A Tables – Base Information

Table A1 Properties and Population

A1.1-11 Unmeasured domestic properties

Data for these lines have been derived from data sourced from the Scottish Executive relating to the total number of domestic properties listed on the Council Tax Valuation List at September 2002, which is compiled from individual local authority returns (CT1 forms). This source data is at the highest aggregate level and makes no distinction for properties that are billed. The WIC 4 report of billed properties has been used but is still incomplete. Several Council Tax areas are yet to submit.

The data supplied has been adjusted in respect of the following:

The number of connected properties shown is based on the number of properties that we have billed in each area. Where provided in WIC 4, the actual billed numbers from each Council Tax area by band were used. Where data was not available from the WIC 4 report an overall Band D billed figure for the area was used and apportioned across the Council Tax bands using the number of properties in each band.
Exempt properties have been identified in total and apportioned across property bands in proportion to total property numbers per band.

The overall information has improved with the introduction of WIC 4, however as this is not yet complete and we are still relying on adjustments made to the Scottish Executive figures the confidence level for this group of data is B3.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes 0.5% increase in the number of band D equivalent properties and an additional increase of 588 homes, 470 band D homes for metered homes reverting to unmeasured services.

A1.12-13 Measured domestic properties

The number of metered properties is based on reports from Scottish Water billing systems.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes 588 metered homes revert to unmeasured services.

A1.14-23 Measured non-domestic properties

All data has been derived from WIC22, as at 31/03/03, sourced from each of the primary billing systems, Custima and Rapid. The number of metered customers has reduced due to more accurate data from WIC22 and expected customer base erosion.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes 3,500 unmeasured business properties move to meters.

A1.24-42 Measured non-domestic - meter sizes: actual

Data has been derived from the 'Meter' report from WIC22. Also see comments for Lines A1.14 to A1.23

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
The meter profile in the forecast figures reflects the expected impact of meter rightsizing.
Budget for 2004/05 assumes 3,500 unmeasured business properties move to meters.

A1.43-61 Measured non-domestic meter sizes: theoretical

All data has been derived from WIC22, as at 31/03/03, sourced from each of the primary billing systems, Custima and Rapid. Figures were obtained using ESW parameters for estimating meter sizes i.e. the customers rateable value was used to determine an estimated meter size.

Future Years

There will be no theoretical meters.

A1.62-67 Unmeasured non-domestic properties

All data has been derived from WIC22, as at 31/03/03, sourced from each of the three primary billing systems, Custima and Rapid. The increase in accuracy obtained from this report coupled with customers moving to meters and customer base erosion explains the overall decrease in figures. The information held in WIC22 for the East and West billing systems does not allow us to accurately breakdown the number of properties into relief and non-relief categories. This results in a B2 confidence grading for these figures.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes 3,500 unmeasured business properties move to meters.

A1.68-70 Summary – properties

A1.70 - Information is taken from the Scottish Executive publication, Housing Trends in Scotland Quarter Ending 30 September 2002. This showed the number of new dwellings completed in quarters 1, 2 and 3 of 2002. This figure was then prorated to give a total for 2002.

This is an area that Scottish Water will improve on in the future.

A1.71-72 Summary – population

A.71
Source data:

- Council Tax Valuation List 2002, Scottish Executive;
- Census 2001

The data supplied has been adjusted in respect of the following:

- An occupancy rate (2.242) was determined using the census data. This multiplied by the number of metered households in our billing systems determined the metered population.
- The total population of unmeasured households was determined as the census population in households less the above measured population. This population figure could then be multiplied by the percentage of properties connected (derived from the council tax data) to get an unmeasured population in connected properties.
- The total domestic population for winter is the sum of the measured population, the unmeasured population in connected properties and the non-household population that accounts for 1.7% of the population according to the Census 2001.

A1.72
Source data:
- VisitScotland publication 'Tourism in Scotland 2001'.

The data supplied has been adjusted in respect of the following
- Tourist Board figures for bed spaces are not conclusive. The number of bed spaces available was given for only half the holiday property types. Data held elsewhere in the tourism report was used to derive the remaining number of bed spaces.
- The population in connected properties was obtained by applying the rate of connected households.

The Tourism in Scotland 2001 report only gives figures for those properties that are registered with VisitScotland. We estimate that only 62% of holiday properties are registered with VisitScotland. The final populations are adjusted accordingly.

A1.73-75 Domestic – population

Source Data:
- Council Tax Valuation List 2002, Scottish Executive;
- Census 2001
- Scottish Water Meter Billing Systems, Custima and Rapid

A1.73 - the population supplied derived for *A1.71* and *A1.72* has been reduced by 1,767 to reflect the population of the 788 measured domestic properties. A multiplier of 2.242 (occupancy rate) has been used to determine the population of the 788 properties. It has also been reduced by the non-household population of 86,054 as stated in Census 2001.

A1.74 - the population of measured domestic properties has been calculated using the figure from *A1.12* (788 properties) and a multiplier of 2.242 (occupancy rate).

Future Years

Zero growth has been assumed for the population in Scotland. In 2004/05 the population increases for unmeasured homes and decreases for metered homes as metered householders are expected to revert to unmeasured charges.

A1.76-79 Rateable Value Base

All data has been derived from WIC22, as at 31/03/03, sourced from each of the primary billing systems, Custima and Rapid. More accurate reporting can explain the overall decrease in R.V. from 2001/02 as well as customers moving to meters and customer base erosion. The WIC22 relief figures from the East and North billing systems have produced an increase as expected with the removal of relief. Reporting issues on the breakdown of properties into relief/non-relief categories has resulted in a decrease in West billing system figures. The decrease in West figures results in an overall Scottish Water decrease in rateable value figures. This has resulted in a B2 confidence grading.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
A1.76 budget for 2004/05 assumes a 2.5% reduction in RV as unmeasured business customers offset by customers where relief ends moving to full unmeasured charges. A1:77 reduces as relief comes to an end for some and increases for those that remain with relief as another relief step is withdrawn.

Table A2 Water Volumes

Introduction:

During the reporting period there has been some improvement in Scottish Water's ability to calculate the overall water balance and it's component parts. The main factors that have given rise to this change are:

The development of a Water Resource and Reservoirs team within the Strategy & Planning Section of the Assets Directorate. This team has adapted legacy systems into a single business wide Database recording water resource availability and works hydraulic performance. They have also established water quantity and customer Levels of Service policies and procedures including the most applicable methodology for all hydrological calculations.

The continued development of INMS and its application across the business. This has given rise to an improved level of understanding of issues such as water balance and leakage. It has also highlighted how different some of the legacy authorities approach to this subject was.

The creation of a single Customer Services billing system which records the meter readings of measured domestic and non-domestic customers and bills customers accordingly.

The WIC continues to focus on the estimation of the unmeasured components of the water balance. The Scottish Water methodology adopted for estimating unmeasured non-domestic demand reflects the importance of this element of the calculation, however the following detailed discussion of the issues surrounding this complex calculation helps to highlight the need for further discussion and agreement on the most appropriate methodology to suit the limited availability of variable confidence data.

A2.1-4 Unmeasured domestic

A2.1: The WIC definition specifies that Unmeasured Domestic Water Delivered includes supply pipe leakage. This is in conformity with Managing Leakage terminology (ref. Managing Leakage Report D, 1994, p. 1, 21, 22, 23, Fig. A2, A3, A4), where Unmeasured Domestic Water Delivered (UDWD) is made up of three components: customer use (CU), plumbing losses (PL), and underground supply pipe leakage (USPL) - Customer use and plumbing losses make up Consumption.

Customer Use vs. Consumption

In contrast with the above definitions, the Per Capita Consumption values used to calculate UDWD in the previous Annual Return (2001/02) were assumed not to include plumbing losses. These PCC values were extracted from the 'Domestic Water Consumption Study 1999'.

This appears to be a correct assumption, based on the methodology applied to estimate consumption from measured zonal flow data in the 1999 Study: zonal consumption estimates were obtained by subtracting an estimate of non domestic consumption and leakage from measured flow into the zones (ref. section 5.7 p. 28). Leakage itself was estimated by subtracting an estimate of non domestic night use from 15-min minimum night flow values (ref. section 5.5 p. 27).

Based on this methodology, the zonal leakage estimates were therefore implicitly inclusive of plumbing losses (and of any domestic customer use, which may have been occurring in the 15-min intervals corresponding to the periods of minimum night flow each night). Consequently, the consumption estimates in the 1999 Study are exclusive of plumbing losses and, in strict Managing Leakage terminology, correspond to 'customer use' as opposed to consumption.

Estimation of Customer Use

The 1999 Study provided PCC estimates for each of The Three Scottish Authorities. The current structure of Scottish Water, split into four areas, makes these estimates unusable. Any attempt to estimate area-specific PCC values based on the data supporting the 1999 Study would be undermined by the limited number of sample zones in each area leading to potential statistical bias.

It is therefore recommended that the same all-Scotland PCC estimate be used for all area calculations. As recommended in the 1999 Study (p. 33 and 42), the median value of 139.10 l/prop/day should be used in preference to the mean value, as it is not distorted by extreme values.

Plumbing Losses

For information, below are the estimates of plumbing losses used in last year's Annual Return calculations:

Table 1: 2001/02 plumbing losses estimates by Authority

	East	North	West	
2001/02	10.40	10.00	N/A	l/prop/day

Both East and North used the Managing Leakage default value of 0.5 l/prop/hr. The slightly different values expressed in l/p/d may be explained by a different hour-day factor assumption. West did not explain how plumbing losses were included in their calculations.

A UK-average value for plumbing losses (PLav) is provided in Managing Leakage Report E p.15 (Table 4.1), based on research into night flow measurements:

PLav = 0.5 l/prop/hour (at period of minimum night flow, assuming AZNP = 50m and average infrastructure condition).

This estimate is the only known estimate of average plumbing losses to date, and can be used as follows to calculate plumbing losses in each Area:

PL (Ml/d) = Plav * PROP * HDF * PCF * ICF * 10^-6

With Plav = 0.5 l/prop/hour
PROP = number of properties in the Area
HDF = Hour-Day factor in the Area
PCF = Pressure Correction Factor = $(AZNP/50)^{1.5}$

ICF = Infrastructure Condition Factor (note that ICF reflects the condition of the distribution system infrastructure, and is used here as a surrogate for the condition of the domestic plumbing systems in the Area concerned)

Underground Supply Pipe Leakage

See A.2, A.3 and A2.39

Calculation of Unmeasured Domestic Water Delivered

In order to derive an estimate of UDWD for each of the four Areas of Scottish Water, the following formula should be used:

UDWD (Ml/d) = CU + PL + UGSPL
= $[(PCC*POP)+(PLav*PROP*PCF*ICF*HDF)+(USPLR* PROP)]*10^{-6}$

where PCC = per capita consumption = 139.10 l/head/day (not area-specific)
POP = population (No), should be equal to value entered in A1.73
PLav = average plumbing losses = 0.5 (l/prop/hour, not area-specific)
PCF = Pressure Correction Factor (dimensionless, area-specific)
ICF = Infrastructure Condition factor (dimensionless, area-specific)
HDF = Hour-Day Factor (hours, area-specific)
USPLR = underground supply pipe leakage ratio (l/prop/day, not area-specific)

UDWD for Scotland, which is the value to be entered in row A2.1, consists of the sum of the 4-Area UDWDs.

Underground Supply pipe leakage (UGSP):
A2.2 Unmeasured domestic UGSP – Billed
A2.3 Unmeasured domestic UGSP – Void
A2.6 Measured domestic UGSP – Void
A2.20 Measured non-domestic UGSP- voids
A2.29 Unmeasured non-domestic UGSP – Billed
A2.30 Unmeasured non-domestic UGSP – Void

In last year's Annual Return (2001/02), each Authority used a different source of information to estimate underground supply pipe leakage. Additionally, one authority (ESW) produced a different estimate for void and billed properties, while the other two assumed the values to be identical. It seemed therefore that a more consistent approach was required for this year's Annual Return.

Last year's reported values for the three Authorities are as follows:

Table 2: 2001/02 total supply pipe leakage estimates by Authority

	East	North	West	
2001/02	49.81	46.06	55.00	l/prop/day

The three sources of information on Supply Pipe Leakage were:

East: "An Assessment of Demands and Resources at 1994" The Scottish Office Environment Department, 1995

North: "UK Water Industry: Managing Leakage" (ISBN 1 898920 21 4) [assumed to be from Report D, table 2.1 p. 7]

West: "Domestic Water Consumption in Scotland 1992" (estimate said to be based on OFWAT)

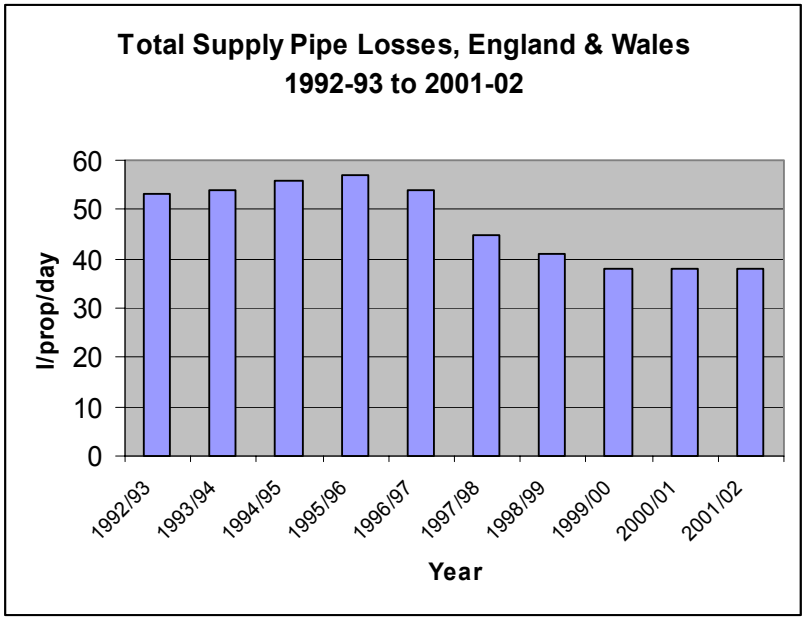
There does not seem to be a reliable Scotland-specific estimate of Supply pipe leakage. From reading the 'Leakage' section in "An Assessment of Demands and Resources at 1994", the break-down of leakage into its various components, inc. supply pipe leakage, appear to be based more on informed judgement than hard facts (Section 4.7). And it is unlikely that there was better information available two years previously at the time of the "Domestic Water Consumption in Scotland 1992", which the West referred to in their commentary.

In the absence of reliable Scottish estimate, the best available alternative estimates come from the OFWAT Annual Return information in England and Wales. The table below shows the trend of total supply pipe leakage since 1992/93 to 2001/02 in England and Wales, taken from OFWAT annual leakage reports:

Table 3: Total Supply Pipe Losses, England & Wales (Source: OFWAT)

	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02
Total supply pipe losses (l/prop/day)	53	54	56	57	54	45	41	38	38	38
Proportion of Total Leakage (%)	24.5	24.5	24.6	25.8	27.3	26.1	26.5	26.5	27.1	26.0

Figure 1: Total Supply Pipe Losses, England & Wales (Source: OFWAT)



The decreasing trend (in l/prop/day) from 1995/96 onwards is partly due to increased efforts by E&W companies in tackling supply pipe leakage, notably through subsidised or free repairs offered to customers. An additional explanation is the increased number of metered household properties in recent years, which show a much lower average leakage level than unmeasured properties, notably for externally metered properties.

In the absence of similar metering and supply pipe repair policies in Scotland to date, supply pipe leakage North of the Border is likely to be closer to the levels observed up to 1995/96 in England & Wales than to today's level. However the proportion of different categories of properties (notably metered/unmetered) for England & Wales in 1995/96 is different from that of today's Scotland. The estimate of total supply pipe leakage in Scotland should therefore be derived from the aggregation of estimates derived for each of its components. This is not an over-complication, as these component estimates are part of the information requirements for the Annual Return to the WIC.

The different categories of supply pipe leakage for which separate entries are required in the WIC Annual Return are as follows (Table A.2):

Table 4: UGSP leakage components in WIC Returns

A2.2	Underground supply pipe leakage – billed unmeasured domestic
A2.3	Underground supply pipe leakage – voids unmeasured domestic
A2.6	Underground supply pipe leakage – voids measured domestic
A2.29	Underground supply pipe leakage – billed unmeasured non-domestic
A2.30	Underground supply pipe leakage – voids unmeasured non-domestic

Again, the only information available to produce these estimates comes from the Annual Returns to OFWAT. The most important component of supply pipe leakage in terms of property count is by far the 'billed unmeasured domestic' component. Information available on unmeasured domestic supply pipe leakage in England & Wales from OFWAT annual leakage reports shows the following trend (all-industry average):

Table 5: Unmeasured domestic supply pipe leakage estimates from OFWAT leakage reports

Unmeasured domestic supply pipe losses (l/prop/day)	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02
	N/A	N/A	N/A	N/A	59.5	50.0	45.6	42.9	43.2	43.8

No value could be found for 1995-96, as the 1995/96 leakage report was not available on the OFWAT website or at Scottish Water scientific library and time constraints did not allow to order a hardcopy from OFWAT's library. However a linear extrapolation from the set of data available for the following years leads to an estimate of 62.3 l/prop/day for unmeasured supply pipe losses in 1995/96[1]. It is this value that has been used for unmeasured domestic supply pipe losses for all 4 areas of Scotland in this year's Annual Return.

It is possible to derive similar estimates for the other components shown in the OFWAT reports, assuming a linear relationship between those components and the level of total supply pipe losses. Based on that assumption, best-fit equations were derived, leading to the following estimates for 1995/96 in England & Wales[2]. It must be noted however that these

[1] This estimate is based on the following best-fit equation, derived from fitting unmeasured domestic UGSP data against total UGSP from subsequent years: Unmeasured domestic UGSP leakage = 1.1023 * total UGSP leakage + 4.608 (R^2 = 0.996)

[2] Based on same method as in footnote 1, the 1995/96 estimates are derived from the following best-fit equations: Externally metered UGSP leakage = 0.1578 * total UGSP leakage + 10.937 (R^2=0.881)
Internally metered UGSP leakage = 0.4945 * total UGSP leakage + 16.731 (R^2 = 0.970)
Void UGSP = 1.1395 * total UGSP leakage - 2.3589 (R^2 = 0.937)

components do not correspond exactly to the components for which estimates are required for the WIC Return. This is made obvious by comparing table 4 (above) and table 6 (below).

Table 6: UGSP leakage estimates by component from OFWAT leakage reports

SP Leakage (l/prop/day)	1992 /93	1993 /94	1994 /95	1995 /96 (2)	1996 /97	1997 /98	1998 /99	1999 /00	2000 /01	2001 /02
Unmeasured domestic	N/A	N/A	N/A	**62.3**	59.5	50.0	45.6	42.9	43.2	43.8
Externally Metered	N/A	N/A	N/A	**19.9**	19.3	18.1	18.1	16.6	16.7	16.9
Internally Metered	N/A	N/A	N/A	**44.9**	43.7	38.6	36.5	35.2	35.5	36.5
Void	N/A	N/A	N/A	**62.6**	N/A	48.9	44.4	41.3	42.0	39.5

In the absence of area or Scotland-specific information, it is recommended that the 1995/96 estimates shown in table 6 above be used to derive supply pipe leakage component estimates in the WIC Return. However due to differences in the split required by OFWAT (ref. OFWAT Annual Return Table 10) and the WIC (ref. WIC Annual Return Table A.2), simplifying assumptions are required in order to populate the WI C Return using the England & Wales estimates. These assumptions are as follows:

- Billed unmeasured non-domestic properties have the same level of supply pipe leakage as billed unmeasured domestic properties;
- All void properties in Scottish Water have the same average level of supply pipe leakage (whether measured, unmeasured, domestic or non-domestic);
- 70% of non domestic metered customers in Scottish Water are internally metered, 30% are externally metered (+/- 10%);
- All domestic metered properties in Scottish Water are externally metered.

Based on these assumptions, and applying Table 6 estimates to the property count forecast for 2002/03 in the 2001/02 WIC Return, total supply pipe leakage in Scottish Water can be estimated as **61.1 l/prop/day**. This is 10% greater than the estimate used last year, but it must be noted that this difference is due to a refined and more consistent analysis this year, not to an actual 10% increase in supply pipe leakage since last year.

Table 7: Summary Results – Supply Pipe Leakage Estimates

	Property Count ('000)*	**UGSP Leakage l/prop/day**	**UGSP Leakage l/prop/data (simplified to match Return's simplifying assumptions)**
A1.1 /A2.2 Unmeasured domestic UGSP – Billed	2196.96	62.3	62.3
A1.11 /A2.3 Unmeasured domestic UGSP – Void	46.45	62.6	62.6
A1.12 /A2.2 Measured domestic UGSP – Billed	0.788	19.9	62.3
A1.13 /A2.6 Measured domestic UGSP – Void	0.00	62.6	62.6
A1.66 /A2.29 Unmeasured non-domestic UGSP – Billed	62.09	62.6	42.5
A1.67 /A2.30 Unmeasured non-domestic UGSP – Void	0.00	62.6	62.6
A1.22 /A2.29 Measured non domestic – Billed	82.95	27.4	42.5
A1.23 /A2.20 Measured non domestic – Void	0.00	62.6	62.6
Total Supply Pipe Leakage	2389.23	**61.1**	**61.1**

* based on Scottish Water 2001/02 WIC Return forecast for 2002/03

Supply Pipe Leakage Confidence Grade

Reliability Band
The supply pipe leakage estimates in Table A are based on England & Wales average values calculated using the 1995/96 OFWAT Annual Return (ref. above commentary for explanation on the choice of 1995/96). This extrapolation from England & Wales average values was assumed to correspond to Reliability Band C.

