Mark Campbell
AC Allan Coulter
AD Alistair Davidson
PH Peter Haddow
GH Graeme Hamilton
MH Margaret Harding
GH Greig Hay
AJ Aileen Jardine
DJ David Johnson
CL Craig Low
KM Kevin Mair
AM Alistair McKenzie
JS Jacqueline Sutherland
DM David Macdonald
KD Kieran Downey
GP George Ponton
EM Ewan Matteys
PC Patrick Lynn
AM Alan McLean
DM David Mentiplay
FN Fraser Nicholson
CO Colin O'Neill
IP Iain Palmer
MP Mark Petrie
KP Keith Phillips
MR Martin Reilly
JR John Robertson
RS Richard Scoble
DS Devanathan Sethuraman (Farrer)
ES Eddie Sharp
GS Gordon Stenhouse
ST Steven Templeton
AW Andy Walkley (Farrer)
MW Martin Walton
SW Steven Waugh
DW David Winter
IT Ian Turpie
LD Lorraine Dutch
DP Dave Petrie
GW Gavin Ward
DC Douglas Cassells
AMC Alan McLean

MA	Miriam Ali
PD	Peter Douglas
ST	Scott Turkington
RyP	Ryan Prangle – Data Management
AF	Alan Farr
JT	Jim Tracey
GL	Glyn Lloyd
LC	Leslie Cameron
EM	Ewen Matthey
EH	Ewen Harrison
DL	David Lavery
IM	Ian Morton
GS	Ged Shotton
CC	Charles Cameron
LC	Lewis Chapman
LB	Les Bell
JC	John Carty
SW	Stephen Watson
SH	Stephen Horne
IP	Ian Piggott
JMcL	John McLeod
SM	Stuart Milne
GW	Graham Wood
PF	Peter Faulkes
MMcG	Mark McGlaughlin
DMcC	Debbie McCormick
RS	Rennie Stone
BM	Brian Martins – Galliford Try
SF	Suzanne Foo
AMcL	Alan McLeod
DT	Dave Turner
IMcK	Ian McKay
IP	Ishbel Parry
NB	Norrie Butter
PD	Paul Davidson
JH	Tom Hedley
RS	Robert Stewart
MM	Mike Mahon
AMcK	Alastair McKenzie
RS	Robert Stewart
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EH2	Elaine Hutchison
LM	Lindsey McMillan
AJ	Aileen Jardine, IDR
CO	Colin O'Neill
SH,	Stuart Henderson
CC	Colin Collier
BMC	Brian McCarthy
RC	Ross Craig
CC4	Claire Chapman
GG	George Guszcana
IP	Ian Palmer
JMcD	Jill McDonald
SB	Steve Boyes
HX	Helena Xanthopoulis
JI	Jackie Ingram
JMcMi	Jim McMillan
MP	Mark Petrie
EH	Eric Hutchinson
AC	Alex Cranston
AF	Alan Falconer
SC	Stefan Corbett
PT	Phillip Todd
JF	John Fyldes
SW	Stephen Watson
GS	Gillian Sneddon
MP	Mark Pearson
DMcG	Duncan Mc Guinity
BN	Brian Nichol
BM	Brian Mitchell
PM	Patricia Melly
JCl	Jim Clarke
AF	Alan Farr
IH	Ian Heggoty
PL	Paul Leithead - Carrillion
JK	Jim Kane
GM	Garvey Murray
NH	Nick Hailey
JL	John Leslie
HMcP	Hugh McPherson
MG	Murray Gordon
GL	Glyn Lloyd
NB	Neil Brennan
HC	Helen Cameron
MB	Michael Brennan
KM	Kieran Morgan
RB	Rod Balfour
GMcL	Gordon McLee
MS	Murray Stewart
DW	David Winter
RM	Raymond Miller
JR	John Robinson, Contractor (RPS)
CC2	Conner Crawford, Contractor (Jacobs)
RD	Richard Dixon, Contractor
PH	Patrick Heaton, Contractor
WB	Bill Brydon
BM	Brian McKinnon
TR	Tracy Rafferty, Customer Services
KD	Kirk Daniel
CC3	Colin Christison
IL	Ian Laing

Appendix E

Summary of time and costs

APPENDIX E Breakdown of time and costs

The breakdown of the estimated time spent by the Reporter and his team for the Annual Return 2009 only is shown in the table below:

Reporter/Team Member	Time spent (Hours)
D Arnell	210
S Bentley	305
S Waite	38
R Pacey	180
M Brandt	165
M Jolly	35
Total	933

The figures quoted above relate to estimated time expended to the 3rd July 2009. The figures exclude any work undertaken answering queries.