Accuracy Band
The 95% confidence interval for the mean value of total supply leakage in England & Wales in 1995/96 was +/- 9%. This would correspond to Accuracy Band 3 (5% to 10%), but this relies on the assumption that Scotland's supply pipe leakage is similar to that of some English Water Companies. This is likely, but not certain, therefore Accuracy Band 4 was deemed a more suitable assumption (i.e. 10% to 25%).

It is therefore recommended that a confidence grade of C4 be used for all supply pipe leakage estimates in Table A.

Recommendations for improving future estimates

In order to move away from extrapolations based on OFWAT Returns in the future and produce Scottish or area-specific estimates of supply pipe leakage by component, it is recommended that a study be carried out to determine the most cost-effective method for estimating supply pipe leakage in Scotland. This study would first consist in a review of the different techniques and methodologies used by water companies in England & Wales to produce their own estimates. Based on this review, a methodology should be chosen and necessary field work carried out to produce a Scotland-specific supply pipe leakage estimate. The methodology should take into account the need to update supply pipe leakage estimates on a year-to-year basis in the future.

Finally, it must be noted that a recent UKWIR report (ref. 02/WM/08/28, 2002) on 'Service Pipe Leakage' provides useful information on existing technology for the detection of leaks on communication or supply pipes, and proposes "a step by step approach to determining the best solution once a service pipe leakage is found". It does not, however, address the issue of estimating the total volume of leakage from supply pipes for the purpose of regulatory reporting.

A2.4 –This is a calculated field [Water Delivered – USPL(billed) – USPL(void)]. Unlike the value of PCC used in line A2.1, this figure includes plumbing losses.

Former Authority Variations:

Previously there has been a slight difference in methodology across the three former Authorities. For example both the former ESW and NoSWA used the population figure from line A1.73 in the calculation of A2.1. This originates from the number of domestic households listed from Council Tax records for the relevant year. The former WoSW used an alternative method; a GIS derived population based on the 1991 Census output. For the Scottish Water approach for this report year, it was considered that for consistency between reporting lines and to utilise current records, the population of line A1.73 should be used.

For future projections, line A2.1, the future projections, for unmeasured domestic water delivered, show Budget figures for Report Year +1; consistent with Scheme of Charges. No forecasts for water delivered have been produced for 2003/04 so the forecast figures are as per the budget.

Budget for 2004/05 assumes no increase in population and metered homes revert to unmeasured services.

For future projections, lines A2.22 to A2.31 – Unmeasured Non-Domestic, the budget figures for Report Year +1 are consistent with Scheme of Charges. Volumes are based on an average annual water use of 37.3m3 / £1,000 RV.

(37.3 = 1000 x 2.5p (per £RV) / 67p (per m3). No forecasts have been produced for 2003/04 so the forecast figures are as per the budget. Budget for 2004/05 assumes underlying 2.5% reduction in unmeasured RV.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes no increase in population and metered homes revert to unmeasured services.

A2.5-8 Measured domestic

A2.5 - All data has been derived from WIC22, as at 31/03/03, sourced from each of the three primary billing systems, Custima and Rapid**.**

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes metered homes revert to unmeasured services.

A2.7 – Scottish Water does not undertake routine meter calibration of the domestic customers. However a meter under-registration figure of 3.1% is applied. This was the WaSCs average as stated in Anglian June Return 2001. Research shows that there is negligible change in the meter under-registration each year. A mix of Class B and D meters are installed in households.

Future Years

A meter under-registration figure of 3.1% is applied.

A2.9-21 Measured non-domestic

A2.9 – A2.20 All data has been derived from WIC22, as at 31/03/03, sourced from each of the three primary billing systems, Custima and Rapid. The number of metered customers has reduced due to more accurate data from WIC22 and expected customer base erosion.

A2.21 - A meter under-registration figure of 4.3% is applied. This was the WaSCs average as stated in Anglian June Return 2001. Research shows that there is negligible change in the meter under-registration each year.

Class B meters are installed on industrial and commercial properties.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes underlying 2% reduction in metered water use in business premises.
A meter under-registration figure of 4.3% is applied.

A2.22-31 Unmeasured non-domestic

All data has been derived from WIC22, as at 31/03/03, sourced from each of the primary billing systems, Custima and Rapid. The volume calculation used by ESW has been retained for unmeasured properties in 2002/03 is 90 m^3 per £'000 of water rateable value. Scottish Water are reviewing data to ensure a value of 90 m^3 is still appropriate.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges. Volumes are based on an average annual water use of 37.3m^3 / £1,000 RV.

(37.3 = 1000 x 2.5p (per £RV) / 67p (per m^3)

No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.

Budget for 2004/05 assumes underlying 2.5% reduction in unmeasured RV.

A2.32-40 Water balance

Refer to Appendix 1 for a schematics of Scottish Water's water balance

A2.32 – Total water delivered to domestic and non-domestic properties

Calculated field – no comment.

A2.33 – Distribution system operational use

Table 9: Estimates of OU from 2001/02 WIC Return

WTLU	ESW	NoSWA	WoSWA
Ml/d	1.85	1.37	14.50
m3/km/day	0.167	0.0766	0.855
% of DI	0.24	0.32	1.22

As can be seen in above table, the three estimates in m3/km/day are significantly different from each other (note that although the '% of DI' values are given for information, the m3/km/day is considered a better comparitor for this component of the water balance). WoSWA shows a particularly high value compared to ESW and NoSWA.

For comparison, below are OFWAT estimates for Operational Use from 1996/97 to 2000/02:

Table 8: OFWAT Operational Use Estimates

Operational Use, OFWAT all-industry average	96/97	97/98	98/99	99/00	00/01	01/02
m3/km/day	0.190	0.205	0.226	0.262	0.257	0.303
% of DI	0.36	0.42	0.49	0.57	0.57	0.65

The above table shows a steady upward trend from 1996/97 to 2001/02 (60% increase in m3/km/day). No explanation could be found on this trend in OFWAT reports, probably due to the lack of significance of this component in the overall water balance.

Overall, the OFWAT average values are much closer to ESW and NoSWA's estimates than to WoSWA's value, which puts WoSWA's estimate of 14.5 Ml/d into question. WoSWA explained in their commentary that 'miscellaneous use', made up of OU, WTLU and WTIU was estimated as 2.6% of the distribution input, including 2 Ml/d of WTIU. The OU and WTLU estimates are believed to have been obtained by dividing the remainder of the 'miscellaneous use' by two. No justification was given on the choice of 2.6%, or on the 2 Ml/d assumed for WTIU.

In contrast, ESW and NoSWA's estimates were both based on a detailed analysis of the different components of OU. A similar exercise has been carried out this year for the whole of Scotland, using as much as possible area-specific data. This resulted in an estimated operational use of **5.63 Ml/day** (0.123 m3/km/day) This is about 2 1/2 times lower than the average England & Wales re-estimate of 0.303 m3/km/day (which, if extrapolated to Scotland, would result in a value of 13.9 Ml/d for operational use). This difference may be explained by different operational practises but may also be due to incorrect assumptions being used in deriving certain components of operational use in Scotland. More work would be required to refine these assumptions, notably through field trials, in order to produce a more robust estimate next year. In the mean time, 5.63 Ml/day remains the best available Scotland-specific estimate for operational use.

A2.34 Scottish Water properties

Last year's estimates of 'Water Taken Legally Unbilled' (WTLU) provided by the 3 Authorities diverged widely, as shown in the table below:

Table 9: Estimates of WTLU from 2001/02 WIC Return

WTLU	ESW	NoSWA	WoSWA
Ml/d	23.30	2.29	14.50
l/prop/d	30.33	4.09	13.69
% of DI	3.00%	0.54%	1.22%

For comparison, estimates from OFWAT Annual Returns show figures of the order of 0.7% of DI or 5 l/prop/day (period1996/97 to 1999-00 – last two years showed a slight increase to 0.9% of DI or 6 l/prop/day).

ESW estimate of 3% seems therefore a comparatively high value, which would require justification. In the absence of a consistent analysis of WTLU across Scottish Water, it is recommended to use OFWAT 1996-99 to 1999-00 average value of 5 l/prop/day for all 4 areas of Scottish Water (l/prop/day is considered the best normalising factor for this component of the water balance).

A2.35 Water taken illegally unbilled

The WIC commentary states that

"Illegally taken water should only be reported here and included in the water delivered total if it is based on actual occurrences using sound and auditable identification and recording procedures. If it is not based on these it should be classified as distribution losses (A2.36)."

Hence this component is assumed to be zero in the absence of any firm evidence to the contrary.

A2.36 Distribution losses

Total Leakage minus Unmeasured Domestic supply pipe losses = Distribution Losses

A2.37 Total Leakage

Method 1 Night Flow Measurement: The independent estimate of total leakage is 885 .80 Ml/d. This is based on limited coverage of about 25% of total properties in Scotland and cannot be considered as reliable. In last year's leakage calculations, only East of Scotland Water produced a truly independent estimate of leakage, as the other two Authorities had insufficient coverage.

This year, the district metering coverage has improved, notably with DMA implementation in Fife and Glasgow. However only 25% of total Scottish properties are within DMAs or metered Water Supply Zones, and some large areas, such as Edinburgh or former NoSWA areas, have no DMAs at all. This explains the large water balance difference of -246.7 Ml/d observed in line A2.39 in the Table 10 overleaf.

Table 10: Water Balance Comparison – 2001-02 / 2002/03 – IFM and Night Flow Methods

Water Balance				2001-02 Table A2	2001-02 Using IFM	2002-03 Method 1. Using Night flow leakage	2002-03 Method 2. Using IFM	2003-03 Method 2a. Sum of 4 Individual Areas Water Balance using IFM
A2.32	Total water delivered dom & non-dom props	Ml/d	C	1397.96	**1397.96**	1374.29	**1374.29**	1374.15
A2.33	DSOU	Ml/d	I	17.72	**17.72**	5.62	**5.62**	5.62
A2.34	Water taken legally unbilled	Ml/d	I	40.09	**40.09**	11.95	**11.95**	11.95
A2.35	Water taken illegally unbilled	Ml/d	I	0.00	**0.00**	0.00	**0.00**	0.00
A2.36	Distribution losses	Ml/d	C	889.74	**935.160**	739.45	**986.10**	986.25
A2.37	Total leakage	Ml/d	I	**1020.26**	**1065.68**	**885.41**	**1132.06**	**1132.21**
A2.38	Distribution input	Ml/d	I	2390.93	**2390.93**	2377.97	**2377.97**	2377.97
A2.39	Difference in water balance	Ml/d	C	**-45.42**	**0.00**	**-246.67**	**0.00**	**0.00**

Note: For line A2.37, the total leakage figure of 885.41 has increased by the addition of 246.97 (Line A2.39), giving a total leakage of 1132.07 Ml/day, as shown in Table A2.

Recent water industry publications have highlighted wide variations in the reporting of household supply pipe leakage and conclude that overall these figures are too low. Establishment of the proposed 60% DMA coverage together with the establishment of reference zones to underpin the PCC study will help SW better understand the current levels of leakage attributable to customer assets. It is however likely that the total leakage figure will rise as a result of better understanding of all components of the overall water balance calculation.

Method 2 Integrated Flow Method: For reporting and comparison purposes, the most reliable leakage estimates for years 2001/02 and 2002/03 remain those based on the Integrated Flow Method (Total Leakage = Distribution Input minus all demand components other than leakage), i.e. 1065 Ml/d in 2001/02 and 1132 Ml/day in 2002/03. Taking into account the uncertainty around those estimates, it must be noted that the apparent 67Ml/d increase observed between 2001/02 and 2002/03 does not mean that Total Leakage has truly increased (in other words, the observed variation between the two estimates is not statistically significant).

Method 2a:For Table E6.12 leakage is reported by 4 Operational Areas. To allow a Water Balance to be calculated in this way, each component of the Water Balance needs to be estimated by the Operational Areas. For this Report Year, some extrapolation was required to apportion non-domestic demand. The difference in Total Water Delivered (Line A2.32) of 0.14 Ml/d observed in Table 10 above, is reflected in Total Leakage (A2.37).

Table 11: Water Balance Summary Table

Scottish Water	June 01-02 Return	June 02-03 Return	Difference in returns	Reasons for differences in returns
Distribution Input (Ml/d)	2390.9	2377.9	-13	Actual measured drop in distribution input
Assessed components of demand				
Unmeasured domestic	827.7	837.7	+ 10	Change is supply pipe leakage estimates and pcc figures
Measured domestic	0.49	0.33	-0.16	
Measured non-domestic	529.7	443.3	-86.4	Measured drop in consumption in Rapid billing system
Unmeasured non-domestic	40.09	93.0	+52.9	New methodology, 01 used assumed consumption of 90m3/£1000RV/year, 02 Estimation of NHNM methodology
DSOU	17.72	5.63	-12.09	Change in methodology - true estimate calculated
Water taken legally unbilled	40.09	11.95	-28.14	5 l/prop/d
		Total difference	**-76.89**	\
Left Over Distribution Input				
Total leakage	1020.3	885.8	-134.5	
Comparison of IFM	**1065.42**	1132.1	+66.7	

A2.38 Distribution Input

This value is calculated from works output and treated export and import meter readings and has an accompanying confidence grade of C4. The reliability grade is based on the distribution input reconciling to 10% of the sum of the separately estimated water balance components. An on-going meter improvement programme of bulk meters will improve the accuracy band in future Returns.

A2.39 – Difference in water balance

Due to different methodologies being adopted last year in producing the Total Leakage estimate, it is not possible to compare the 2001/02 and 2002/03 Differences in Water Balance. Last year, two of the former Authorities used the integrated flow method to estimate leakage, leading to the reported Difference in Water Balance for the West and the North being close to 0. ESW alone used a truly independent estimate based on night flow measurements, with a reported Difference of Water Balance of 30 Ml/d. Simplifying assumptions used to consolidate the Water Balance at Scottish Water level resulted in a reported Difference in Water Balance of 45 Ml/d.

This year's Difference in Water Balance using Night Flow Measurement is based on a more consistent methodology across Scottish Water. The fact that this Difference is relatively large (10 % of Distribution Input) can be explained by the lack of reliability of the Total Leakage estimate, which is still based on a limited coverage of Scotland (25 %, unevenly spread).

As stated in Line A2.37 (Total Leakage), the most reliable leakage estimates for years 2001/02 and 2002/03 remain those based on the Integrated Flow Method (Total Leakage = Distribution Input minus all demand components other than leakage), i.e1065 Ml/d in 2001/02 and 1132 Ml/day in 2002/03. These are the estimates that should be used for reporting and comparison purposes. As this is the first year of consistent methodology, and although improvements in methodology are still required, it is recommended that this is considered as the Base Year for future Returns and that the leakage estimate from the Integrated Flow Method be reported as the most reliable leakage figure available to SW at this time.

It is suggested that in future years, Total Leakage should be calculated using the Integrated Flow Method until such time as the independent estimate based on night flow monitoring areas becomes sufficiently reliable (i.e. based on a larger and more representative DMA coverage and leading to a difference in water balance inferior to 5% of distribution input).

The Water Balance relies on an accurate coverage of night flow measurement as described in section A2.37 but also on customer billing records. Using the Integrated Flow Method, any error in reporting measured and non-measured water delivered will be reflected in the leakage figure, instead of appearing as the Difference in Water Balance (A2.39). The reported difference in water balance will therefore be 0. However, Scottish Water will still report the independent estimate of leakage in the commentary together with the actual difference in water balance.

When the difference in water balance resulting from using the independent estimate of Total Leakage becomes less than 5%, it is suggested that the water balance should be reconciled using the MLE methodology, as recommended in OFWAT reporting requirements. Scottish Water will however keep reporting the pre-MLE water balance in the commentary.

For future years, the forecast change in distribution input was calculated to reflect exactly the change in its components. This ensures consistency in the calculations. As a result, the difference in Water Balance remains constant over the next 2 years.

A2.40 – Assessment of overall water balance

Although the confidence grades have been requested to be based on methodologies which underpin the component estimates, it is recommended that this year's Water Balance is considered as the base year with a confidence grade of C4. Following definitions and guidelines, the reliability band for the overall Water Balance has been awarded as C as the water balance components reconcile with measured distribution input to within 10%. (To achieve band B, the water balance components must reconcile with measured distribution input to within 5%). The accuracy band of 4 was based on the individual components of the water balance.

A2.41 – Bulk supply imports

Scottish Water has no bulk supply imports or exports.

A2.42 – Bulk supply exports

as A2.41

A2.43 – % of distribution input through PFI treatment works

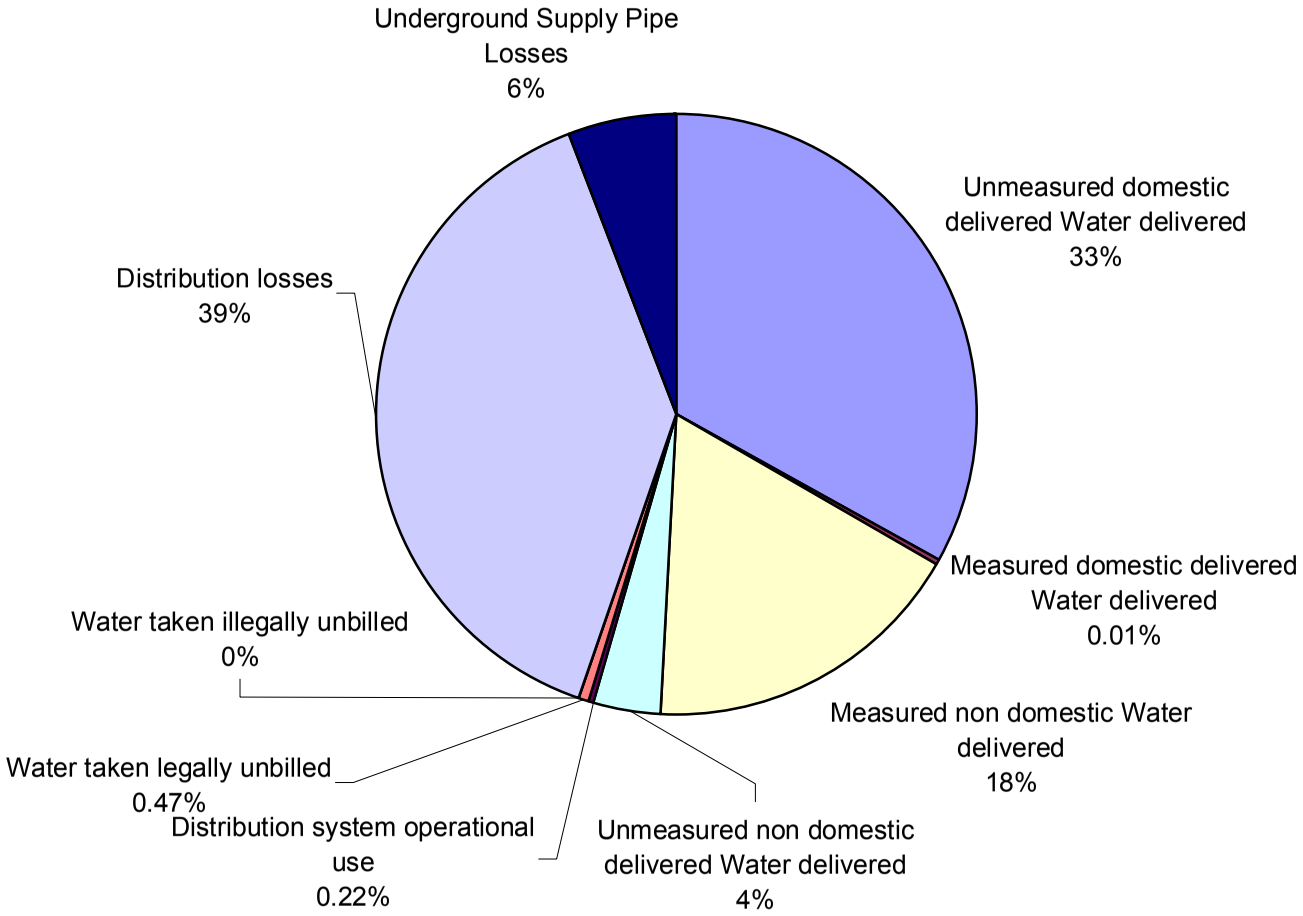
Scottish Water does not have any Water Treatment PFI Works.

Water Balance Pie Chart

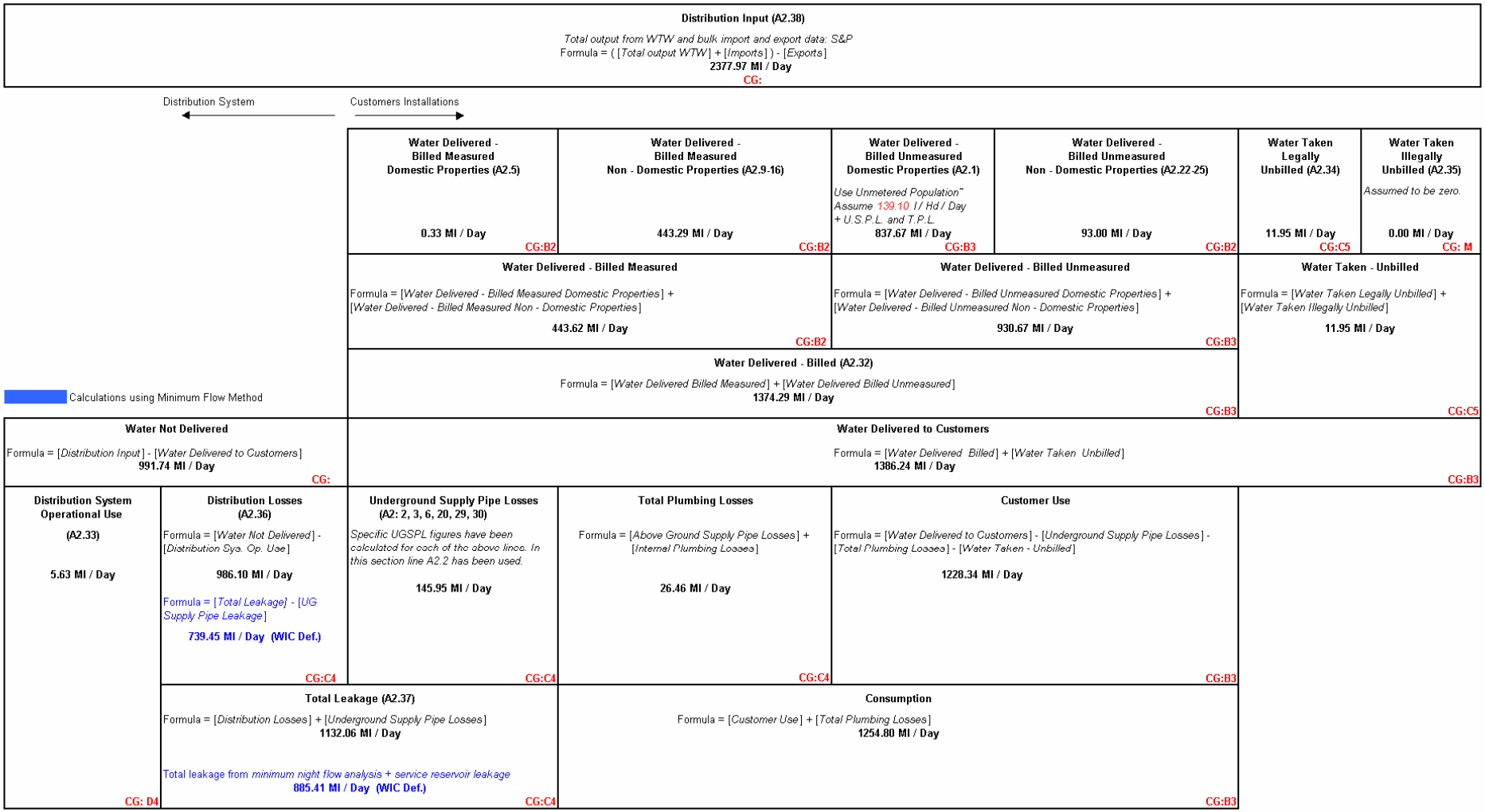
Using Integrated Flow Method For Leakage

WATER INDUSTRY COMMISSIONER FOR SCOTLAND

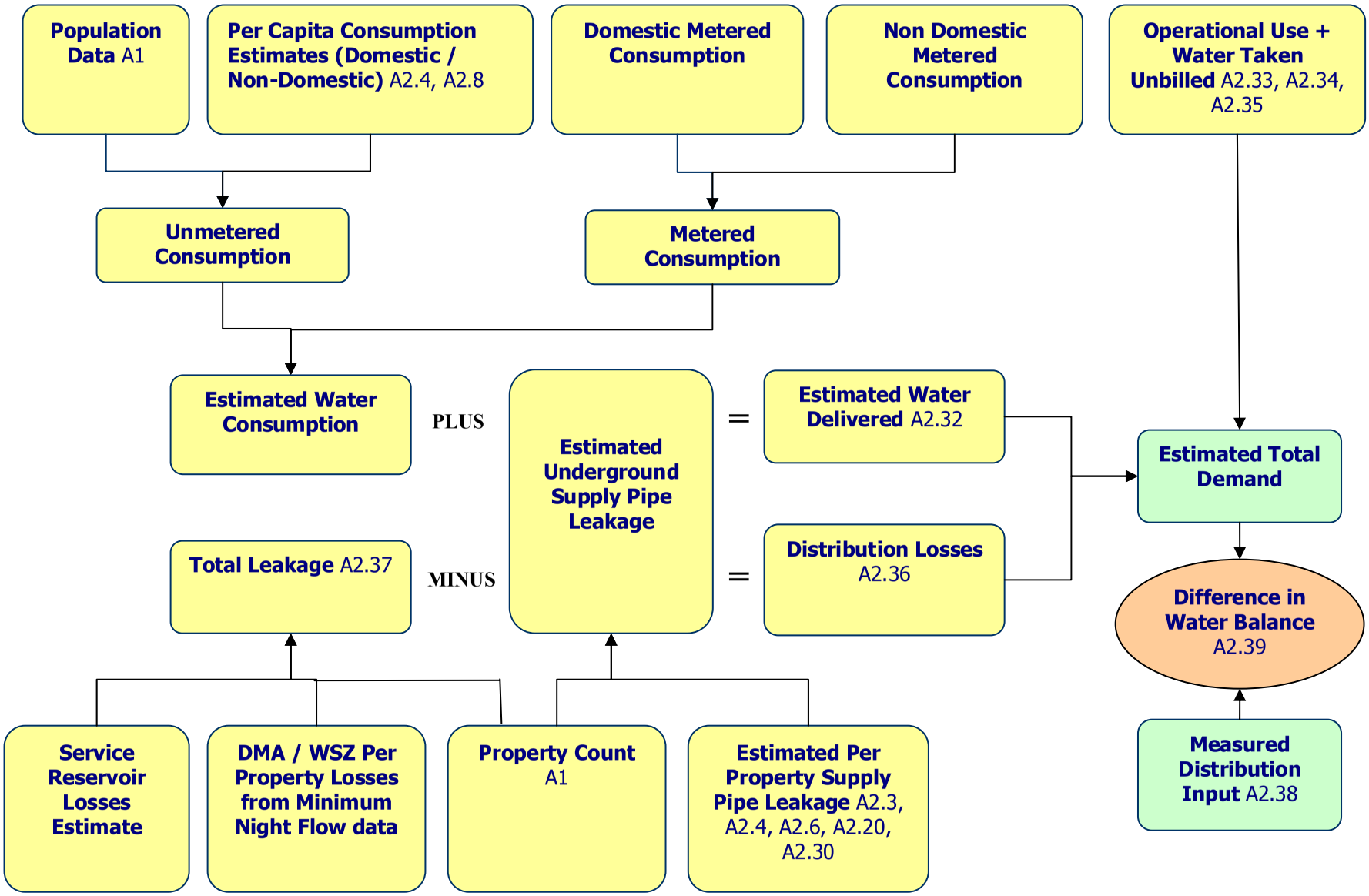
Distribution Input
2378 Ml/d



Appendix 1 – Water Balance Schematic- see appendix file attached.



WATER BALANCE SCHEMATIC



A2.41-42 Bulk Supplies

This is not applicable to Scottish Water as no water is imported or exported to other authorities in bulk supplies.

A2.43 % of distribution input through PFI treatment works

Scottish Water does not have any Water Treatment PFI Works.

Table A3 Properties and population – wastewater

A3.1-13 Unmeasured domestic properties

See lines A1.1 to A1.11

A3.14-17 Measured domestic properties

See lines A1.12 to A1.13.

A3.18-30 Measured non-domestic properties

See lines A1.14 to A1.23.

A3.31-49 Measured Non-Domestic - Meter Sizes: Actual

See lines A1.24 to A1.42.

A3.50-68 Measured Non-Domestic - Meter Sizes: Theoretical (ESWA only)

See lines A1.43 to A1.61.

A3.69-76 Unmeasured non-domestic properties

See lines A1.62 to A1.67.

A3.77-80 Surface Water

To date, the charge mechanism is optional and only about 151 properties have been transferred. The data relates to measurements supplied by customers and verified via Scottish Water's GIS section for these 151 properties.

There is no 'non standard' tariff for the service.
Area 'not charged' is the property area identified by the customer as not returning to sewer plus standard 10% reduction.
No properties have been identified as having surface water drainage only.

A3.81-84 Summary – population

A3.81 – A3.83 See lines A1.71 to A1.72

A3.84 –Scottish Water employs an assumption of a 5% non-return to sewer allowance, which is the assumption that is commonly used in England and Wales.

A3.85-119 Rateable Value Base

See lines A1.76 to A1.79.

Table A4 Sewage volumes and loading

A4.1-19 Sewage – volumes

A4.1 to A4.5 - All data has been derived from WIC22, as at 31/03/03, sourced from each of the primary billing systems, Custima and Rapid. Volumes were derived as 95% of the water volumes (as calculated for lines A2.22 to A2.25) for properties connected to the wastewater system.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes
Static domestic population with movements between metered and unmeasured households.
2.5% reduction in unmeasured water use for business customers due to metering.

A4.2 Unmeasured Waste Water - Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges. Volumes are based on an average annual water use of 36.4m^3 / £1,000 RV.

(36.4m^3 = 1000 x 4.0p (per £RV) / 110p (per m^3)

No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.

Budget for 2004/05 assumes underlying 2.5% reduction in unmeasured RV.

A4.7 to A4.15 - All data has been derived from WIC22, as at 31/03/03, sourced from each of the primary billing systems, Custima and Rapid.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes a 2% underlying reduction in volumes of wastewater at metered business premises.

A4.16 – Data based on billed volumes as billing for 2002/03, where possible. Where bills have yet to be issued to customers the figure is pro-rated for the year. There is also some estimation, based on a company's consent therefore a confidence grade of B3 applies.

Future Years

Budget figures for Report Year +1 are consistent with Scheme of Charges.
No forecasts have been produced for 2003/04 so the forecast figures are as per the budget.
Budget for 2004/05 assumes a 5% reduction in underlying trade effluent volumes.

A4.19 The number of tanks emptied is recorded at the area offices and is accurate, although in the South East Area the number of public septic tanks is not recorded separately from the private tanks.

The tank volumes are not known, and the following figures have been assumed for the purposes of estimating this line:
Private domestic tanks – 3m^3
Private commercial tanks – 12.5m^3
Public tanks – 25m^3

The volume has been estimated on a more consistent basis than previously, which accounts for the much higher figure than last year. This is not a large proportion of the total flow, and it is expected to decrease by about 2% per annum in line with the reduction in water volumes as described in Table A3.

A4.20-39 Sewage – loads

A4.21 This figure has been deduced from the resident population figure (A4.20) by deducting an estimate for the population served by sea outfalls and septic tanks. An annual average figure for the non-resident population used in deriving the summer population figure (A3.82) has been added. This is based on Tourist Board figures for the number of hotel beds with an assumption of an equal number of camping/caravan visitors. The annual average figure was obtained by assuming a summer season of 4 months in accordance with OFWAT definition.

Resident population figures are not held on a works-by-works basis, but the above global approach is considered to give a more accurate estimate than last year. This, in part, accounts for the noticeable increase in comparison to last year. However, the greater part of the change is due to the conversion of 370,000 population from preliminary to secondary treatment with the construction of new works at Inverclyde, Meadowhead and Stevenston.

A continuing increase in this figure, albeit at a reduced rate, is anticipated in the short term as treatment standards at a number of unsatisfactory sea outfalls are improved.

A4.22, A4.23 The basis for this figure is the same as that for Line A4.21, with a reduction based on an estimate of the population served by primary treatment works.

The reason for the increase over last year is explained under A4.21 above, but is more pronounced because of the upgrading of a number of primary works to secondary treatment.

A similar trend to A4.21 is anticipated as the standard of treatment continues to be enhanced.

A4.24 This figure has been calculated as the non-trade element of the non-domestic flow as billed and charged.

Data was not available last year, so it is not possible to make a comparison or identify a trend. However, this volume is expected to decrease by about 2% per annum in line with the reduction in water volumes as described in Table A3.

A4.25 BOD has been calculated from settled COD figures as charged, assuming BOD = COD/2. BOD load is a settled BOD figure, representing load discharged from primary to secondary treatment, not the load entering the WWTW. Last year's figure was a mixture of settled BOD (East) and straight BOD (North & West).

The small increase shown in the coming year is due to the fact that the load at Meadowhead, Stevenston and Inverclyde will apply for the full year, whereas this year it applied for 6 months only. Thereafter, the load is expected to decrease by 5% per annum, in line with the prediction made at Line A4.16.

A4.26 The COD figure is calculated from the settled trade effluent COD load as charged and volume.

There will be an increase in the coming year for the same reason as noted under A4.25 above. Thereafter, the load is expected to decrease by 5% per annum, in line with the prediction made at Line A4.16.

A4.27, A4.28 The method for assessing the volume of waste has been described under line A4.19. The load has been assessed by assuming an average value of 6000mg/l. The public septic tank load for the South East Operational Area is not identified separately and is included in the private septic tank total.

There is a noticeable reduction in load compared to last year because of differences in the method of estimation used by different areas. The load is a very small part of the total, and is expected to decrease by about 2% per annum in line with the reduction in water volumes as described in Table A3.

The confidence grade C4 takes account of the fact that data are gathered in different ways in different areas. Last year the grade referred to the individual assessments made by each area.

A4.29, A4.30 This is based on the total tankered waste (excluding septic tank waste) received at treatment works. The loading has been assessed from average values taken from analyses where known.

There is no significant change from last year, and the figures are expected to decrease by about 2% per annum in line with the reduction in water volumes as described in Table A3.

The confidence grade C4 takes account of the fact that data are gathered in different ways in different areas. Last year the grade referred to the individual assessments made by each area.

A4.31 The corresponding figure in E8.18 is 138,500 tonnes, compared with a figure last year of 123,500 tonnes. There has been an increase of approximately 21,000 tonnes of load receiving secondary treatment capacity, mainly at Levenmouth, Meadowhead, Stevenston and Inverclyde, and the figure of 123,500 tonnes last year appears to be an overestimate.

A further small increase in load receiving secondary treatment is anticipated as new works are brought into service.

A4.32 The figure reported here is taken from Table E8, and is based on the actual load received at the works. The decrease of approximately 10,000 tonnes is explained almost entirely by the double counting of Dalmuir primary works with Dalmuir PFI (secondary) works, which took place last year.
A small decrease in load receiving primary treatment is expected in the short term, as further upgrading of works is carried out.

A4.33 The figure reported here is taken from Table E8, and includes the load receiving preliminary treatment or screening. In the case of preliminary works it is the actual load received at the works, and in the case of screening it is an estimate based on population served. The substantial reduction from 24,900 tonnes last year to 2,300 tonnes this year is due mainly to the upgrading of preliminary treatment facilities at Levenmouth, Meadowhead, Stevenston and Inverclyde.

A small decrease in load receiving preliminary treatment is expected in the short term, as further upgrading of works is carried out.

A4.34 This figure is taken from E8.18 and is the actual load received at treatment works and sea outfalls. There is a small increase, approximately 2%, compared with the figure reported in A4.34 last year, but this is believed to be due mainly to changes in the way the information has been collated. The figure reported in E8.18 last year, 167,671 tonnes, is believed to be too high, as explained in the commentary for that Table.

The total load is expected to decrease by about 2% per annum in line with the reduction in water usage as described in Table A3.

A4.35 The figure given is the settled COD figure used in the charging scheme. For 2001/2 and 2002/3 it is an average of the 3 former Water Authority values (350+600+250)/3 = 400.

A4.36 The figure given is the pH-corrected suspended solids of "average sewage" used in the charging scheme. For 2001/2 and 2002/3 it is an average of the 3 former Water Authority values (258+400+150)/3 = 269.

A4.37 The equivalent population served has been calculated from the total load received at the works (Line E8.18) assuming the average load to be 60g BOD/head/day. The figure for non-resident population (used to determine the summer population) has been deducted from this figure, a summer season of 6 months being used to estimate the annual average population.

There is no significant change from last year, but the figure is expected to decrease by about 2% per annum in line with the reduction in water usage as described in Table A3.

A4.38 This figure has been determined on the same basis as Line A4.37, but restricted to works where a known numerical consent is in place. It should be noted that a further 266,000 population equivalent is served by works where the status of the discharge consent has not yet been confirmed, and work is continuing to clarify the position of these works.

The increase of approximately 10% on last year is believed to be due mainly to greater clarity concerning the consent conditions in force. The figure is expected to decrease in line with the reduction in water usage noted in Table A3, but this will be offset as more consents are confirmed, and standards are tightened.

A4.39 This is the load received at PFI works that has been reported within the figures in Table E8.

The slight increase on last year's figure is believed to be due improved reporting accuracy. No major change is expected in the short term, as no new PFI works are planned at present, but a small reduction of about 2% per annum is expected in line with the reduction in water usage as described in Table A3.

A4.40-45 Sewage – facilities

A4.40 This is the number of treatment works reported in Table E8. The figure includes septic tanks, but does not include preliminary works, which are included as sea outfalls in Line A4.41.

There is no significant change from last year, and none is expected in the short term.

A4.41 This is the number of sea outfalls reported in Table E8, including preliminary treatment works.

There is a significant reduction in the number of outfalls, which is even more marked in Table E8. This is because of a major discrepancy between the two Tables last year, which has now been resolved. The reasons for the decrease are given fully in the commentary on Table E8.

A further reduction in the number of outfalls is anticipated with the construction of new coastal wastewater treatment works.

A4.42 The available capacity has been taken as the design capacity of works, where known. Preliminary works and sea outfalls are not included in this total. For a number of smaller

works, where the design capacity is not known, the available capacity has been taken to equal the load received at the works.

No meaningful comparison with last year is possible because of confusion in the units used at that time. This year's figure shows headroom of approximately 9% over the load received, and this is not expected to change in the short term.

A4.43 This is the figure reported against sea outfalls (including preliminary works) in Table E8, assuming a load of 60g BOD/head/day. No reduction has been made for non-resident population, as this is considered to be an insignificant proportion of the total.

The reduction of nearly 90% in last year's figure is due mainly to the removal of works such as Levenmouth, Meadowhead, Stevenston and Inverclyde from the outfall list. A further reduction is anticipated as more outfalls are replaced with new wastewater treatment plants.

A4.44 Unsatisfactory outfalls are deemed to be those that are failing specific SEPA conditions, or that discharge to bathing waters or shellfish waters that are at risk. Discharges where an upgrade is required by 2005 under the Urban Wastewater Treatment Regulations are not considered unsatisfactory at the present time.

A number of unsatisfactory discharges have been addressed by new works in the last year, and this accounts for the reduction in the figure reported here. Work to improve other discharges is in hand, and a continuing reduction in the number of unsatisfactory discharges is anticipated.

A4.45 This figure has been derived from the load reported in Table E8 against those outfalls identified as unsatisfactory in Line A4.44, assuming a load of 60g BOD/head/day.
There is a very significant reduction in this figure compared with last year, and this is due almost entirely to the removal of Meadowhead from the unsatisfactory outfalls list. A further small reduction in this figure is anticipated as new works to address unsatisfactory discharges are brought into service.

A4.46-52 Sewage sludge disposal

A4.46 – A4.51 Figures reproduced from Scottish Water Sludge model and the three authorities Gemini Sludge Management Systems, The amount disposed of by each route was totalled and presented as a percentage of the total Scottish Water sludge production detailed in A4.52.

B Tables - Outputs to Customers

Table B1 Water Availability

General comments

The WIC definition states that a water resource area is:

'The largest possible area in which all resources, including external transfers, can be shared and hence the area in which all customers experience the same degree of supply failure from a resource shortfall.'

In order to satisfy this definition, Water Operational Areas (WOA) were used to define the water resource areas. The WOA is the high-level reporting zone for the water distribution network and is defined as follows:

A Water Operational Area encompasses all properties, distribution and trunk mains fed from one unique Water Treatment Works (see Figure 1.). The only exception to this is where water from more than one water treatment works mixes. In this situation, a new WOA is created to encompass all properties, distribution and trunk mains supplied by the mixed water (see Figure 2.)

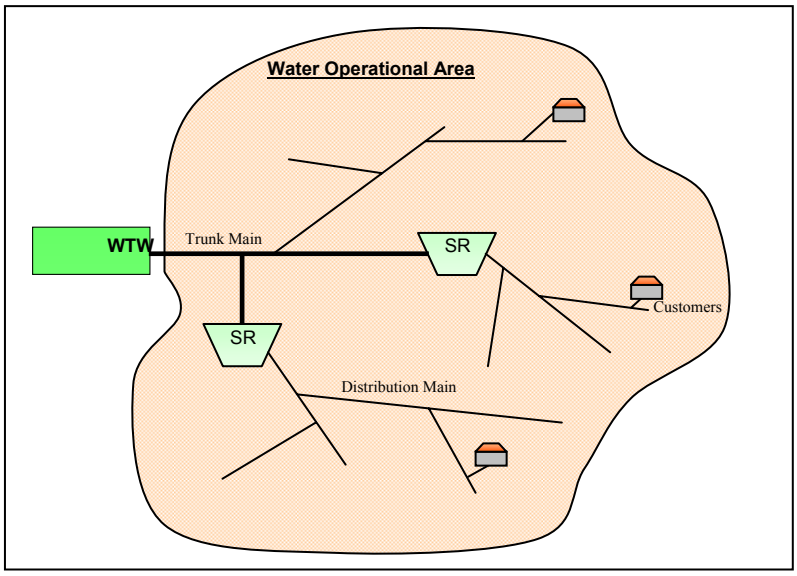


Figure 1: Simple WOA Diagram

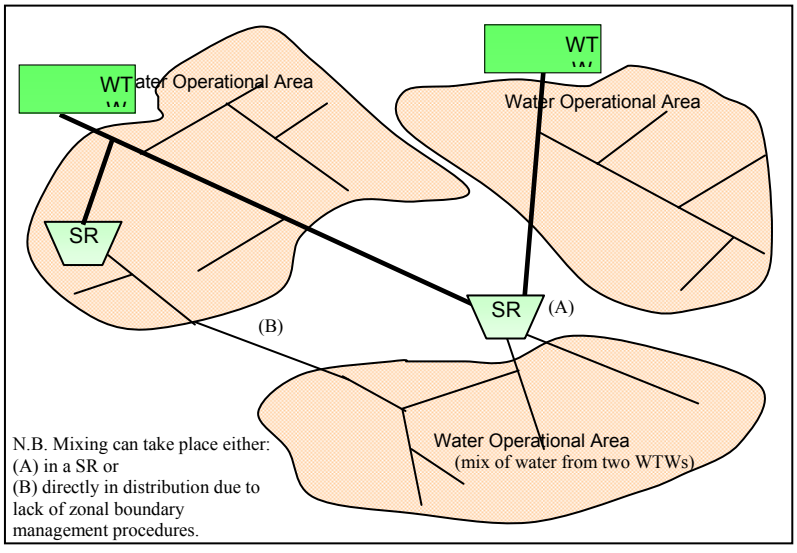


Figure 2: WOA structure with treated water mixing.