We were not able to work within our target hours this year. In particular we spent more time than anticipated on the OPA report and in particular on properties, populations and the water balance

The costs of undertaking the work are given in our letter of transmittal.

Appendix F

Areas of concern and challenge

APPENDIX F Areas of concern and challenge

In this Appendix we describe some of the challenges we made to the Company while it compiled the information for its Annual Return. We had numerous discussions on points of detail which are covered in our main report sections.

Tables A1 & A2

General

The overall methodology and calculation developed for producing the water balance which feeds into tables A1, A2 E6 and the P tables is a thorough well structured process that generally delivers consistency across the tables. The relationships between lines in the tables are readily auditable. We also noted that discrepancies in the final tables of previous returns have not been evident this year. However we are still aware that different teams are responsible for individual table lines and that common data required by the different teams was supplied at different times before the base data had been finalized requiring reworking by the teams when identified.

Table A1

Scottish Water was expecting to use the CMA's data for trade effluent figures because these should be a complete record and consistent with the charges made. However, on inspection the CMA record is volumetrically 15% less than SW's reasonable assessment and therefore SW used the same methodology as in AR08. We expect this problem to apply to the current year only.

Table A2

When undertaking the OPA audits we were informed that a different water balance calculation was being undertaken when compared to Table A2. In addition neither calculation included the latest measured estimates of leakage, even though SW had calculated its leakage with an accuracy that allowed an MLE adjustment to be applied. We are concerned that there is a risk of confusion over the current level of leakage and believe that the measured leakage figures, suitably adjusted using the MLE adjustment, should form the basis of future leakage estimates.

We noted with concern that the new figures from the CMA concerning non-household numbers and consumption are inconsistent with SW's previous figures. This adds significant uncertainty to this year's water balance. We believe that is very important that these anomalies are rectified as soon as possible.

The above considerations formed a significant part of our work this year and represent our major concern from this year's audit.

Water Taken Legally Unbilled includes 13,599 animal trough connections billed as a fixed charge. We questioned whether they should be included instead in the Unmeasured Non-household category as well as the metering programme. Poor maintenance of animal trough plumbing can result in significant unrecorded water loss.

Sample surveys in 8 rural DMAs in 2007/08 concluded that there were 21,468 unrecorded troughs and 7,828 billed troughs, a ratio of 2.7 unbilled troughs to each billed connection. Further surveys of 54 DMAs in 2008/09 found that the ratio to be 0.8 unbilled troughs to each billed trough. Based on the results of both surveys, SW concluded that the number of unbilled field trough was 6,146.

Leakage from water trough underground supply pipes has been estimated using the assumptions used for measured and unmeasured connections. When considering the unrecorded locations of the majority of the connections in this category and the potential lack of maintenance, the resultant UGSP leakage of 0.96 Ml/d may be underestimated.

When reviewing information on septic tank and other tanker loads we noted that while all the data is derived from the computer based tanker load control systems there is a significant amount of manual extraction necessary. We noted the possibility of error and suggest that as part of its data improvement project Scottish Water reviews its current methods of data extraction.

Table B2

Data on interruptions still come into the database from SW's contractors using handwritten forms and paper forms are also used in some locations where there are signal and connectivity issues with hand held devices. In the report year data on 46% of incidents was provided by manual data entry from operators on site.

Considering the different Scottish Water operating areas, the percentage of manual entries was comparatively low in Ness, which is a remote mountainous region, and higher in other, more populous regions. In addition, where there is no signal, hand-held recorders hold data until such time as a signal is available for an automatic download. In our opinion the percentage of manual entries is higher than would be accounted for by hand-held down-time or a lack of mobile signal and the use of hand-helds could be further extended. Scottish Water has informed us that they are working to increase the acceptance of hand-held technology by operators.

Table B3

In our view, the flooding at-risk register has been greatly improved in recent years. However, the base records continue to include some properties from the inherited records of the three predecessor authorities, which may not be complete or accurate. We recommend that Scottish Water continues to review these cases by customer contact and hydraulic modelling.