The water resource areas were split into two distinct categories; single resource areas and multiple resource areas. The single resource areas were defined as a source (or group of sources) which provides a discrete supply to a water treatment works (WTW), which in turn provides a supply to a single WOA (i.e. a discrete zone). This can be seen in Figure 3.

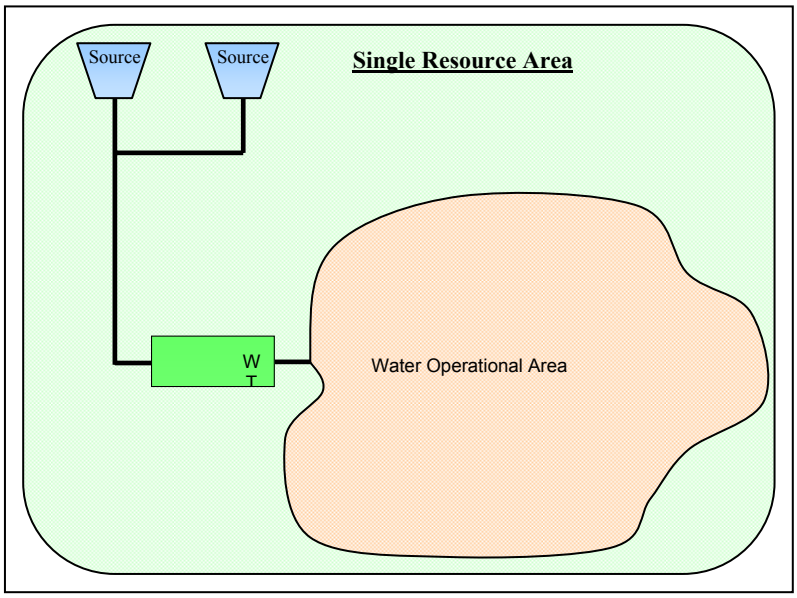


Figure 3: Single Resource Area

Multiple resource areas were defined either as:

a source (or group of sources) supplying two or more WTW and their associated WOAs, where it is not possible to link individual sources to an individual WTW. An example of this is shown in Figure 4;
or;
a combination of WOAs where water from two or more WTW mixes in the distribution network. In this case, although the sources and WTW may be discrete systems, they are linked within the distribution network This can be seen in Figure 5.

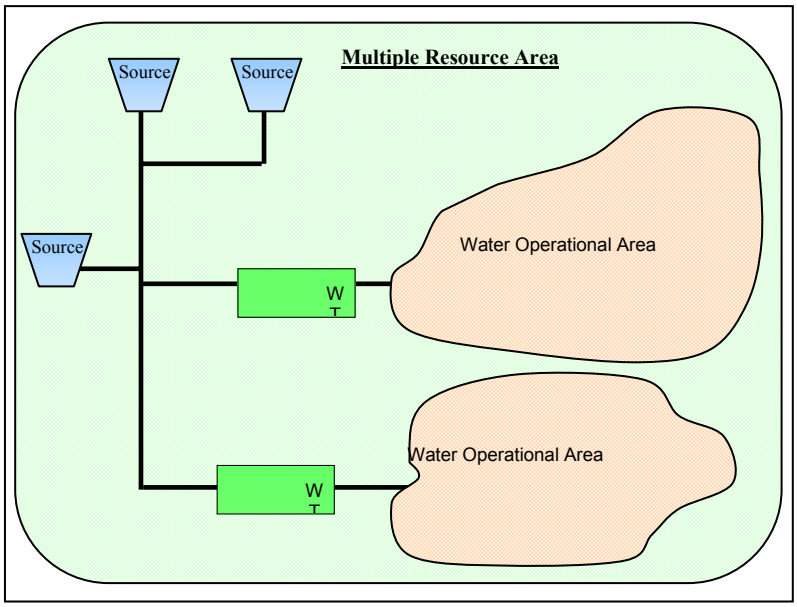


Figure 4: Multiple Resource Areas with linked sources to multiple WTWs

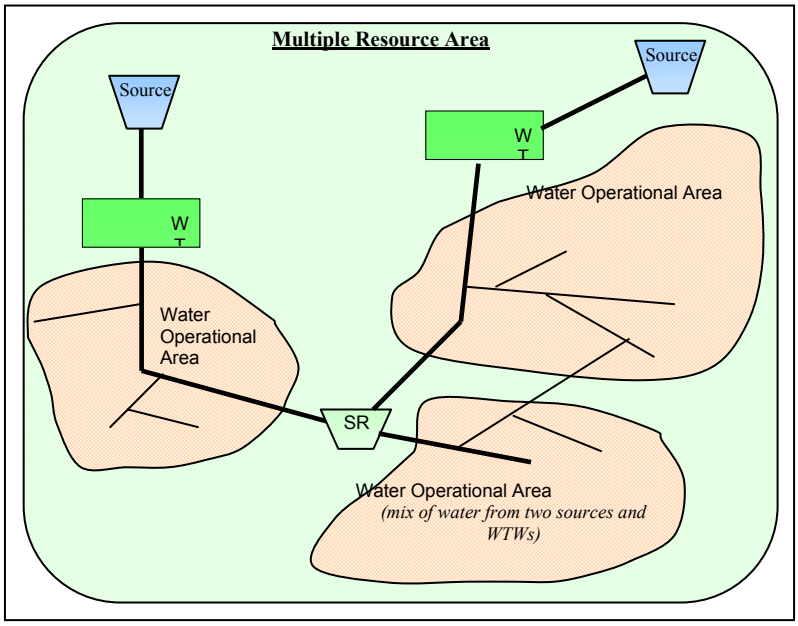


Figure 5: Multiple Resource Area with separate sources and WTWs but linked in distribution network

The total number of WOAs within Scottish Water was estimated at 381. This figure was composed from information available from the various INMS zonal management projects taking place across the authority and estimated for areas where zonal management has yet to commence. These areas are generally rural in nature and it was felt to be appropriate to create one-to-one WTW to WOA relationships as the networks tend to be geographically isolated from one another. It is recognised that as zonal management proceeds, this number may be subject to change as improved information on network operation becomes available.

Therefore, the reported number of water resource areas was 381, of which 305 are single resource areas, and the remaining 76 are grouped into 14 multiple resource areas.

The number of water resource areas has reduced from 458 (the figure reported last year) to 381. The reduction is due in part to the closure or reclassification of water treatment works over the 2001/02 reporting period (a reduction of 31 WTWs) and also to the differing methodology used this year utilising the improved knowledge of WOAs. However, the 2001/02 figure was compiled from the summed total of the legacy authorities' water resource areas. This included separate water resource areas from the same WTW, as treated water was exported to another authority. In the 2002/03 return, these water resource areas have been combined resulting in an overall reduction in the number of water resource areas.

B1.2 to B1.4: The number of water resource areas reported by headroom band has changed from last year; the <2% category has dropped from 126 to 102 while the >5% category has decreased from 326 to 273.

B1.5*:* The population figure is brought forward from Table A.

B1.6 to B1.8*:* The populations in areas provided with headroom show a marked change from last year. The population receiving <2% has dropped from 2507k to 968k while the population receiving >5% headroom has increased from 2.46k to 3.92k. While these two movements show an overall improvement of Level of Service it must be stressed that the majority of the change is due to the new methodology adopted as discussed above.

Over the last year, a number of projects have taken place which have resulted in a better understanding of the water distribution network. As a result of this, WOAs where water from adjacent water treatment works mixes have been identified. As work progresses on zonal management, it can be expected that the number of WOAs where treated water mixes will be reduced and this will result in a decrease in the overall number of WOAs and therefore a corresponding decrease in the number of water resource areas.

The headroom characteristics for each resource area and the subsequent population affected are determined by following the calculation methodology set down by WIC. This simplistic approach does not consider all of the uncertainty that surrounds headroom calculations. A more robust methodology would utilise the UK standard procedure for assessing headroom uncertainty, i.e. UKWIR Report (ref: 98/WR/13/1) – *A Practical Method for Converting Uncertainty into Headroom.*

All population totals are sourced directly from Table A1 and no further correlation is carried out as the result of the headroom calculation. Comments on the quality of the population and demand data are included in the commentary accompanying tables A1 and A2.

The headroom bands are too narrow and a review should be undertaken by the WIC to determine if a more appropriate breakdown could be used. Negative headroom areas are included in the ≤2% band and not identified individually.

The confidence in the accuracy of the historic estimates of yield from Scottish Water's surface water resources has improved. This is due to the ongoing reassessment of yields using industry best practice software (Hysim – Aquator) where applicable.

For other sources, empirical methods such as the Institute of Hydrology – Low Flow Methodology or equivalent have been used. Ongoing discussions with SEPA will formalise the appropriate methodology. This will result in greater confidence in yield assessments but will also highlight the need for additional investment.

Water Resource Plan: Scottish Water are currently developing a Water Resource Plan (WRP) as required by the Scottish Executive to highlight areas of resource deficiency and potential areas for investment. This will adopt a varying Level of Service for drought conditions, which is different to the fixed return period of 1:50 years used in this return.

B1.9-11 Restrictions on Water Use

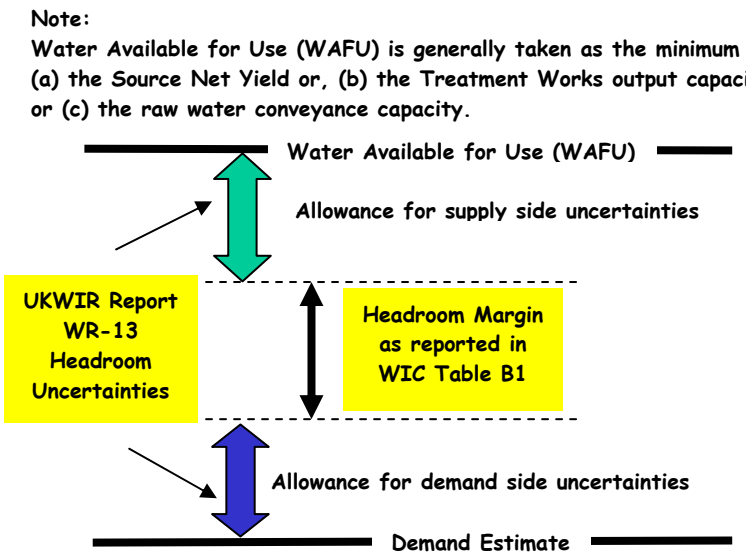
The data in this section is extracted from Scottish Water internal records of any restrictions applied. The Water Resources and Reservoirs Team within Assets Strategy & Planning keep and maintain these records.

Discussion on WIC Table B1

The annual return Table B1 gives an indication of the water availability under three main headings: Resource Areas, Population and Restrictions on water use.

In order to seek clarification, the definitions and methodology to be employed in determining the entries for this table were discussed with the WIC representatives. In particular Scottish Water considers the term headroom as used in Table B1 to be ambiguous as this term is also used in an UKWIR Report[3], which deals with the conversion of uncertainty into a headroom allowance. The concept behind the UKWIR report is that there are clearly a number of uncertainties in the figures used to determine the supply / demand balance, and that a rational and prudent approach to this is to allow some additional headroom to cover these uncertainties. The components of this approach are shown below.

[3] UKWIR, *A Practical Method for Converting Uncertainty into Headroom*. Contract WR-13, 1998



The attached Table A has been produced using the UKWIR Headroom methodology and depicts typical values for Scottish Water's stream and reservoir sources. A source by source estimate for headroom uncertainty is not feasible at present but, from this generalised analysis a figure of 12% could be taken as typical value.

It will be possible to reduce any target headroom allowance for uncertainty when improved estimates of yield and climate change impacts have been assessed over the next two years.

The definition of Water Resource Area adopted for Table B1 reflects the current Scottish Water asset structure in a 'source to tap' methodology. Difficulties continue to exist in areas of multiple supplies, however, a 'normal operating condition' rule has been applied. The introduction of dynamic monitoring of boundary valve movements will further improve monitoring of zonal interconnectivity and will further improve the accuracy of the headroom calculations

Further conclusions that can be drawn from this analysis are:

The band sizes are rather narrow, thus for instance the mid-band of >2% and $\leq$ 5% has low counts and adds little information, whilst the lower and upper bands have high counts.

The table does not show that in a number of cases the supply to demand position has negative headroom, other than it is implicitly included in the $\leq$ 2% count.

The rationale for specifying 2% and 5% as break-points for Table B1 is not clear, as in the field of water resources these magnitudes are below reliably detectable thresholds for most of the variables, such as metered consumption. It may be that more meaningful information would be gained by altering the band sizes and including negative ranges.

Table A - UKWIR Methodology Headroom Estimates							
	Uncertainty Factor	**Min Max**	**Intakes**		**Reservoirs**		**Comment**
			Lo Val	**Hi Val**	**Lo Val**	**Hi Val**	
S1	Vulnerable Surface Water Licences	0-5	0	1	0	1	In general low risk, but some sources are SSSI's
S2	Vulnerable Ground Water Licences	0-10	n/a	n/a	n/a	[2]n/a	Ground water is minor factor in WoSW
S3	Single Source Dominance	0-10	10	10	5	5	Generally supply from river intake or single reservoir
S4	Bulk Transfers	0-5	n/a	n/a	n/a	n/a	Not applicable for majority of WoSW supplies
S5	Time Limited Licences	0-15	n/a	n/a	n/a	n/a	Not applicable in Scotland
S6	Gradual pollution…Reduction in Abstraction	0-15	0	2	0	2	In general low risk, but forest impact possible.
S7	Uncertainty of Climate Change on Supply	0-10	2	6	2	6	Summer / Winter changes, say low to medium risk.
D1	Accuracy of Sub-component Data	0-10	6	8.5	6	8.5	Class B/C, limited detail and poor reconciliation.
D2	Demand Forecast Variation	0-15	7.5	11	7.5	11	Medium spread to lowish bound estimates.
D3	Uncertainty of Climate Change on Supply	0-5	2.5	2.5	2.5	2.5	Who knows – take mid range as recommended.
	Sum(S1,S2,S4, S5,S6)		0	3	0	3	
	Sqrt(Sum($S3^2$, $S7^2$, $D1^2$, $D2^2$, $D3^2$))		14.2	18.3	10.6	16.1	
	Total Score:		14.2	21.3	10.6	19.1	
	Percentage Headroom (from graph):		**12.2**	**14.6**	**10.2**	**14.0**	

Table B2 Pressure and Interruptions

General comments

Updated Information:

Data from last year's return has been updated based on the following information:

- Calibrated all mains network models that have been completed within the report year.
- Information from Level 1 DMA reports
- Data from Preliminary Zone reports, which were based on zone investigations and consultations with operational staff.

Definition of the standard:

In accordance with the WIC guidance, Scottish Water reports against a standard of 15m in the adjacent main as a surrogate for the WIC standard. This will take into account the position of the water tank in the property. At present, no allowance has been made for properties on common or shared services, as these are currently being identified in our GIS.

Exclusions from the Standard:

Pressures below the standard **will** be acceptable in the following specified circumstances:

- Essential maintenance which has been pre-notified by a minimum of 24 hours;
- One-off incidents such as third party action / disturbance where these are not recurring incidents;
- Periods of less than one hour; and
- A period of abnormal peaks in demand, not more than 5 days per annum or 25 days in a rolling 5-year period. This exclusion will not be taken to cover daily, weekly or seasonal peaks, which could normally be expected.

Level of Service Register:

Currently there is no corporate Scottish Water Level of Service Register. Information is gathered from various sources across each of the areas, however, recording of low-pressure complaints now operates consistently across Scottish Water.

Future development

In Operation Zones (and eventually DMAs), where pressures regularly fall below 18m, and therefore pressures at some properties may fall below the 15m reference standard, there is currently no continuous monitoring of zonal pressure is carried out.

The use of inferred pressures from level 1 DMA reports will lead to a less reliable estimate of the number of properties subject to low pressure, as the reduction in pressure due to head loss in the pipes cannot be taken into account. The actual minimum pressure of these properties in the field will vary dependent upon local headlosses, the layout of properties relative to Critical Monitoring Points and the network layout. In some instances, estimates will be over stated, and in others under stated. The only reliable method of measuring the problem is to install continuous critical point monitoring.

Customer complaints about low pressure, received by telephone, electronic mail and letter, are recorded and consideration will be given towards logging the zone or DMA appropriately if loggers are not already in place.

B2.1-10 Properties receiving pressure/flow below reference level

B2.1 – Refer to Line A1.69

B2.2 - Data is taken from the 2001-2002 WIC Returns for the three former Authorities.

B2.3 –Information for the former North and East have been added from the results of calibrated All Mains WSZ network models completed in 2002/2003.

For the former West, information was taken from the Level 1 DMA reports that inferred properties subject to low pressure from logged pressures at the highest point in the system. This would tend to over-estimate the number of properties subject to low pressure due to an over-estimation of the head losses in the system. This is a change in methodology since in the 2001/2002 return, the pressure was inferred from the pressures at the service reservoir. This would tend to under-estimate the number of properties subject to low pressure since this method under-estimates the head losses in the system.

B2.4 –No investigation or analysis is yet in place to be able to determine if additions to the number of properties with low pressure were the result of asset deterioration. Operational activities on boundary valves may be masking problems. This is being addressed through the boundary valve management system.

Since no data has been entered, a confidence grade of 'M' has been assigned. To improve this it is necessary to have better confidence in line B2.9 and reasonable coverage of proposed zonal management areas.

B2.5 – No investigation or analysis is yet in place to be able to determine if additions to the number of properties were the result of operational changes, hence no data has been entered and a confidence grade of 'M' has been assigned. To improve this it is necessary to have better confidence in line B2.9 and reasonable coverage of proposed zonal management areas.

B2.6 – Removals were due to,

- Data from calibrated All Mains WSZ network models completed in 2002-2003
- Investigations based on preliminary zonal report production

B2.7 – No post-assessment information is available and so it is not possible to determine if properties have been removed from the LOS tables. In order to improve this it is necessary to track rehabilitation projects and perform full post-assessments.

B2.8 – No investigation or analysis is in place to enable determination of properties that can be removed as a result of operational changes. A confidence grade of M has been entered. To improve this it is necessary to have better confidence in line B2.9 and reasonable coverage of proposed zonal management areas. In addition, it is hoped that in the future customers will be removed through solutions from Geographical Strategies.

B2.9 –Calculated field. This has been given a confidence grade of C4.
An incorrect figure of 1541 was entered in last year's consolidated return. It should have read 7,607 made up of the total of each legacy authority return (ESW 1526 + NoSWA 5062 + WoSWA 1019)

B2.10 – No investigation or analysis is yet in place to be able to determine this value.

Data for lines B2.11 to B2.46 is similar to our WIC 5 quarterly returns. However, as data in our systems has been input/updated after the quarterly returns were submitted, the data may differ slightly from the aggregate of WIC 5 returns for 2002/03.

B2.11-46 Properties affected by planned / unplanned interruptions and restoration times

The numerical data for Supply Interruptions is gathered in accordance with the Interruptions to water supply procedure.

Interruption to Supply sheets are included in work packs prepared for and completed for each job where an interruption to supply occurs, as well as from data collected by contractors carrying out infrastructure renewal work. The data from the completed sheets is input to the Interruptions Database and EMPAC (a work management system). This facilitates the reporting requirements of the business, the quarterly (WIC 5) and annual returns.

The data entered in the 2002/03 annual return has been extracted from the Interruptions Database, Empac and information collated from our contractors. There has been no extrapolation to arrive at the total number of interruptions reported.

It should be noted that an interruption to supply should only relate to actual interruptions from a customer's perspective i.e. if the main is repaired under pressure or if a back feed is put in place, there is no interruption to supply.

It should also be noted that each interruption can affect differing numbers of properties e.g. a meter installation can affect one property whilst a valve replacement can affect 1,000 properties. Failure to restore supply by the notified time can occur for a number of reasons and, if the event has affected a large number of properties, the number of properties reported will be high.

The confidence grading of the data submitted in the 2002/03 annual return is regarded as B3. On auditing the data content against interruption events, it has been highlighted that there are still some works being carried out for which the information is not being entered into or updated in the systems.

Table B3 Sewage Flooding

Reference is made to Scottish Water's sewer flooding register. This document is confidential and not available to external parties.

General Comments

In 2002 Scottish Water compiled a Flooding Register as part of its asset management process. This Flooding Register was populated by merging sewer flooding records from the former WoSW and EoSW. The flooding recorded was that which occurred due to overloaded sewers, but it excluded all flooding relating to temporary chokes, blockages or plant failures. A data collection exercise of the former NoSW has resulted in properties being added to the Flooding Register. Former North data is known to be far from complete and accurate at this stage. Presently, the overall confidence in the Scottish Water Flooding Register is described as average.

Cleansing of data in the Flooding Register is being approached from two sources: by continuous liaison with Operations and Customer Services staff through normal working practices and by undertaking a Flood Cluster Project in which Phase 1 targeted the top priority 60 flooding Problems. These activities have and will continue to clean the data and define / confirm the flood clusters. In addition to the above, these ongoing activities will increase the confidence in the numbers in the register.

Further data cleansing is planned using Drainage Area Study information as it becomes available, which again will increase the confidence in the data held in the Flooding Register.

The merged Scottish Water Flooding Register is currently being further developed to accommodate all data from the preceding databases, to provide data management rules and processes and to permit easy reporting of business KPIs and WIC return information.

The Flooding Incident Database used in the former WoSW has been introduced across Scottish Water (in February 2003) to capture the data required for the Annual Return. The database is populated with data captured on the flooding incident record sheets.

A process to audit the data prior to records being added to the Flooding Register is being developed to enhance the accuracy of the Flooding Register.

Future recording of all flooding incidents and causes on the flooding incident database will increase the confidence of the Annual Return figures for non-internal flooding records to the same level as internal flooding. A process to audit this data has recently been introduced and the benefits of this will be realised in the coming months.

Due to climate change in recent years Scottish Water's catchment is experiencing more storm events which are more tropical in nature. In the future, this will lead to new problems emerging in the sewer networks which will require larger engineering solutions with greater capacity in order to maintain the current levels of service to the customer. Exact details of climate change are unknown but Scottish Water will continue to liaise with others in the water industry and react accordingly.

The Glasgow East End Flood Event (Summer 2002) affected over 1000 properties with various types of flooding. Scottish Water, through working with other unitary authorities, recorded the full extent of the flooding. In addition to previously recorded properties on the Flooding Register, 190 properties were recorded as having internal flooding. These properties have been added to the Flooding Register as DG10s, however the cause and nature of the event requires to be validated and this number may be reduced when this validation is complete. A study of the Glasgow area to determine a flooding strategy for Glasgow is currently being lead by Scottish Water in partnership with Glasgow City Council.

At April 2003, the Scottish Water Flooding Register recorded the following unresolved flooding (a property is only recorded in one category):

Register Status	No. of Properties
DG5	499
DG10	515
Garden	1511
Highway	469
Other Flooded Areas	60

The 'at risk' register is for overloaded sewers.
DG10 is Properties at risk of flooding from sewers (once in ten years).
DG5 is Properties at risk of flooding from sewers (twice in ten years).

Currently, the total properties at risk for Scottish Water places the authority below the median company in England and Wales. Scottish Water will therefore require to make significant investment in flooding resolution. However, it should be noted that confidence in the At Risk Register data is average (B4). The table below demonstrates Scottish Water's position.

Water Company	**Actual Properties (DG5 + DG10)**	**No. of Properties Per 100,000**
Yorkshire	392	18
Northumbrian	213	19
Dwr Cymru	395	30
Southern	552	31

South West	244	38
Severn Trent	1497	41
United Utilities	1404	46
Scottish Water	**1014**	**47**
Anglian	1172	49
Wessex	1135	105
Thames	7928	146

B3.1-6 Annual Flooding – Overloaded Sewers

This year's submission has been produced using systems in place from the predecessor authorities and rolling out their best practice across Scottish Water. This takes the form of the Flooding Incident Database being populated by the flooding incident record sheets.

The changes in figures from last year can be attributed to more robust recording of sewer flooding. However improvement of this data is expected when KPIs on the data collected are introduced in 2003 / 2004 which will increase the accuracy and confidence in the data.

B3.7-13 Annual Flooding – other causes

Figures are obtained from the Flooding Incident Database. As discussed above the confidence in these figures is known. Although the process to audit the data is not yet fully developed, figures submitted were checked for accuracy.

B3.14-22 Clean up response times

Lines B3.14 and B3.15 are calculated fields.

The information on these lines is mainly provided by the Flooding Incident Database by way of the flooding incident record sheets, populated by sewer squads and customer service representatives. Reporting awareness has increased the robustness and accuracy of these records, however further improvements are expected next year as KPIs on data collection are introduced.

B3.23-26 At risk summary

The submission from the former authorities was completed last year from registers from the former EoSW and WoSW, but NoSW did not have an "At Risk" Register and therefore were unable to return any data.

The methods of recording data on the respective Flooding Registers and the data recorded were different and have been found to be inconsistent.

EoSW "At Risk" Register was largely done by reviewing flooding by each sewer network with the appropriate Customer Services staff and collating details (addresses / flooding type) of historical flooding. In addition data was gathered from Drainage Area Studies along with knowledge from staff on past incidents to make predictions on areas and properties that could be at risk of flooding. As actual dates and rainfall records were largely unavailable, the frequency of flooding (1 in 10, 2 in 10 or greater) could not be determined.

Therefore, the information did not permit the separation of 1 in 10 and 2 in 10 year occurrence frequencies and it was assumed that 10% of those properties would fall into the 1 in 10 year bracket.

Initially WoSW "At Risk" Register Figures were supplied from a similar data collection process to that in EoSW, however properties were added to the register only where they

were known historically to flood. Since February 2002 records are supplied from the Flooding Incident Database. Confidence in these figures is known, as there is an audit process in place.

B3.23 – B3.26 "At Risk" Summary

The properties reported in this year's return are based on properties which have reported or confirmed historical information. Therefore, properties on the former EoSW Flooding Register which were classified unconfirmed or unreported but were predicted / assumed to be at risk of flooding (176 properties) are not included in this year's return figures.

The total number of properties on the "At Risk" Register has increased by 12.5% from that reported by the former East and West. This is mainly due to the addition of North properties to the register (118 properties) and the Glasgow East End Event (190 properties).

Additional properties highlighted as "at risk of flooding" in Drainage Area Studies as described in the previous paragraph, are recorded on the register as unconfirmed or unreported. Scottish Water are currently confirming if there is good reason for these properties being at risk of flooding and will reclassify these properties accordingly in due course. As the Drainage Area Studies programme is not yet complete the number of properties classed as unconfirmed or unreported is expected to increase.

As Scottish Water do not have 10 years of data collection line B3.26, total properties at risk but not flooded in last 10 years, cannot be complete

The merged Scottish Water Flooding Register is currently being further developed to accommodate all data from the preceding databases, to provide data management rules and to permit reporting of business KPIs and WIC return information.

Additionally Information from completed Drainage Area Studies currently predicts that more properties are at risk of flooding than reported to date. This data requires validating and the outcome will result in some properties being reclassified accordingly, therefore as the above this will give rise to the increase to the number of properties on the at risk register.

B3.27-28 Problem status of properties on register

Scottish Water have addressed internal flooding of properties on a temporary basis by introducing temporary improvement solutions and flood contingency plans. These interim solutions prevent / reduce the risk of occurrence of internal flooding of properties by way of using periscope vents, flood guards and sand bags. Work is ongoing to deliver temporary solutions where possible and in recent months 7 properties have had non-return valves fitted and 33 have periscope vents fitted. Investigations are ongoing for many other flooding problems which will result in many more properties receiving interim improvement solutions and contingency plans. It should be noted that it is not always possible, or acceptable to our customers, to implement interim improvement solutions and or contingency plans.

Temporary solutions have shown a significant increase in activity resulting from Scottish Water's more proactive approach to flooding.

B3.29-32 Annual changes to register

B3.29 indicates 55 properties removed through Scottish Water action. Significant efforts will be required to remove more properties in the future in order to align Scottish Water with the median performing water plc in England and Wales.

The figure in B3.31 is 420 which is mainly due to the Glasgow East End event of July 2002. This added high numbers of properties which had never been reported to Scottish Water

prior to the event as described above. Data collection in the former NoSW area added 118 properties. In addition Scottish Water carried out a Flood Cluster Project to data cleanse and investigate the top 60 priority flooding sites across Scotland which resulted in additions and removals (B3.30) through better information.

The figure in B3.32 is currently zero. Demand does apply if we allow a new development (growth in the network) to connect to the sewer network and subsequently properties flood due to this development. We have no reports or records in the register that suggests this.

B3.33-36 Problem solving costs

Figures for B3.33 this year were supplied from the Flooding Register in which data is based on information from Scottish Water's capital programme.

20 projects were completed during the year, which resulted in removing properties from the flood register. The projects resolved 55 internal property floodings giving an average cost per property of £59,814. The projects completed to date are those identified as straight forward and presented no engineering difficulties. However, the future projects which are being assessed currently are more problematic and engineering solutions will be more complex, which may lead to higher costs per property.

Figures for B3.35 are based on the work carried out as described in B3.27 and B3.28. The total cost of implementing these temporary solutions was £31.7k, giving an average cost of £792.50 per property.

Figures for B3.34 and B3.36 currently cannot be extracted from recording systems and consequently we are unable to fully complete these lines. However, as the Flooding Register develops, data for opex costs will be captured for the return next year.

Table B4 Customer Care – enquiries

General comments

Data for this section is similar to our WIC 5 quarterly returns. However as data in our systems was updated after the quarterly returns were submitted, the data may differ slightly from the aggregate of WIC 5 returns for 2002/03.

The numerical data for Enquiries is gathered in accordance with the 'Billing Enquiries', 'Change of Payment Method Request', 'Water Meters – Applications and Installations' and 'Customer Contacts Categorising and Logging' procedures.

All Billing Enquiries including Change of Payment Method Requests, have been captured on Scottish Water's corporate billing, Collection and Customer Management systems, Rapid and Custima, with some metering contacts continuing to be captured on Customer Plus.

The data entered in the 2002/03 Annual Return has been extracted from Rapid, Custima and Customer Plus.

B4.1-13 Billing/Charging/Metering enquiries

It should be noted that data entry errors identified in WIC 5 Quarter 1 and Quarter 3 returns have been corrected within the annual return submission.

B4.14-26 Change of payment method enquiries

It should be noted that data entry errors identified in WIC 5 Quarter 1 and Quarter 3 returns have been corrected within the annual return submission.

B4.27-39 Other enquiries

B4.27 Total number of other enquiries has increased significantly since last year as a result of Scottish Water adopting West of Scotland Water's method for calculating this line. This is detailed as follows:

Number of calls answered on customer contact lines – (number of telephone complaints + number of all billing, charging and metering contacts including change of payment) + other written enquiries.

Time banded information is taken from the WIC 5 returns with the difference deemed to be dealt with at source and allocated to 0-2 days.

B4.40-52 New Customer Set up

B4.40 The numerical data for new customer set up is gathered from the Authorities corporate Billing Collection and Customer Management systems, Rapid and Custima,

The data entered in the 2002/03 Annual Return has been extracted from Rapid and Custima.

B4.41-B4.52 Scottish Water is unable to report fully on these lines. Systems are not yet in place to record when first contact was made. Therefore, although Scottish Water can provide a robust total for the number of new customers, it cannot provide the breakdown in timebands.

Table B5 Customer Care –complaints

General comments

Data for this section is similar to our WIC 5 quarterly returns. However as data in our systems was updated after the quarterly returns were submitted, the data may differ slightly from the aggregate of WIC 5 returns for 2002/03.

The numerical data for Complaints is gathered in accordance with the "Complaints" and "Customer Contacts Categorising and Logging" procedures.

All customer contacts categorised as complaints have been captured on Scottish Water's corporate customer contact systems, Customer Plus. All Billing complaints have been captured on Scottish Water's corporate Billing, Collection and Customer Management systems, Rapid and Custima.

A centralised complaint handling team has been established and all new, written complaints are being directed to this team for investigation and response.

The data entered in the 2002/03 Annual Return has been extracted from Scottish Water's corporate systems Customer Plus, Rapid and Custima.

B5.1-13 New Written complaints

B5.1a/b Scottish Water is unable to provide this data. It is not possible to differentiate between new written complaints and ongoing complaints. However systems and procedures have been put in place to allow Scottish Water to report this figure in 2003/04.

B5.14-26 New Telephone complaints

B5.14a/b Scottish Water is unable to provide this data. It is not possible to differentiate between new telephone complaints and ongoing complaints. However systems and procedures have been put in place to allow Scottish Water to report this figure in 2003/04.

B5.27-38 Complaints by category

Differences in complaints for sewerage service and sewerage infrastructure in 2002/03 are due to the recategorisation of complaints under Scottish Water.

Table B6 Customer care – other

B6.1-9 Telephone contacts

The statistics are taken from telephony data supplied from the British Telecom Service View, the Kingston Telephone Management System, Callscan and the ACD switch Meridian Max, and are based on the complete year's telephone activity.

The telephony management systems have been developed and established during the year to accommodate a virtual call centre environment within Scottish Water.

This environment has facilitated more accurate and robust data capture, logging and categorisation of customer contacts received by Scottish Water.

B6.2 - Scottish Water is unable to fully provide this data. However systems and procedures have been put in place to allow Scottish Water to report this figure for 2003/04.

B6.8 'All lines busy', has a zero return. This is due to the introduction of the British Telecom Service View (Message Link) resulting in every customer call receiving either an agent response or a pre-recorded message specific to an event occurring in the customer's STD area code.

The confidence grading of data submitted is regarded as A1, as data is based on factual information with infrequent system down time.

B6.10-20 Private septic tank emptying

Data is entered / captured within septic tank management system Gemini 1 and EMPAC, a work management system. This facilitates the reporting requirements of the business, the WIC 5 Quarterly and Annual Returns.

The data entered in the 2002/03 Annual Return has been extracted from Scottish Water corporate systems Gemini and Empac. Figures reported are based on real data with no extrapolation.

B6.21-29 Keeping appointments

The data for Keeping Appointments is entered / updated on the Customer Plus contact system, facilitating the population of both WIC 5 Quarterly and Annual Returns.

Table B7 Customer Care – GMS Performance

B7.1-8 Planned interruptions

B7.1-4 - the data entered in the 2002/03 Annual Return has been extracted from the Interruption to Supply Database, Empac and our contractor submissions.

B7.5 - Under the Guaranteed Standard Payment criteria Scottish Water does not currently make automatic payments for interruption failures. However, on certain occasions, in the interest of customer service, automatic payments have been processed.

B7.6 and B7.8 – 'Actual payments made' data was extracted from Scottish Water Financial Systems.

B7.9-17 Unplanned interruptions

B7.9-13 - the data entered in the 2002/03 Annual Return has been extracted from the Interruption to Supply Database, Empac and our contractor submissions.

B7.14 - Under the Guaranteed Standard payment criteria Scottish Water does not currently make automatic payments for unplanned interruption failures. However, on certain occasions, in the interest of customer service, automatic payments have been processed.

B7.15-17 – 'Actual payments made' data was extracted from Scottish Water Financial Systems.

B7.18-22 Sewer flooding

'Actual payments made' data was extracted from Scottish Water Financial Systems.

B7.23-27 Request to change method of payment enquiries

The data entered in the 2002/03 Annual Return has been extracted from Scottish Water corporate systems Customer Plus, Rapid and Custima.

B7.24-27 – 'Actual payments made' data was extracted from Scottish Water Financial Systems.

B7.28-32 Other Billing/Charging/Metering enquiries

The data entered in the 2002/03 Annual Return has been extracted from Scottish Water corporate systems Customer Plus, Rapid and Custima.

B7.29-32 – 'Actual payments made' data was extracted from Scottish Water Financial Systems.

B7.33-37 Written Complaints

All customer contacts (written) categorised as complaints have been captured on the corporate customer contact systems, Customer Plus, Rapid and Custima. The data entered in the 2002/03 Annual Return has been extracted from Customer Plus, Rapid and Custima.

B7.34-37 – 'Actual payments made' data was extracted from Scottish Water Financial Systems.

B7.38-42 Telephone complaints where written response is requested

All customer contacts (telephone complaint - written response requested by the customer) categorised as complaints have been captured on the corporate customer contact systems, Customer Plus, Rapid and Custima. The data entered in the 2002/03 Annual Return has been extracted from Customer Plus, Rapid and Custima.

B7.39-42 – 'Actual payments made' data was extracted from Scottish Water Financial Systems.

B7.43-50 Keeping appointments

The data is entered on the Customer Plus contact system facilitating the population of both WIC 5 Quarterly and Annual Returns.

B7.47-50 – 'Actual payments made' data was extracted from Scottish Water Financial Systems.

It should be noted that, although there are less 'Keeping Appointment' failures reported as against the number of payments made reported in this return, payments have been made to customers where an appointment had been made verbally but not recorded and not attended. The appointment had not been correctly created/updated in the Customer Plus system and could not be retrospectively amended to show the failure.

B7.51-52 Ex gratia payments made

'Actual payments made' data was extracted from Scottish Water Financial Systems.

C Tables – Quality

Table C1 Water quality outputs – Compliance

General Comments

- All data in this table is for the calendar year 2002.
- Data in lines C1.1 to C1.19 and C1.22 to C1.23 is taken from the Laboratory Information System.
- The zones in lines C1.3 to C1.15 are water supply zones as defined in The Water Supply (Water Quality)(Scotland) Regulations 1990 i.e. an area designated for the purpose of the Regulations with a population of not more than 50,000 and in which all the premises are supplied for domestic purposes from the same water source or combination of water sources.

C1.1-4 Summary

C1.1 – these are the determinants which have a limit specified in The Water Supply (Water Quality)(Scotland) Regulations 1990..Free and total chlorines, and colony counts, for example, are not included

C1.2 – these are determinants that exceed the limits specified in The Water Supply (Water Quality)(Scotland) Regulations 1990. No allowance is made for Temporary Relaxations allowed under these Regulations.

C1.3 - see definition above of supply zone. These zones are reviewed at the end of each year and where a works closes zones are merged. Hence the number of zones will decrease.

C1.4 - this is the number of zones that have a determinant that exceeds the limits specified in The Water Supply (Water Quality)(Scotland) Regulations 1990 . Some zones fail for more than one determinant.

C1.5-15 Specific parameters within water supply zones

C1.5 to C1.14 – these are the zones that exceed the limits specified in The Water Supply (Water Quality)(Scotland) Regulations 1990 for the determinant shown. The number of zones failing for colour, hydrogen ion, and iron show large apparent increases since 2001. This is because no allowance is now made for the Temporary Relaxations noted in 1.2 above. Earlier returns did allow for these.

C1.15 - some of these zones will have failed for more than one determinant. These also show a large apparent increase; see comments above about Temporary Relaxations.

C1.16-19 Samples taken for water leaving the WTW's

C1.16 - the number of samples taken for coliforms has shown a slight increase since 2001.

C1.17 - the number of samples with coliform failures has fallen when compared with 2001, the result of policies to improve water quality.

C1.18 - the number of samples with faecal coliform failures has remained broadly the same when compared with 2001.

C1.19 – these are the works where any cryptosporidium failure has been recorded.

C1.20-23 WTW's/Service Resevoirs

C1.20 - The number of untreated supplies is the number of individual properties that are supplied either from a connection to a raw water main before a treatment works or directly to the raw water reservoir that feeds a treatment works. Scottish Water has no supply zones supplied with raw untreated water.

Starting point data for this line was taken from last years individual returns - 57 properties from the West area and 14 from the East area. The North area reported no untreated supplies to properties.

Further investigations in the east and west areas have identified details of properties excluded from previous year's returns due to:

- Unoccupied
- In process of disposal from legacy authority housing stock
- Derelict / abandoned
- Agricultural use only (outbuildings etc.)
- Multiple units counted as one e.g single supply to large estate.

The net effect has been to increase the gross total number of untreated supplies by 112 to 183. The task of identifying all similar supplies in the north area has been too great to execute within the given time-scale. The total is expected to rise considerably upon completion of this exercise. A register of all untreated supplies will be created which will be of additional use in the ongoing debate and consultation process on Private Water Supplies legislation.

Five properties in the Fife and Lothians areas have been provided with treatment at point of entry and have been removed from the gross total leaving a net figure of 178. Properties supplied from burns or springs were not included in this figure.

The confidence grade has been reduced from B3 to C3 to reflect the uncertainty of the overall situation.

Line C1.21 – this number refers to the number of water supply zones that have relaxations granted by the Scottish Executive under the Water Supply (Water Quality) (Scotland) Regulations 1990. This number has reduced from previously as a number of projects have been delivered in the reporting period that have rectified the water quality issues associated with these relaxations. It should be noted that under the revised Regulations that are fully implemented in December 2003, these temporary relaxations no longer exist and a new system is implemented. This will not allow a comparison to be made in future years.

Line C1.22 - the number here includes all service reservoirs in use for all or part of 2002. Service reservoirs can be taken out of use temporarily for repair or refurbishment. When in use they must be monitored under the Regulations. The number of service reservoirs in use can also increase. When a treatment works is closed due to the completion of a mains extension it is often converted into a service reservoir.

Line C1.23 - there is an ongoing program to refurbish service reservoirs, and this is reflected in the improvement in coliform failures when compared with 2001.

Table C2 Water quality outputs – asset performance

General Comments

- All data is for the financial year 1st April 2002 to 31st March 2003
- All data was taken from the Laboratory Information System.

- Compliance value is taken to be the permitted concentration or value in The Water Supply (Water Quality)(Scotland) Regulations 1990. Note that apart from coliforms these limits apply at customer taps not treatment works.
- The number of treatment works is those works that were in use for all or part of the period 1st April 2002 to 31st March 2003. Some works closed during this period but have been sampled and so are included in the figures. This number is taken from the Laboratory Information System
- During 2002/3 a new Scotland wide sampling scheduler was introduced. This involved the harmonisation of the previous three schedulers. During 2002/3 not all the works were sampled for all the determinants reported in this table.
- Comparison of the information from previous years has not been carried out. There is no regulatory requirement or guidelines for operational sampling and as such the three predecessor authorities had different criteria for conducting operational sampling. Scottish Water is in the process of determining the required level of operational sampling to assist in management and investment decision making. The level of operational sampling has historically not been carried out on a like for like basis and has been determined on an annual basis and therefore no comparison can be made.

Table C3 New obligations – water

General Comments

- Water supply zones in lines *C3.1, C3.4, C3.7, C3.10, C3.13, and C3.16* are water supply zones as defined in The Water Supply (Water Quality) (Scotland) Regulations 1990, i.e. an area designated for the purpose of the Regulations with a current maximum population of 50,000 and in which all the premises are supplied for domestic purposes from the same water source or combination of water sources.

- Undertakings in lines *C3.1, C3.4, C3.7, C3.10, C3.13, and C3.16* are taken to be Undertakings relative to section 76E of the Water (Scotland) Act 1980. These are agreed with the Scottish Executive when a treatment works fails to meet a standard. Scottish Water then gives an undertaking that the treatment works will be upgraded or improved by a certain date.