Table B3a

The validation carried out for internal flooding is not carried out for external flooding and there is a significant level of missing data. Confidence in the answers is therefore lower. As a result a very significant uplift is applied to the numbers of external flooding incidents reported due to both overloaded sewers and other causes. It follows that a significant proportion of the numbers reported are not location-specific. Confidence in the number of external flooding incidents is lower than that in internal flooding incidents. There is unlikely to be much change to this situation so long as no investment is available to tackle external flooding

Tables B4 & B7

We had few concerns with the information in tables B4 and B7 this year. Scottish Water has made a number of improvements to its processes over the last 2 years which are pleasing.

We noted that telephone contacts that are dealt with at the time are not recorded on the Peoplesoft billing system. This is inconsistent with Promise, where all calls are logged.

We challenged SW on its assumption that there we no abandoned calls on its Message Manager system. We noted last year that SW had not analysed the data in the light of WICS guidance. Following further discussion this year we agreed that the substantive part of the message occurred within 3 seconds of the start of the message and using this as a basis SW reviewed its results and made minor adjustments to its previously quoted figures.

We noted that following written complaints SW based its completion times on the time to sending out a response and not the time when the resulting action was completed. The action frequently requires substantial work to investigate the problem which is subject to delays by the highway authorities and others, precluding the possibility of completing the action within the prescribed time limit. While we believe that SW's interpretation is reasonable we note that the definition of holding response and when it can be used to complete an action is not completely clear.

Table B8

As for last year we again noted that the WAMS system fails to encourage site staff to amend the resolution codes to the outcome as exercised on the ground. Although free text boxes are provided the contents can sometimes be ambiguous to later readers. The site squads are not required to relate the problem to the exact asset. The job OS grid reference for the customer's address recorded in Promise can be in error by up to 20 metres in relation to the asset, potentially corrupting asset quality information. We were shown how easy it would be for site data on sewer laterals to be collected via the hand held devices and suggest that consideration is given to using them to gather further information. We understand that in the Edinburgh City area, a plan of the laterals is held and frequently consulted for greater speed, efficiency and improved customer service.

Table B9

There remains uncertainty in a number of the components used to calculate the SOSI index including outage allowance, treatment works and raw water main losses that lead to uncertainty in the deficits in some areas and hence the score itself. This can be material where deficits are small. Based on the contractor's report and selective works visits, revised site specific figures are used where possible, otherwise generic figures used for previous returns have been used. Recognising that there may be insufficient new statistical data to derive revised generic values, it is a weakness that site specific factors have not been produced for the larger zones, works or components that are significant where zones are marginal.

Table D6 and Table H4

The closing balance of critical sewers has been determined from the GIS data. We commend Scottish Water for taking this fundamental approach on a year-by-year basis (rather than relying on adding or subtracting changes to last year's figures).

The closing balance for all sewers is based on the total length of sewer in GIS, plus a further 1000km of main sewer, assumed to exist but which are not yet in the asset inventory together with an allowance of about 16000 km representing lateral sewers which are assumed to exist but are not included in the asset inventory. This methodology was first used out in the AR06 return and the same process repeated in every year since. There are two unresolved problems with this methodology:

- While 1000 km of main sewer was reasonably added (assumed to exist but not recorded) in 2006, any new discoveries are added into the GIS without a corresponding reduction in the 1000 km allowance. No account has been taken of this.

- The estimate of around 16000 km of lateral sewers was based on a relatively detailed investigation into dwelling types etc. from local authorities in 2005-06. This was repeated in AR07 and this year. However, the initial investigation was based on a statistical approach of the likely length of lateral sewer per dwelling of each type. Intrinsically the number should not change with time, so recalculation should be unnecessary. In fact, recalculation has produced a different length each year, from 15364km in AR06 by stages to 16403km in AR09. The changes reflect the changes in housing type from published local authority data which can have little effect on actual sewer lengths in the ground.

Tables E1 to E3a

We note that SW has a very sophisticated method of allocating costs to assets (ABM process) which is well managed, impressive and in advance of methods we have seen used elsewhere. sew have noted that whilst some of the allocation of sludge treatment costs and water distribution pumping costs at water treatment works have been reviewed by local managers there are no clear audit trails as to the methodologies used to allocate the split of costs. We recommend that these allocations are further reviewed through the year and updated if necessary for future returns. The methodologies used should be available for audit.