- Undertakings in lines 3.16, 3.18, 3.20 are based upon risk assessments carried out in accordance with The Cryptosporidium (New Water and Sewerage Authorities) Direction 2000. It should be noted that the Scottish Executive will be issuing a revised version of the Direction during 2003 and it is likely that this will generate further undertakings and therefore further investment. As part of this revision the risk assessment scoring has been amended which will have a potentially adverse effect on line 3.16 in the next annual return.

C3.1-3 Drinking Water Directive (98/83 EC)- A) Lead pcv = 25 µg/l

C3.1 – Scottish Water has identified 149 undertakings as part of the Lead Strategy to meet the 25 ug/l standard. The number has increased from 93 to 149 as a result of new information becoming available following the completion of lead surveys as part of an agreed strategy with the Scottish Executive. The figures reported in last year's return were based on incomplete data as the survey work was still ongoing and the approach to address lead in smaller zones had not been identified and agreed with the Scottish Executive.

C3.4-6 Lead pcv = 10 µg/l

C3.4 - There are currently no undertakings to meet the 10 ug/l standard which does not come into force until December 2013. The industry approach for achieving compliance with the lead standard is to achieve the 25 µg/l standard by 2003 via optimised treatment. Once

this has been achieved further survey work will be carried out to determine the number of zones where the 10 µg/l standard cannot be achieved with treatment alone. It is likely that undertakings to meet the 10 µg/l standard will be required post survey work in 2004.

C3.7-9 Trihalomethanes pcv = interim

C3.7 **-** There is no interim THM standard in the Water Supply (Water Quality) (Scotland) Regulations 2001.

C3.10-12 Trihalomethanes pcv = final

C3.10 - The number of THM undertakings has fallen from 164 to 150 due to completion of a number of new works and mains extensions.

C3.13-15 Other parameters

C3.13 - The number of undertakings for other parameters has fallen from 53 to 42 due to completion of a number of new works and mains extensions.

C3.16-21 The cryptosporidium direction 2000

C3.16 – Scottish Water has no Water Supply Zones with a risk assessment score >100 under the current Direction.

C3.18 – The number of water supply zones with a risk assessment score between 76 and 100 is 31. The number reported in last year's return was the number of water treatment works (5) that had a risk assessment score between 76 and 100 rather than the number of zones. Effectively there is no change in the position this year. This number will reduce during the next financial year as a number of projects to address Crypto will be completed.

C3.20 –The number of water supply zones with a risk assessment score between 50 and 75 has fallen from 83 to 48 due to completion of a number of new works and mains extensions.

C3.22-30 Water mains rehabilitation under agreed programme of works

This is the length of main that has been rehabilitated during the report year, as part of the overall Q&S 2 mains rehabilitation programme. All mains rehabilitation during this first year of Q&S 2 has in fact been mains renewal, with no relining during this period.

The number of water quality zones reported as being subject to mains rehabilitation is reduced on that in the previous return, due to the decision to exclude from the list zones where the work is only of a 'hotspot' nature (short lengths of main rehabilitated to resolve localised performance issues) and which are therefore distinct from the large scale work programmed under the zonal rehabilitation programme.
It should also be noted that mains rehabilitation is actually programmed and managed on the basis of water supply zones and district metered areas, rather than water quality zones.

The length of mains surveyed as PPRA has increased from 519 to 810 km in this reporting period. This line has improved in confidence grade from B3 to A1. The length of mains is identified from GIS and INMS datasets.

The data for work undertaken in the report year has been provided by the Programme and Procurement department from the project monitoring developed as part of the Action Plans relating to sections D, H, G and K of June Return.

C3.31-36 The Abstraction Directive, the Birds Directive and the Habitats Directive

C3.31-33*:* The Abstraction Directive does not currently apply to any Scottish Water assets. This may change with the introduction of the Water Environment and Water Services Act, any implications will be reported next year.

C3.34-36*:* No data is input into these lines as Scottish Water has not been requested by SNH or SEPA to carry out works associated with these Directives. Again the Water Environment and Water Services Act may introduce new obligations which will be reported next year.

Table C4 Wastewater quality outputs – asset performance

C4.1, 4.4, 4.7, 4.10, 4.16, 4.19 A master spreadsheet has been compiled, from the central registers of the three previous authorities, detailing each consent for all Scottish Water Waste Water Treatment Works. This is held and maintained by the Regulation and Strategy Group. All new consents are sent directly to R&S where the consents are scanned in and the spreadsheet updated accordingly. The number of consented waste water treatment works does not as yet match with the total number of waste water treatment works assets. The assets for which we do not currently have copies of the consent are likely to be assets for which a consent was issued prior to the formation of the three previous authorities. Consents may exist for these and an exercise is underway to confirm this and source copies of the consents. Information excised due to political sensitivity.

C4.2, 4.5, 4.8, 4.11, 4.17, 4.20 A process does not exist SCOTTISH WATER wide to capture all SEPA results. The information used is based on sample information provided by SEPA to each Scottish Water operational area. Information excised due to political sensitivity.

Scottish Water will be working closely with SEPA to assist them in setting up a system for reporting monthly compliance figures on a national basis. This system will form the basis of more accurate and robust reporting for this table.

C4.3, 4.6, 4.9, 4.12, 4.18, 4.21 At the beginning of May SEPA submitted a Compliance Report to Regulation & Strategy (R&S). Information excised due to political sensitivity. Scottish Water is confident, therefore, that the compliance figure for our works is accurate.

Scottish Water will be working closely with SEPA to assist them in setting up a system for reporting monthly compliance figures on a national basis. This system will form the basis of more accurate and robust reporting for this table.

C4.1-3 All discharges

C4.1 It has been assumed that the term numeric consents in the definition should have been all consents. As a result Scottish Water has included all Sewage Treatment Works Consents both numeric and non-numeric.

C4.13-15 Absolute non sanitary consents

C4.13-15 Definition unclear. We have included consents that only contain non-sanitary parameters (everything except BOD, Ammonia and Suspended Solids). Consents that contain both sanitary and non-sanitary parameters have not been included in these figures. Consents that contain both sanitary and non-sanitary parameters are included in either two tier or single tier as appropriate.

C4.22-24 Pollution incidents

4.22-24 A process is in place to capture all pollution incidents. A list of all pollution incidents was provided by the Scottish Executive.

Table C5 Wastewater quality outputs – asset performance.

Scottish Water does not sample all wastewater treatment works on a monthly basis. Sampling of wastewater treatment works is either done on an audit basis or in response to failing or near miss SEPA sample results. As a result of this, and as agreed with WIC's office on 4 April 2003 the cells in this table will be populated as '0' with confidence grades of 'N' for not applicable. This reflects the fact that the audit samples taken by Scottish Water cannot be used as a year to year comparison.

Table C6 Wastewater quality outputs – new obligations

This Table reports commissioned projects in the Report Year which delivered against the nine key investment drivers relating to new quality obligations. Some works have multiple drivers and therefore the population equivalent will appear more than once in the table. The population equivalent is calculated from the Asset Inventory records.

C6.1-6 Driver WQ1: control of pollution act 1974

Improvements were undertaken at 22 WwTWs or discharges including Biggar WwTW and Mintlaw WwTW, and 2 sewerage schemes at Culross and Maybole. The Maybole Relief Sewer also removed 6 CSOs from the unsatisfactory CSO (uCSO) list.

C6.7-16 Driver WQ2: improvements to poor or seriously polluted waters

Improvements were undertaken at Lyne of Skene (Letter Road) Septic Tank. There were no CSOs or Surface Water Discharges/Industrial Estates upgraded against this investment driver in the Report Year. Six villages, or parts of communities, received first time sewerage – Hillswick, Charleston, Eriskay (Rhuban, Balla and Castle Road), Seilibost, Port Seton and Low Askomill.

C6.17-22 Driver WQ3: protection of risk

Improvement works were undertaken at Burntisland and Cardhu. There were no improvements for phosphorous control in the Report Year.

C6.23-34 Driver EC1: UWWTD directive

Improvement works have removed 29 CSOs from the uCSO list including Inverurie Market Place, Dyce Farburn PS, Kirkcaldy, Macduff, and Boddam.

Improvement works were undertaken at 113 WwTWs or discharges including Rothesay, Annan, Tobermory, Meadowhead, Maidens, Kilchattan Bay, Furnace, Cargenbridge, Dyke, Lumsden and Dalcross.

The population equivalent reported does not include the total pe of 53 works where autosamplers have been installed nor the pe of 29 works where flow monitors have been installed although these are classed as improvement works.. In a number of cases, flow monitors and autosamplers were installed at the same works through different projects.

C6.35-38 Driver EC2: bathing waters directive

One CSO was removed from the uCSO list – Carnoustie Fox Street. No improvement works at WwTWs were completed in the Report Year.

C6.39-42 Driver EC3: shellfish waters

There were no improvement works delivered in the Report Year under EC3.

C6.43-46 Driver EC4: freshwater fish directive

Improvement works were undertaken at Tomatin WwTW.

C6.47-49 Driver EC6: sludge (use in agriculture) directive

There were no improvement works completed in the Report Year.

C6.49a-c - Driver EC8: habitats directive

4 sites have been identified requiring action but none were programmed for completion in the Report Year.

C6.50 Driver EC9: dangerous substances directive

There were no improvement works undertaken in the Report Year.

D Tables – Asset Information

Tables D1 to D3 are populated automatically from Investment Plans and individual confidence grades and commentaries are included where appropriate.

Commissioned assets have been analysed and allocated to either replaced/refurbished or new/enhanced as appropriate. The financial information on project capital expenditure has been reconciled with the corporate financial management system. Whilst Scottish Water has developed a single corporate Asset Inventory, systems to record commissioned assets are still under development. The asset information has been obtained from available record information and analysis of projects completed.

Rolling programmes have been shown as commissioned in 2002-03 to ensure that the completed assets are included in Table D. However the lower confidence grade reflects concern that not all assets refurbished through minor works have been recorded in the Investment Plan.

Where there were more than 5 asset types included within a single project, these have been rolled up to enable the reporting to be as representative as possible of the investment incurred.

Table D1 Workload commissioned assets – water service

Table D1 records replaced/refurbished, new and enhanced assets commissioned in the Report Year 2002-03. This is based on Scottish Water's approved investment programme to meet the requirements of legislative driven quality improvements and on-going capital maintenance to ensure that the necessary level of service is maintained.

D1.1 and D1.31 – The majority of investment relates to compliance with the Reservoirs Act and improved security.

D1.12 and D1.42 – Security work under the Code of Practice for the Security of Service Reservoirs has been undertaken at a total of 259 service reservoirs. Meters have been installed at 117 reservoirs.

D1.35-36 – Meters have been installed at 55 Water Treatment Works.

D1.47 – The new and enhanced potable water mains figure includes the lengths of main resulting from new developments and represents the assets adopted. As Scottish Water only makes payments to developers up to the reasonable cost limits for new developments, the investment reported does not reflect the actual costs to developers.

There is no suitable code to report investment on replacement or air valves which are not being undertaken as part of a mains renewal project.

Table D2 Workload commissioned assets – wastewater service

Table D2 records replaced/refurbished and new/enhanced assets commissioned in the Report Year 2002-03. This is based on Scottish Water's approved investment programme to meet the quality requirements of UWWTD, Bathing Waters Directive and the Control of Pollution Act. Capital maintenance and infrastructure renewals ensure that the necessary level of service is maintained.

D2.5 and D2.35 – The de-dualling and creation of new manholes has been reported against these lines where the work was not carried out in conjunction with new or replaced/refurbished sewers.

D2.32 – The new enhanced critical, non-critical and sewage pumping mains resulting from new developments are included in the commissioned assets and represent the assets adopted. As Scottish Water only makes payments to developers up to the reasonable cost limits for new developments, the investment reported does not reflect the actual costs to developers.

D2.43-44 – Two projects to install autosamplers at 53 secondary and tertiary works and flow monitoring at 29 secondary and tertiary works account for the number of Sewage Treatment Works appearing against these lines.

Table D3 Workload commissioned assets – support services

Table D3 records additions to the asset inventory to maintain a base level of service over the report year 2002-03 and is populated with information brought forward from Investment Tables.

The formulae in Investment Tables for support service assets only pick up replaced/refurbished assets. This results in new and enhanced corporate assets not appearing in D3 and these are detailed as follows:

D3.3-4 – Depots and Workshops – 3 depots with total area 770m^2 were upgrades Information excised due to commercial sensitivity.

D3.9 – Telemetry Systems – an additional 130 new telemetry outstations were commissioned in 2002-03 Information excised due to commercial sensitivity.. This represents 5.8% increase in telemetry coverage. Upgraded SCADA was also installed at two sites Information excised due to commercial sensitivity.

D31.13 – Other Non-Operational Assets – new equipment purchases have been reported as 6071 Information excised due to commercial sensitivity.

Table D4 Asset changes – water, wastewater and support services

The data presented in Table D4 shows the difference in the asset stock due to the following:

- Unified approach to asset classification using WAMS and GIS.
- Improved understanding of the asset types and banding factors.
- Investment in year 2002/03.
- Improved costing information.

There are a number of commissioned values in the table which do not have a corresponding number in the banding section. This is due to improvements in the costing data following the revised unified approach to the calculation of EARCs.

Table D5 Asset performance and activities – water service

D5.1-6 Asset performance indicators

D5.1 - The total length of mains is based on current analysis of corporate GIS records using mains with operational status, “in use”, “isolated”, “adopted” and type “trunk” or “distribution”. This ties in with the definition of potable mains for Table H. It excludes the lengths of fire, washout and private mains and excludes raw water mains. The number of bursts is calculated from the number of bursts repaired in the report year as recorded on Scottish Water’s works management systems, and the length of main as reported in Table H3.

The burst rate for this report year – 194 bursts per 1,000 km, as would be expected, falls between the burst rates for the three legacy authorities, which were 98, 145 and 209, although the actual figure contained in the consolidated return, due to an error, was reported as 593.

As the data used in this line is based solely upon the number of bursts reported and repaired, the carrying out of more active leakage detection activities could potentially raise this rate, and give a more accurate representation of the actual burst rate on the network.

D5.7-11 Activities

D5.7 to D5.11 –The total number of distribution zones identified for study is the total number of all the current Water Supply Zones within Scottish Water. The number of completed studies is the summation of the studies completed under the INMS programmes of the three legacy authorities. These were carried out to different formats, which are currently being reviewed to develop a common format for future studies.

The percentage of zone studies completed has fallen from last year partly due to the exclusion from the total of some types of study previously included and partly due to a large increase in overall number of zones identified for study from 919 to 1,424. This increase in total number of zones identified for study is due to the north area having previously reported only the number of zones within the immediate study programme, whereas this year's total is for all existing water supply zones within Scottish Water.

Despite the percentage of completed zone studies being only 17%, the percentage of Scottish Water's properties covered by zone studies is significantly higher. This is the result of a number of studies being focused on urban centres with large numbers of properties.

Table D6 Asset performance and activities – wastewater service

D6.1-9 Asset performance indicators

D6.1 – The figures for much of Table D6 have been produced using the legacy systems of the 3 former areas including Smallworld GIS, address point data from the GIS, EMPAC (including SAPS data), MIMMS and Phoenix. This has been supplemented with the new Scottish Water corporate systems such as the uCSO register and CSO database. Further cross-referencing with DAP/SIIOP Studies where available has been undertaken where study outputs are available. CCTV figures have been calculated using the GIS system and Examiner database software and are consistent with the data produced for Table H. The new DAS Zone boundaries have been applied for the calculation of DAS/SIIOP Study information.

Due to differences in legislation between Scotland and England and Wales, Scottish Water has a proportionately longer and more expensive network to maintain. The most significant differences in the Law in Scotland relating to sewerage in comparison with England & Wales are that:

- A drain becomes a sewer when it passes out of the curtilage even if it only drains one property. This means that there are "lateral" sewers connecting the main sewer to the property drains. These laterals are vested in Scottish Water. This situation does not exist in England & Wales where drains are the responsibility of the householder right up to the main public sewer.
- All private sewers connected to the public were automatically vested in the Sewerage Authority in 1968 or on completion afterwards. The only private sewers in Scotland are those connected to Private sewage treatment works. As a result of this difference Scottish Water has a greater operating liability for the public sewerage system than English & Welsh Plc's. It is estimated that Scottish Waters sewerage network is

10,000km longer than it would be if the Law in Scotland matched that in England & Wales. This extra length is also the most problematic length.

Lateral sewers tend to be at minimum depth and are more susceptible to damage from other utility companies and traffic. Lateral sewers are more prone to blocking than normal sewers due to the smaller diameter (typically 100mm) and because there is little flow to flush any potential build up of rags away. This is particularly the case where a lateral serves only one household. Clearing such blockages can be extremely problematic, especially if no disconnecting manhole exists. Screening blockage calls at the call centre to ascertain whether or not the blockage is in the private drain or public lateral is also extremely difficult.

Blockage clearance is the single largest task undertaken on these sewers. Increased blockages lead to an increased level of internal and external flooding. It is estimated that there is a yearly operating cost of £3.3 million in dealing with these issues. There is also an ongoing Capital cost in replacing collapsed sewers.

D6.1-6 Asset Performance Indicators

D6.1 – The figures for 2002/03 have been produced using the legacy datasets (EMPAC, MIMMS and Phoenix). A query has been run equating "replacement" with collapse supplemented further by information obtained from Networks Operations. The increase in the total sewer length due to the addition of laterals (as per the general section D6) has impacted on the calculation by limiting the % increase (had last years length been used, the increase would have been approximately 76%).

The number of recorded collapses has increased due to better information being available. It is believed that these figures are still are most likely under reported, as collapses are currently not recorded consistently in the corporate system. The robust and consistent recording of collapses is therefore a future improvement requirement for the Scottish Water corporate system/processes. A Confidence Grade (CG) of C4 has been allocated to this line which is an improvement on the 2001/02 combined submission. It would appear that, as a greater number of collapses are indicated this year, the sewer system is in poorer condition than previously reported and is more likely to collapse.

D6.2 – The 2001/02 submission for the former East area was based on the agreed (with SEPA) uCSO list and data from the SIIOP Study programme. The former North area submission was based on an extract from the "Dolphin" database. The former West area submission was based on the agreed uCSO projects indicated in the Investment Plan (agreed with SEPA) and data from the DAP Study programme.

The 2002/03 submission has been produced using the Scottish Water uCSO register which is now a corporate system. The uCSO's on this register are based on the uCSO list that has been agreed between Scottish Water and SEPA. The figure has reduced from last year to 534 uCSO's due to authority action (investment to resolve uCSO problems) and improved information.

From last year's total of 700, the changes for the 2002/03 submission are indicated in Table D6.2.

Table D6.2

D6.b	Opening Balance	Removed better info	Removed – Inaccuracy correction from 01/02.	Removed Authority Action	Capital Projects	Screen Installed	Total Removed by Authority Action	uCSO outstanding balance
2002/03	700	36	32	30	35	18	83	549

This represents the removal of 83 uCSOs during the first year of the Q&SII period (12%) by Scottish Water Action. The total net reduction is 151 which represents a 22% reduction on the 2001/02 return. A Confidence Grade of A2 has been allocated which is an improvement on the 2001/02 Scottish Water combined submission. The reduction in the uCSO figure reduces the risk to Scottish Water of consent failure and pollution incidents and represents progress towards the Q&SII targets.

D6.3 – The 2001/02 submission for the former East area was based information from GIS records and the SIIOP Study programme with an assumption that EOs were at foul only Pumping Stations. The former North area submission was based on an extract of 'combined sewer overflows' from the "Dolphin" database. The former West area submission was based on a definitive list of CSO's and overflows compiled during 2001/02 (amended by improved by data from the DAP Studies) as per Table D6.3.

The 2002/03 return has been produced using a GIS query cross-referenced using the Scottish Water CSO database. The figure is more accurate than last year and has increased from 2,983 to 3,099.

The number of CSOs has increased due to improved and more complete information held in the GIS system which is as a result of CSO surveys and the SIIOP/DAP Studies undertaken. As this figure has gone up, the number of assets owned and maintained by Scottish Water has risen. A Confidence Grade of B4 has been allocated which is a lower accuracy band compared to the 2001/02 Scottish Water combined submission of B3. The B3 grade from last year was 'optimistic'. In light of better data, it should have been B4.

D6.4 – % of uCSOs. Calculated from D6.2 and D6.3, the confidence grade is considered to be the B4. The return last year was 23.47% and is now 17.72% this year. This has reduced due to Authority action to remove uCSOs and improved information on these assets. Better knowledge of the data has caused the confidence grade to drop.

D6.10-20 Activities - critical sewer investigations

D6.10-12 – Used as the opening balances for the 2002/03 submission.

D6.11 – The balance here is 0 as the former East and North areas returned 0 balances last year (the former West area returned a balance of 2688 but this was not included in the 2001/02 combined submission). The CGs for D6.10 (B3), D6.11 (M) and D6.12 (C3) have remained unchanged.

D6.13 – The 2001/02 figures produced for the West are based on the Investment Plan project outputs carried out during that year (58.9). The North figure was produced by ascertaining the total length of sewerage from the GIS and subtracting the previous years closing balance (799) which would be expected to be an overestimate. The East figure returned was 0. The Scottish Water combined submission was 857.9km and this figure's accuracy cannot be validated. Scottish Water does not believe the confidence grade of B3 was correct, as the accuracy could not be determined.

No figure is returned this year as the data is not available from a corporate system and no other data sources have been identified. The sewers re-classified (line D6.16) may include this figure, currently GIS lacks the ability to report these figures to be separated. This is a future improvement requirement for the new corporate GIS system/processes. The confidence grade has now reduced to M, which is poorer than last years B3 from the combined submission but Scottish Water believes that this is a fairer reflection of our current knowledge.

D6.14 – 2001/02 figure for CCTV undertaken was obtained by Examiner database queries and records from the DAP/SIIOP teams.

The 2002/03 submission has been produced using GIS and Examiner supplemented by records from the DAP/SIIOP team.

The reason for the 83.5% reduction in this figure is that the majority of the planned CCTV survey work is undertaken for the SIIOP/DAP Studies and most of the ongoing Studies have now passed the data collection phase. This trend will continue in future years as the current CCTV programme nears completion. This will ensure that Scottish Water will have increased their knowledge of the condition of the sewer system.

D6.15 – The former areas did not carry out a length by length estimate of critical sewers for the 2001/02 submission and therefore returned zero values for D6.15. No such exercise has been carried out for the 2002/03 submission and therefore a 0 is returned again. Scottish Water's critical sewer network assessments are now largely made on actual data collected/recorded and statistically extrapolated/interpolated data for the unsurveyed critical sewer stock. The CG has therefore remained at M.

D6.16 – The 2002/03 figure produced (using GIS) is 340km which is the difference between the total critical sewers opening balance and the new critical sewers closing balance. It should be noted that this figure includes the 'D6.13 New Critical Sewers Added', as these figures are not recorded separately. This is a future improvement requirement for the new corporate GIS system/processes. The CG has improved to C5 and the increased length provides Scottish Water with an increased critical network to maintain.

D6.17 – Sewers abandoned from 2001/02 submission was –6km (B3) for North, 0 (A1) for East and 6.68km (B2) for West. The figure returned for the Scottish Water submission was 0.68km (B3). The CG for the former East area should have been M which in turn would have made the combined submission M. There was inconsistency in the way the line was completed between the North and West areas. The North figure was returned as a negative to ensure that line D6.20 recorded the correct value, therefore the actual length of sewers abandoned should have been 12.68km in the combined submission.

The data held in GIS does record abandoned sewers but does not record the date the sewer was abandoned. It is therefore not possible to query this figure from Scottish Water's corporate GIS system at present. This is a future improvement requirement for the new corporate GIS system/processes. The figure returned for the 2002/03 submission is 0 and the CG placed here must therefore be M.

D6.18-20 Summation lines for D6.10 – D6.17

D6.18 – The figure returned in the 2002/03 submission has a CG of B3. This represents an improvement in CG. This year's figure represents a 5.6% increase on last year's return and an increased knowledge of the sewer system.

D6.19 – Assessed by estimating has returned 0 values last year and this year. CG is also M for both this year and last year.

D6.20 – This represents an increase in total critical sewers and this indicates that Scottish Water have a larger critical sewer network to maintain with a higher consequence of failure. It should be noted that this line requires the summation of lines D6.12, D6.13, D6.16 and D6.17. Line D6.17 is Sewers Abandoned and if a figure is entered in this line it will be added to the closing balance. Including abandoned sewers in the total sewer length ensures that abandoned sewers will remain part of the total each year (as this will be next year's opening balance).

D6.21-25 Activities – studies

Consistently defined Drainage Area Study (DAS) Zones are now in place for and cover the entire Scottish Water area. These DAS Zones define areas, which encompass significant (in terms of population) hydraulically independent sewered areas and include the area outwith these sewered areas to account for future development. The new DAS Zones provide the boundaries for which Drainage Area Studies are undertaken. In total there are now 808 DAS Zones.

In the former areas the boundaries for drainage studies differed. The East boundary definition was the same as the new DAS Zone definition and these have been carried forward into the Scottish Water DAS Zones. The North study boundaries were taken as the sewered areas and therefore have a direct one to one relationship with the new DAS Zones which have been developed around them. The West study boundaries were also taken as the sewered areas but these areas were not always hydraulically independent of each other and therefore there is no one to one relationship between them and the new DAS Zones. In a number of instances a new DAS Zone encompasses a number of West sewered areas. This becomes significant where these sewered areas are subject to studies which are at various stages, either ongoing, completed or not started. Where a DAS Zone contains numerous studies the DAS Zone is only recorded as complete if all the studies within that zone are complete. If any of the studies are ongoing the DAS Zone has been allocated as ongoing.

D6.21 – The number of drainage study areas identified for study for the 2002/03 submission is based on the new DAS Zones as detailed previously. The redrawing of the boundaries has resulted in a decrease in the DAS Study numbers of 223. This has not reduced the area or population coverage of the planned DAS Studies.

D6.22 – The number of DASs ongoing for the 2002/03 submission is approximately 30% of the total number identified for study. This number is lower than the reported figure for last year due to the re-definition of DAS Zones as explained above and the completion of some studies from last year. There are some DAS Studies (which were included in the completed studies figure last year) which are no longer considered complete because they are now part of a larger DAS Zone which includes other studies which are not yet complete.

D6.23 – The number of completed studies for the 2002/03 is lower than the reported for last year due to the re-definition of the DAS Zones as explained previously. The total does not include those studies which are not considered complete because they are now part of a larger DAS Zone which includes other DAS Studies which are not yet complete. This should be taken into account when assessing the change in completed studies over the last year.

D6.25 – The 2002/03 figure has increased as the numbers of properties covered by completed studies has increased. This is calculated by counting the number of address points within each DAS Zone using the corporate address point database. A sum of the total address points covered by completed studies DAS Zones was made and a percentage of the total address points for Scotland calculated. This figure does not include those address points subject to a completed study, which is within a DAS Zone, which also has an ongoing study as explained previously.

E Tables – Operating Costs and Efficiency

General Comments

- The E Tables for 2002/03 were prepared using reports from the corporate finance system. This system consolidates the three component ledgers of the former authorities, mapping them into a format consistent with WIC reporting requirements.
- A consolidated financial system combined with a more consistent approach to the allocation of operational costs has resulted in a greater proportion of costs being directly allocated to services with a consequent improvement in confidence grades.
- A consistent approach was applied across Scottish Water to direct costing and the allocation of costs to services and activities. This makes any comparison with prior year figures, where there were 3 different methodologies applied, very difficult. We have however, fully explained the methods used to allocate costs in the current year and commented on any material variances from last year as required by WIC guidelines.
- For areas where direct cost capture was not available, we have used extrapolation to derive the figures including; the allocation of direct costs to sludge treatment and third party costs; the apportionment of costs between water and waste water for the business activities; doubtful debts and exceptional items; and the distribution of general and support costs to service and activity. Where extrapolation has been used the confidence grades have been reduced accordingly.
- SW recognises that there are areas where cost capture and quality of data can be improved. In order to address this in 2003/04 we are implementing:
    - A single consolidated ledger for SW
    - A primary accounting model which will ensure that costs are being directly captured at the lowest level of detail against assets
    - Activity Based Management Software
    - All of which will greatly improve cost capture against assets and therefore improve the quality of information provided in next year's annual return.
    - With the exception of accruals for potential contract claims with regard to PFI schemes, there are no atypical costs included in the 2002/03 return.

ALLOCATION OF COSTS

Customer Services
Billing, credit control and meter reading costs were apportioned to water /waste water based on the water/waste water income. Customer communication costs were allocated equally between water and waste water in the absence of any allocation alternative.

Laboratory Services
Laboratory services are split into two main areas; laboratory services and scientific services. The allocation between water and waste water for laboratory services was based on the number of samples taken during the year, and the split between scientific services was based on the level of activity (80%water, 20% waste water).

General and Support
50% of electrical and mechanical maintenance costs were charged directly to above ground assets. For the element of electrical and mechanical maintenance which was not charged directly, we have apportioned the costs based on the total spend for water treatment, sewage treatment, sludge treatment and pumping stations.

The balance of general and support expenditure was allocated to services and activities in two ways. For fleet, information and technology, and property costs were allocated to services and activities based on usage. Where information on usage was not available, the balance of general and support costs were apportioned based on the total spend for each

business and service activity. For example, to derive the general and support allocation for water treatment, the total general and support cost was divided by total opex then multiplied by water treatment direct costs.

Apportionment of Costs to Asset Level
Where the costs of more than one asset are grouped within one cost centre and it has not been possible to identify the costs of each, individual asset costs have been pro-rated based on the theoretical design capacity of the asset. As a consequence of this, confidence grades are low.

Third Party Costs
For 2002/03 25% of non-core costs were directly captured in unique non-core cost centres. The remainder of costs associated with non-core, were captured in cost centres containing both core and non-core costs. These costs were apportioned based on the volume of core and non-core activities carried out within each cost centre. For 2003/04 separate cost centres have been created for all non-core costs, which will enable more accurate reporting in next year's return.

No depreciation charge for non-core services has been included in the return because non-core activities are not asset intensive. This is consistent with the approach applied by some companies in England and Wales.

Table E1 Activity based costing - water service

Table 1a This table has been left blank as instructed by WIC as it is concerned with last year's data.

Table 1b
A consistent approach was applied across Scottish Water to direct costing and the allocation of general and support costs to services. This makes any comparison of costs on a line by line basis difficult. However, total functional expenditure has reduced by £25.8m from 2001/02 due to efficiency savings.

E1.0-12 Service analysis - water: direct costs

E1.1, E1.3 & E1.10 – Overall, employment costs (including hired and contracted costs) have decreased by £7.8m as a result of the reduction in headcount.

E1.3 - This line includes all costs relating to the use of external consultants/contractors for operational activities. As explained in the introduction to this commentary, the increase of £4.9m is due to improved costing allocations, rather than an increase in actual cost.

E1.13-26 Operating expenditure

E1.15 – In prior years, two of the three legacy authorities did not include the full costs of their regulation departments within these costs. For 2002/03 these costs have been included and this has resulted in the £0.7m increase in costs.

E1.19- E1.21 – Exceptional costs charged total £24.6m and relates to restructuring and transformation costs undertaken as part of the £200m Spend to Save programme. Staff costs associated with the Transformation programme in line E1.20 were £0.438 million. These exceptional costs incurred during the year include staff severance costs of £9.3m and £15.3m of other costs, predominantly IT related, associated with the fundamental restructuring and transformation of the business. These costs have been allocated 52% to water and 48% to wastewater in proportion to core functional expenditure (excl PFI).

E1.27-28 Reactive and planned maintenance (included in opex)

E1.27-E1.28 – Planned and Reactive Maintenance. The allocation of costs in Lines E1.27 and E2.27 has changed significantly for 2002/03. We have assumed that all expenditure on below ground assets is classified as maintenance with the exception of SEPA and Power costs. This is consistent with the approach applied by Welsh Water.

E1.29-36 Capital Maintenance

E1.29-E1.33 During the year the former authorities asset registers were consolidated into a single register for Scottish Water. This analysis of depreciation between water and waste water is consistent with that provided in table L10 of the p12 RAB return..

Table E1c Table to be submitted once Strategic Business Plan is approved.

Table E2 Activity based costing - wastewater service

Table 2a This table has been left blank as instructed by WIC as it is concerned with last year's data.

E2.0-12 Service analysis - wastewater : direct costs

As stated previously, a consistent approach was applied across Scottish Water to direct costing and the allocation of general and support costs to services. This makes any comparison of costs on a line by line basis difficult. However, total functional expenditure has reduced by £6.3m (excluding PFI expenditure included in E2.12) from 2001/02 due to efficiency savings.

E2.1, E2.3 & E2.10 – Overall, employment costs (including hired and contracted costs) have decreased by £1.2m as a result of the reduction in headcount.

E2.3 - This line includes all costs relating to the use of external consultants/contractors for operational activities. As explained in the introduction to this commentary, the increase of £3.3m is due to improved costing allocations, rather than an increase in actual cost.

E2.4 – The estimated costs of running PFI schemes increased by £23.4m as four new Schemes were commissioned during the year (Daldowie, MSI, Levenmouth and Moray) and the Aberdeen, Tay and Dalmuir projects which were commissioned part way through 2001/02 had a full-year impact on operating costs in 2003/04.

E2.13-26 Operating expenditure

E2.15 – In prior years, two of the three legacy authorities did not include the full costs of their regulation departments within these costs. For 2002/03 these costs have been included and this has resulted in the £0.6m increase in costs.

E2.19- E2.21 – Exceptional costs charged total £24.6m and relate to restructuring and transformation costs undertaken as part of the £200m Spend to Save programme. Information excised due to confidentiality of voluntary severance data. These costs have been allocated 52% to water and 48% to wastewater in proportion to core functional expenditure (excl. PFI).

E2.27-28 Reactive and planned maintenance (included in opex)

Planned and Reactive Maintenance. The allocation of costs in Lines E1.27 and E2.27 has changed significantly for 2002/03. We have assumed that all expenditure on costs for below

ground assets is maintenance with the exception of SEPA and Power costs. This is consistent with the approach applied by Welsh Water.

E2.29-36 Capital Maintenance

E2.29-E2.33 During the year the former authorities asset registers were consolidated into a single register for Scottish Water. This analysis of depreciation between water and waste water is consistent with that provided in table L10 of the p12 RAB return.

Table E2c Table to be submitted once Strategic Business Plan is approved.

Table E3 PFI project analysis

Table Overview

Table E3 provides details of the 21 PFI wastewater treatment works that are managed under 9 separate PFI Concession agreements.

The total PFI annual charge has increased by £63.3m from 2001/02, with PFI operating costs included within functional expenditure £24.6m higher (£23.4m on E2.14 plus £1.2m operating costs incurred by Scottish Water). Four new schemes were commissioned during the year (Daldowie, MSI, Levenmouth and Moray and the Aberdeen, Tay and Dalmuir projects which were commissioned part way through 2001/02 had a full year impact on operating costs in 2002/03.

E3.0-6 Project data

E3.1 The data is based on an assessment of the connected address points and using an occupancy rate of 2.242 to calculate population. The connected properties were established by ignoring those address points where there was a business name provided (these were assumed to be non domestic properties). The annual average resident connected population was based on the number of address points within the catchment of each works, and an occupancy rate was applied based on 2001 data, to calculate the population for each works. These figures tie in roughly with E7.1 annual average resident population (by operational area), although more work needs to be done on updating catchment boundary population figures.

The address points were queried into the sewered areas within each Drainage Area Study zone. The DAS zones covering each of the PFI sites were added to establish a total connected domestic population.

E3.2 Non-resident population for 2003-03, served by PPP schemes (and Large Works), is based on the non-resident population data supplied for E7.2. However, as an annual average population is required for E9.2 and E3.2 line submissions, (for each works), we have referred to Ofwat's Annual Return methodology for calculation of the annual average non-resident figure. This methodology applies a seasonal occupancy rate for 4 months in the year, and an annual average is deduced accordingly. Therefore, the non-resident population of 214,000, has been divided by 3 to obtain an annual average value.

(As approximately 71% of Scottish Water's resident population is served by PPP schemes & Large WWTW), this adjustment has been applied to the total non-resident population figure, before calculation of the annual average.

The data source for the prorated information, for the 2002-03 return is "VisitScotland" publication "Tourism in Scotland 2001". This detailed numbers of bed spaces for various types of holiday property. The population in connected properties was obtained by applying the rate of connected households." This information, combined with data on the number of

bed-spaces (which enabled calculation of an occupancy rate) was used to deduce the total non-resident population receiving wastewater service. Scottish Water have estimated that only 63% of holiday residences are included in the "VisitScotland" publication, therefore an adjustment was made to the calculated population to account for additional properties (and hence bed- spaces) not included in the publication.

E3.3 Data is based on average daily consumption figures and charged at (settled COD) values. Estimated conversion factor between sCOD and COD of 1.5.

E3.4 The tanker loads imported are measured by weight of total sludge. Fifty-five sludge import samples were analysed from Inverness and these gave an average COD of 23,800 mg/COD/l. This conversion factor has been applied to all tanker imports. For example at Almond Valley Seafield Esk (AVSE) works, the calculation is based on:

- Dry tonnes of imported sludge reported by PFI Company (2.75 ttds/day).
- Average dry solids of imported sludge reported by the PFI Company from random sampling between November 2002 and March 2003 (2.5% dry solids (DS); therefore 110m^3 wet tonnes per day).
- Estimated conversion factor between wet tonnes sludge and kg COD of 23.8 (23.8 x 110 = 2600 kg COD / day).

As the Lossiemouth site has only recently been commissioned, the volumes of tanker imports is likely to vary considerably in the future.

Sludge imports into Newbridge sludge treatment facility are not included as all sludge imports (estimated 3000kg COD/day) are derived from within the AVSE scheme (i.e. East Calder, Blackburn and Whitburn WwTW).

All Sludge imports to Meadowhead are derived from within the MSI scheme (i.e. Meadowhead,, Stevenston and Inverclyde WwTW)

E3.5 On a daily basis Scottish Water take composite samples of the influent to the works and at the same time measures the volume of influent using an open channel flow meter. This data is used to calculate the daily load of influent received at the works. The load from tanker imports is added to this figure and the population calculated using an average BOD of 60mg/head/day. Estimated COD / BOD ratio of 2 used to estimate BOD loading received by works from imported sludge (2600 / 2= 1300 kg BOD / day).

Sludge imports into Newbridge sludge treatment facility are not included as all sludge imports (estimated population equivalent 20,000) are derived from within the AVSE scheme (i.e. East Calder, Blackburn and Whitburn WwTW). The Hatton result is very low reflecting the very weak influent at Hatton.

At Dalmuir and MSI influent volume is not measured. Data has been sourced from the project documents submitted by the PFI Company and originates from trade effluent surveys and sampling programmes and flow and load surveys. The data has been subjected to due diligence investigation by the consortium funding the project.

E3.6 Based on project status at 31 March 2003. During 2002 to 2003 Levenmouth WwTW was under construction and the sludge dryer is currently under commission. Commissioning of the wastewater treatment works (excluding the sludge dryer system) was completed in November 2002.

The Moray Coast project was commissioned January 2003.

Dalmuir, Daldowie and MSI are undergoing commissioning and final tests.

E3.7-11 Scope of works

E3.7 AVSE project includes Esk Valley sewerage catchment. Levenmouth project includes contributing sewage pumping station and rising mains in Leven, Buckhaven and Methil.

Hatton includes extensive pumping mains and pumping stations.

E3.8 The MSI projects each comprise a sewage treatment facility with a common sludge treatment centre at Meadowhead.

E3.9 Daldowie is exclusively a sludge treatment centre.

E3.12-16 Sewage treatment – treatability

These lines have been populated from data collected at each of the works. It should be noted however that the BOD etc is measured after screening. In addition, Total Organic Carbon (TOC) is not measured at any of the works. NH3 is not measured in Highlands, Moray Coast, Hatton, Aberdeen and Levenmouth.

The works at Peterhead and Fraserburgh have highly variable influent due to seasonal loads from fish processors.

E3.17-22 Sewage treatment - effluent consent standard

E3.17-21 Data obtained from consents held as part of the PFI contract documentation and verified with the appropriate PFI Company.

E3.22 Data obtained from appropriate PFI Company for year to date. SEPA have yet to notify PFIs of a number of sample results for year 2002-03.

E3.23-24 Sewage treatment flow

E3.23 At Highlands, Tay, Aberdeen and Moray Coast (Lossiemouth & Buckie works) the data is based on qualifying dry days as defined in Scottish Water's agreements. Namely the mean dry weather flow on all days when there is zero rainfall, following a day when there is less than 0.25mm of rainfall. The Moray Coast scheme is based on a part year.

At Levenmouth dry weather flow is estimated by calculating average daily flow in the three dry months of September 2002, February 2003 and March 2003.

Dry weather flow analysis for AVSE is calculated from flows between 19 and 25 September 2002.

At Dalmuir, Daldowie and MSI information is based on continuous flow monitoring during seven consecutive dry days at each works.

E3.24 At present, not enough data is available to determine the ratio of maximum to minimum flow at Banff MacDuff.

No analysis of flow ratio is available for Levenmouth as plant has only recently been commissioned.

No data is currently available from the AVSE PFI Company for the period 2002-03. Ratios are as per WIC return for period 2001-02 based on analyses by the PFI Company, and assume no significant change to catchment characteristics.

At Dalmuir, Daldowie and MSI data for maximum and minimum daily flows is based on SCADA records for instantaneous flow and is not available as an hourly average.

E3.25-31 Treatment works category

Information contained in these lines is extracted from the project agreements and is given a confidence grade of A1.

E3.25 Levenmouth primary stage does not include primary sedimentation.

E3.28 East Calder and Whitburn tertiary treatment includes both nitrifying filters and sand filters.

E3.29 Sand filters at Newbridge, East Calder and Whitburn are assumed to be rapid gravity sand filters for WIC classification purposes.

E3.31 Sand filters at Blackburn are assumed to be rapid gravity sand filters for WIC classification purposes.

E3.32-37 Miscellaneous Data

Information contained in these lines is extracted from the project agreements and is given a confidence grade of A1.

E3.33 A number of works include inlet pumping stations. Seafield includes an intermediate lift pumping.

E3.34-35 The following works do not treat sludge from other facilities – Presley, Fraserburgh, Buckie, Banff, Macduff, Stevenson and Inverclyde.

E3.36 Newbridge sludge treatment facilities receive imported sludge from East Calder, Blackburn and Whitburn WwTW (estimated 3000kg COD/d).

Inverness receives imported sludge from Fort William; Nigg from Persley; Peterhead from Fraserburgh; Moray West from Moray East and Banff MacDuff.

Meadowhead receives imported sludge from Stevenston and Inverclyde.

E3.37 Levenmouth, Meadowhead and Moray West sludge treatment facilities are currently under commission.

E3.38-41 Total cost analysis

E3.38 The annual charge is based on the actual charge paid to the Concessionaire during the year plus accruals.

E3.39 The capital equivalent values of £702m were derived from the base model incorporated in a report to the Transport and Environment Committee on 21 June 2001 adjusted for inflation. At Daldowie the PFI cost was used in the absence of a PSCE value, similarly for Levenmouth and AVSE the values have been taken from the 01/02 WIC return.