As for previous years some of the information on PPP in tables E3 and E3a is based on original information extrapolated by SW which does not have access to up to date information from the PPP contractors. This significantly reduces the accuracy and use of the data. The format of the tables does not allow full information on failures against consents to be recorded.

Tables E6 & 7

Capacity data for sewage pumping are much poorer than those for water supply. Whereas around 85% of water pumps have data in Ellipse, only about 20% of sewage pumps do so and there is heavy reliance on infilling. These data would benefit from improvement.

Table E11

We note that computer peripherals such as printers are omitted from the asset inventory.

G Tables

There continue to be significant issues in a small number of Q&S2 completion projects relating to definition of project scope or the required permissions to complete the works which may result in further cost escalation and/or delay to project completion. We concluded that the level of uncertainty regarding the cost and programme completion of these projects has been reduced. However with 1974 Q&S2 projects due to be completed (reach Capex5) in 2009/10, there remains a significant risk of further slippage, adding to the £38.1m of Q&S2 project expenditure which Scottish Water has currently reprofiled into 2010/11.

There remains the potential for a reduction in project completions and output delivery due to the impact of third-party issues on a number of Q&S3a projects. A large number of projects remain to be completed during 2009-10 and there is potential for this figure to increase, delaying the delivery of outputs to beyond the current review period. Much of the overhang is concentrated in a small number of large projects.

Significant progress has been made during the past year on bringing projects to Capex3 approval. However 616 Q&S3a projects had not reached Capex3 approval by 31st March 2009 and with one year to go to the end of the investment period there is a significant risk that some of these projects will not be completed in the year. Scottish Water has reprofiled a number of projects and 202 Q&S3a projects are now programmed to reach Beneficial Use after 31st March 2010, resulting in a forecast expenditure of £149m on Q&S3a projects in the Q&S3b period. This is an increase of £75m on the position for AR08, when £74m of Q&S3a project expenditure was forecast to fall into the Q&S3b period.

The reported serviceability performance forecasts that targets will be met by March 2010. However the expenditure programme includes a significant overhang beyond 2009/10, which has doubled from that forecast at AR08. Some of this overhang relates to key quality programmes of water quality, wastewater quality and UIDs which have a bearing on the delivery of serviceability indicators. In some cases reported actual serviceability performance for AR09 has deteriorated from that reported for AR08. For some lines actual performance at the end of 2008/9 remains below the target for the same date. The achievement of serviceability targets by the end of the investment period is crucially dependent on the completion of a number of quality projects during 2009/10 without slippage and it is therefore not currently possible to confirm that the necessary outputs will be delivered in all cases.

For this year all SW's risks, both for Q&S2 and Q&S3a, have been consolidated into a single project in the Q&S3a programme, totalling £32.38M (of which £4.47M was for Q&S2 and £27.91M was for Q&S3a). This project is coded to drinking water quality - other parameters. However it is also known to cover a range of other outputs such as general items, water non-infrastructure capital maintenance, growth, sewer flooding, non-strategic UIDs and wastewater quality.

During our audits we continued to note that the focus of SWS staff involved in projects remains on contract cost, rather than overall project cost. We found some examples where significant external risk factors (such as the need to agree consents or reach agreements with third parties) which could affect project completion dates were not included in project risk registers, which focus on costed risks. We recommend that project risk registers should be reviewed to ensure that they contain all risks, including those borne by Scottish Water, particularly where these could affect completion, but do not affect outturn cost.

The robustness of allocation to drivers for Q&S2 projects has improved following a review and a greater proportion of allocations are now based on an analysis of project scope and expenditure. Significant numbers of projects have however not been reviewed. We continue to recommend that this review should be completed for all projects except those having a single capital maintenance driver.

Table H3, Lines 3 and 4 - Water Mains

We again note that Scottish Water's predictive model for water mains condition grading indicates a significantly poorer condition than that derived from reported burst frequency. We believe that further work is required to reconcile the predictive model with burst frequency. We recommend that the results of the renovation programme are used to validate the current assessment of condition and performance grade reported in the asset inventory.