E3.40 Estimated annual direct operating costs are based on the Concessionaire's model. As this model includes an element of the partner's profit, the costs in the model are not controllable and cannot therefore be compared to SW's own operating costs. The operating costs are based on the part of the year during which the plant was operational.

E3.41 The contract period for PFI projects varies between 24 and 40 years.

E3.42-46 Associated authority costs

E3.42 With the exception of Dalmuir and MSI, all standard SEPA charges are met by the Concessionaire and are included in the tariff rates. Accordingly, there are no costs for SW. At Nigg SW meet the additional SEPA charges associated with 2 parameters as detailed in the contract. The SEPA costs at Daldowie are costs incurred before commissioning.

E3.43 This includes the costs of the SW PFI department that deals with PFI schemes. These costs have been allocated to projects based on total spend.

E3.44 At Meadowhead and Stevenston SW operate a downstream terminal pumping station, however these costs are not directly captured. This is being addressed in 2003/04. At all other schemes the terminal pumping station costs are met by the Concessionaire and are included in the tariff rates. Accordingly, there are no costs for SW.

E3.45 Apart from Inverness and Fort William, sludge disposal costs were the responsibility of the Concessionaire. For Inverness and Fort William, costs were based on the volume of wastewater treated. Costs are apportioned between the two projects based on this volume, on a ratio of 4 (Inverness) to 1 (Fort William). Sludge is disposed of to land. Moray West sludge disposal costs were met by SW prior to the commissioning of the Sludge drier. In Daldowie, as a consequence of the project's late start, Scottish Water incurred £5m of Interim Sludge Solution costs.

E3.46 SW costs include start up costs associated with PFI projects.

Table E4 Water explanatory factors - resources and treatment

Asset Information provided in Table E4 does not correlate with information provided in the Authority's H tables. This is in part a reflection of the different approaches taken by the two tables, i.e. E includes only assets that incur cost as a result of their operation and varying level of performance within the year while H takes a snapshot of all assets (which including operational decommissioned and redundant) as at 31 March 2003. Other factors, which contribute to the different values submitted in the two tables, relate mainly to asset status. The confidence grade of this information will improve with the introduction of a single asset inventory held within the Works and Asset Management System (WAMS). This new corporate system will be fully operational for the June 2004 return.

General Comments

- All information submitted in lines E4.0 to E4.38 has been sourced initially from the new WAMS system as of March 31 2003.
- A large increase in the number of non-operational assets has been generated during creation of the WAMS common asset inventory.

E4.1-12 Source types

E4.0 – E4.5*:* Overall there has been an increase of 8.7% in the number of sources from last year, (increase from 541 to 588). This is particularly apparent in the Lochs, Burns and Springs category where there has been an increase of 56 sources and Impounding Reservoirs where there has been a decrease of 10 reservoirs. This is due to a consistent methodology being adopted for this year's Return, which reverses the approach, adopted by the predecessor Authorities and 'unbundles' all sources supplying yield to a reservoir or an aqueduct. Similarly, all spring sources at the same site have been identified separately. For the former East area (in contrast to last year) all catchwater sources to a reservoir or an

aqueduct have been grouped under the source that they are supplying. Similarly, all spring sources at the same site have been grouped together under the main spring source. This is also as a result of on-going data maintenance by the Water Resource and Reservoir Team within the Assets Strategy & Planning Section who have standardised on a single asset structure across the business. This approach allows all opex costs to be allocated against the operational asset and not simply bundled against areas.

There has also been a change in the proportion of water supplied by each raw water source type. Last year 83% of water was supplied by impounding reservoirs with 6% supplied by river abstractions. In 2003, it is estimated that 79% of supply comes from impounding reservoirs and 14% is from river abstractions.

Where a WTW is served by more than one source type, the output has been allocated to the major source and the minor source output reported as zero. This is due to the fact that the raw water is generally not metered and it is deemed impractical to estimate. Source output data included in this section of the table relates to treatment works output. This data is produced by the Water Resource & Reservoir Team using 'Water Update', a monthly business wide report which captures all dynamic water resource data including rainfall, reservoir levels and stock, works outputs, etc. Confidence grades for this section of the table have been set at B4.

In the section for Own Source Outputs the distribution input has been used to calculate the average daily output derived from each source type. This does not take into consideration losses as a result of raw water transmission and during water treatment processes.

The treated water exports are included in this data although not normally classed as distribution input. If the exports were excluded, the calculation fields for the different areas in line E4.46 would not be correct.

Where a WTW was operational for only part of the year, the annual output that was put into supply is included, and the WTW is included in the count of number of works. Since the frequency with which flow meters are read varies (by telemetry, or manually - daily, weekly or monthly) the average daily supply has been calculated as the sum of the annual outputs in Ml divided by 365.

There is a reported 3% decrease in distribution input this year. This is likely to be a result of reporting as a single authority, which eliminates duplication of distribution input between previous boundaries. The confidence grades are reported as B4 in all cases.

A "Meter Improvement Programme" is on going with a view to replacing the strategic water meters. As a result, distribution input will be monitored to a higher degree of accuracy.

No raw water was exported from or imported to other resources areas during the reporting period

E4.6 to E4.7: Scottish Water does not have any raw water exports and correspondingly an A1 confidence grade has been entered for this line.

E4.8 to E4.12*:* There have also been some major changes in the proportion of water supplied by each raw water source type (see note above). This year, because of a detailed consideration of the characteristics of one major source – Loch Lomond, the proportions have changed. Other raised lochs in the north west area were also considered for alteration from lochs, burns and spring intakes (LBS) to River Abstractions (RA) however, as their overall characteristics excluded raw water pumping and bankside storage, no changes were made.

Scottish Water would welcome the opportunity to review the classification of sources specified by WIC in the Annual Return. The current split (reservoirs; lochs, burns and spring intakes; river abstractions and boreholes) was devised to provide Scottish Water with an increased allowance through modeling to take account of the unique issues of operating in an upland rural area. The WIC models used in the econometric models remain unchanged from the OFWAT models. Scottish Water feels it is being penalised by the WIC methodology, not only are we not receiving any additional allowance for these difficult sources, we are losing the allowance that we would receive if we were operating under the OFWAT regime and classifying the burns as rivers.

Note: Loch Lomond is situated at an elevation of 8 metres above sea level. Only the top 1.22 metres depth of water is controlled by Scottish Water by means of a barrage across the River Leven. While it is referred to as a loch this method of harnessing its natural resource is very different to any other in Scotland. It is also considered by many to be more like a flooded river basin. The abstraction pumping and scale of raw water holding at point of treatment performs the same function as bank-side storage.

E4.13-16 Peak Demand and Pumping Head

E4.13: The peak demand to average ratio was calculated using works output data. There was limited historical data available in some areas therefore for consistency, the peak demand to average ratio was calculated using the previous year only. .

E4.14: As in previous Returns, the formula used for the calculation of the pumping head was not the version listed in the WIC definitions. Following discussions with the WIC, the formula below was used;

$$Average\ pumping\ head = \frac{\sum\left(l_i * wp_i\right)}{d}$$

where:
i = each site at which pumping occurs
l_i = annual mean lift at site i (m)
wp_i = volume of water pumped at site i
d = distribution input

The resource and treatment average pumping head figure has reduced from 18.4m to 13.9m mainly as the result of one project. A gravity cross-connection between the Loch Katrine and Loch Lomond systems was brought into operation in summer 2002. It allows up to 120 Ml/d of pumped flow from Loch Lomond to Balmore WTW to be replaced by gravity flow when resources permit.

When calculating the pumping heads in each area, consideration has been made to water that is pumped from one area in to another. For example, water that is pumped from resource to treatment in Forth Valley and then subject to internal export to Lothians is included in the column for Average Pumping Head – resource to treatment for Lothians.

Pumping Head information has been taken from multiple data sources across the business. These include data collection exercises co-ordinated by the Mechanical & Electrical (M&E) section. Information on the majority of large clean-water pumping stations in relation to pumping head and capacities is recorded while the pumping head is estimated for many of the small booster pumpsets in distribution, not surveyed in the above-mentioned exercise.

E4.17-21 Water Treatment Works by Process Type

The works process type is defined in WAMS. Manual checking of the information accuracy has been carried out by the new Area Asset Planning Teams who amended a small number

of records for recently commissioned sites and one W4 site which was wrongly classified in last year's return. Since the submission of the last return a small number of works have been closed, abandoned or disposed of by sale at auction.

E4.17-23*:* The total number of works has dropped by 30 to 371. This is almost entirely due to correct operational status being established and all non-operational sites being removed from Table E4. There has also been considerable movement within the treatment process types. Simple disinfection works have reduced by 33 while Type W3 have increased by the same number. Type W1 have increased by 3 and Type W2 have decreased by 33. Type W4 has changed from 1 to 0 as the result of the correction of a wrong entry last year.

E4.24-29: The proportional breakdown of distribution input has also changed in line with the movement in number of works detailed above. Simple disinfection accounts for 19% while Type W1 has greatly reduced by 4% as a result of improved treatment processes. The resultant increases mean that Type W2 accounts for 32.5% and Type W3 44%. Type W4 has been corrected from 4% to NIL as detailed above.

E4.30-39 Water Treatment Works by Size Band

The peak hydraulic capacity that was used to determine each works placing in the size bands was determined by the maximum output in WAMS and checked by the Area Asset teams. The maximum output is determined by the actual maximum hydraulic throughput by the individual works over the last two years. The proportional breakdown of distribution input by works size band is almost identical to last year.

The following changes in water treatment works by size band have occurred from last years return. The total number of works has reduced by 30 to 371 with the smallest band <=1 Ml/d reducing by 10 to 240 due to rationalisation of small assets and improved treatment at certain sites.

Number of works >1 to <= 2.5 Ml/d has reduced by 9 to 25 mainly due to improved treatment and the correction of operational status to non-operational. >2.5 to <=5 Ml/d has decreased by 4 to 35 reflecting correct operational status. >5 to <=10 Ml/d has reduced by 5 to 18 as a result of the allocation of correct operational status.

All other size bands have either reduced by one due to allocation of correct operational status or remain unchanged.

E4.41-46 Bulk Import and Exports

E4.41-42 - Both zero as there are no bulk imports or exports.

E4.43-44 - Exports are entered as positive to ensure that the calculation is correct.
Note:
The net internal change will be zero this year as a result of the formation of Scottish Water.

E4.47-58 Costs

Where there is a one to one relationship between an asset and a cost centre, the costs reported in E4 have been derived from cost data, which is directly captured with an allocation of general and support costs. Where this is not the case i.e. where more than one asset is included within one cost centre, the total costs directly captured have been allocated to the individual assets based on the design capacity of each asset. Confidence grades have been lowered to reflect the levels of allocation that were required. For 2003/04 there is a one to one mapping relationship for each asset, which will allow more direct cost, capture and improve the quality of information reported.

The total water resources and treatment costs from Table E1b have been allocated to size bands using data provided by Scottish Water's Asset Operations team. Similarly, the costs of water sources have been allocated to treatment works based on operational data.

Table E5 Large treatment works information database

General Comments

- Table E5 contains the same 26 large WTWs >25 Ml/d throughput as last year's return. They are listed in alphabetical order within operational area order. Works 1 and 2 are in NW; works 3 to 9 are in NE; works 10 to 15 are in SE; works 16 to 26 are in Scottish Water.

- Information provided in this section of the table has been taken from existing data within the Works and Asset Management System (WAMS) and various Water Treatment and Water Quality data-sets.

- The WAMS data originated in the three legacy authority asset systems. They were populated in accordance with procedures laid out in a proven Data Collection Manual (Severn Trent). This data has recently been migrated into one common replacement system.

- The Water Treatment data has been collected for on a weekly basis, various reporting purposes in accordance with set guidelines. Hydraulic data is collected on a weekly basis, from treatment works for the 'Water Update' report. Works flow information is also extracted from site SCADA systems either directly or remotely via telemetry, by the Process Optimisation teams within the Asset Operations function.

- Raw and Regulatory treated water quality data is recorded in a new corporate Laboratory Information Management System (LIMS) database which has resulted in the increased confidence grade of A1 being applicable across the whole Table.

E5.0-4 Works size

E5.1 - This figure is based on daily average of the peak seven day period as per the definition in line E4.13.

E5.2 – This figure is based on daily average of the peak seven day period as per the definition in line E4.13.

E5.4 – Headroom in this table is arrived at via a simple calculated field. Refer also to the commentary for Table B1.

Variance in confidence grades in this section reflects the different levels of data currently held on each of the works, especially the accuracy of bulk flow measurement devices. Action Plans are in place to improve and harmonise the data.

E5.5-20 Raw Water Source and Compliance and Performance

All data included in these lines was taken from the LIMS and relates to the financial year 1 April 2002 to 31 March 2003. Compliance value in line E5.15 is the PCV of 0 coliforms/ 100ml. Threshold value in lines E5.16 to E 5.20 is the PCV for that parameter.

E 5.10 to E5.11 - Parameter 'a' is iron for works. While this is considered a problem at some works it is not always the case. It is not clear from the guidance whether different parameters can be chosen for different works. Also, iron will contribute to turbidity and

colour in lines E5.6 to E5.9. Algae is also considered a problem at some works but this parameter is not measured in mg/l.

Unlike in the predecessor authorities, no attempt has been made to simply repeat colour and turbidity as parameters ‘a’ or ‘b’ as the values for these parameters is clear from lines E5.6 to E5.9.

E 5.12 to E5.13 - Parameter 'b' is manganese. While this is considered a problem at some works it is not always the case. It is not clear from the guidance whether different parameters can be chosen for different works. Also, manganese will contribute to turbidity and colour in lines *E5.6 to E5.9*.

Unlike predecessor authorities, no attempt has been made to simply repeat colour and turbidity as parameters ‘a’ or ‘b’ as the values for these parameters is clear from lines E5.6 to E5.9.

E5.14 - High risk is a risk assessment score of greater than 75; medium risk a score of 50 to 75 and, low risk a score of less than 50 according to The Cryptosporidium Direction 2000.

E5.21-25 Treatment Processes

This information is extracted from the dataset used to populate Table E4.

E5.26-30 Miscellaneous Data

There has been no major investment at any of the water treatment works with capacity >25ML/d. As a result the information contained in the miscellaneous data section of the Table has not altered from last year.

E5.31-42 Works Cost

As explained in section E4, costs have been allocated to treatment works based on information provided by asset operations. Although there has been an improvement in costs reported in 2002/03, e.g. Balmore Treatment works where all the costs of pumping have now been reported, these costs have been included within the cost of networks. Cost capture processes are being improved for 2003/04.

Table E6 Water explanatory factors – distribution

In the ‘comments’ worksheets in Tables E6, E7 and others, the 'issues with data section' frequently requests a reconciliation of this information. However, in all cases where 2002-03 data is submitted, the data should reconcile where necessary. It appears that, where there is a marginal difference in the numbers of decimal places specified (in the two pieces of data which should reconcile), the flag ‘a solution is required’, incorrectly appears.

Table 6a This table has been left blank as instructed by WIC as it is concerned with last year’s data.

E6.0-7 Area data

E6.0 – Sourced from operational areas.

E6.1 - Property and Population data submitted in this table is sourced from Scottish Water’s Geographic Information System (GIS), based on Ordnance Survey Boundary Line 2000. The methodology to derive the population connected to the water service is the same as for A1.71- Winter population. The operational area split is built up from properties on the Council Tax Valuation list 2002 (Scottish Executive), with the occupancy factor applied as described in A1.71. The actual split of properties across each operational area was derived from Census 2001 population data, which was mapped to the council areas. Scottish water

geographic boundaries overlap in three council areas ie. Argyll & Bute, Falkirk & Moray, therefore GIS was used to extract address- and 'yellow'- point information. This output a split of population across these council areas, which were then reallocated to the appropriate operational area in Scottish Water. The resulting total of the operational area populations (plus those reallocated due to boundary issue), were prorated against the resident winter population (A1.71).

The information provided in E6.2 correlates to that provided in A1.69.

E6.3 – Volume of water delivered to households is the product of the following components:

Unmeasured household supply pipe losses
Unmeasured household internal plumbing losses
Unmeasured household customer use
Measured households

The values for this line have been calculated using the same methodology as in lines *A2.1 & A2.5,* this methodology is detailed in the commentary for Table A2 and shown in the Appendix to the Table A commentary. Additional comments are provided on the schematics.

E6.4 - All measured and unmeasured non-domestic data has been sourced from each of Scottish Water's primary billing systems Custima & Rapid. District codes, (corresponding to the operational areas in Scottish Water), from Rapid were mapped to Scottish water's four operational areas, using information sourced from GIS. This enabled derivation of the water volumes delivered to non-domestic properties; which were allocated against each district code within the system. Adjustments to the final volumes, for each operational area, were carried out for both: supply pipe leakage and for accurate allocation of water volumes across the four operational areas. The latter adjustment was based on property counts for unmeasured – and measured non-domestic customers from A1.66 and A1.22, in conjunction with the billing systems' property counts per operational area.

The volumes for unmeasured non-domestic customers, for 2002-03, were based on 90 m3 per £'000 of water rateable value. These figures did not include supply pipe leakage estimates. For consistency with the analysis carried out in table 2A, a supply leakage value of 62.28 l/prop/day for unmeasured customers and 62.60 l/prop/day for measured customers was added. A confidence grade of B3, was allocated the information held in the customer billing systems is audited and reliable. However, reliance on the assumption of 90 m3 per £1000 of water rateable value, (to calculate the unmeasured volumes) has resulted in a less accurate confidence grading; hence the allocation of B3 as an overall score.

E6.5 This is the total geographical area of each of the authority's four operational areas, as calculated on the corporate GIS.

The area for the whole authority shows a marked increase on that reported in the previous return, 38,054 to 79,976 km^2. This is due to a change in the methodology used by the former North area. Whereas the former East and West areas reported the total area within their jurisdiction, the North reported only the area that fell within regulation zones.

The change in methodology, to reporting the total geographical area within each operational area, has been deemed appropriate, so as to more fully represent the area across which the authority has to deliver services. Although the total geographic area of urban areas in the North East and North West may be relatively small, these urban areas are not contiguous and the authority must maintain a corresponding organisational structure to support them.

E6.6 - Not in use.

E6.7- Water supply zones are defined in The Water Supply (Water Quality) (Scotland) Regulations 1990, i.e. an area designated for the purpose of the Regulations with a current

maximum population of 50,000 and in which all the premises are supplied for domestic purposes from the same water source or combination of water sources.

This data was extracted from Scottish Water's GIS and INMS systems. Regulation zones in this table represent those in existence as at 31 March 2002.

E6.8-13 Water Mains Data

E6.8 – Data submitted is sourced from potable mains (infrastructure) on GIS mains length calculation undertaken in May 2003.

E6.9 Data is sourced from potable mains (infrastructure) on GIS - length calculation undertaken in April 2003.

Unlined iron mains were calculated using the totals for cast, ductile and spun iron plus the length of mains whose material is unknown, which is assumed to be unlined cast iron for reporting purposes – all filtered for assets with no rehabilitation date.

E6.10 - Data is sourced from potable mains (infrastructure) on GIS - length calculation undertaken in April 2003.

E6.11 This is the number of mains bursts repaired during the report year, as recorded on Scottish Water's works management systems.

The total number of bursts – 8,869, is a reduction from the figure for the previous year, of 9,616.

The most notable feature is the large number of bursts recorded in the South West area. This is partly due to the length of mains in this area – particularly unlined ferrous mains (8,758km), but also due to the leakage management activities currently underway in this area, which are leading to the detection and repair of bursts which may remain unrecorded in other areas.

E6.12 - At present Scottish Water does not have a sufficient number of DMAs set up in the distribution system to allow estimates of total leakage to be made from night flow measurements, as specified in the WIC reporting requirements. As such, this line has been calculated as described in table A2.

E6.13 – Data reported in this line originates in the calculations behind Table B2. Data from last year's return has been updated based on the following information:

- Calibrated all mains network models that have been completed within the report year.
- Information from Level 1 DMA reports
- Data from preliminary Zone Reports, which were based on zone investigations and consultations with operational staff.

E6.14-18 Pumping Stations/Service Reservoirs

Data from the Works and Asset Management System (WAMS), predecessor's annual returns and various asset databases has been used to provide total numbers for pumping stations and service reservoirs. The total numbers and capacity data from WAMS were passed to the Area Asset Planners for checking and provision of dynamic data over the reporting period.

The original pumping head/capacity data was taken from a specific exercise carried out by M&E. Data this year represents actual figures taken from the pumping stations for large resource and treatment installations but also includes desk study approximations for many of the small booster sets in distribution. This situation is reflected in the confidence grade.

E6.15: The total pumping capacity has been calculated from the operational pumping stations as referred to in the commentary for E6.14 and E4.14.

Where data is unavailable for our largest distribution pumping stations historical data has been used. For smaller booster pumping stations located within the distribution system that supply a small number of properties or troughs, it has not been possible to use these in the final calculations as they are mainly unmetered and considered to have a minor impact on the final output.

E6.16: Refer to commentary for E4.14.
Data is not complete for Average Pumping Head - Distribution. The figures reported are for our largest distribution pumping stations. Data is extrapolated in many cases to give an average pumped volume for the year. Where data is unavailable for our largest distribution pumping stations historical data has been used.

For smaller booster pumping stations located within the distribution system that supply a small number of properties or troughs, it has not been possible to use these in the final calculations as they are mainly unmetered and considered to have a minor impact on the final output

The distribution input (*DIj*) has considered the bulk transfer of water between distribution areas when calculating the total distribution input per area i.e. Gowanbank SR (Export from south-west) to East Craigs SR (Import to south-east).

E6.17-18 Service Reservoirs

The number of service reservoirs has increased from 1500 (the consolidated figure reported last year) to 1550, with a corresponding increase in total capacity from 3520ML to 3711ML. This is due to the different source of data used to compile these figures.

The number and capacity of service reservoirs was extracted from the Service Reservoir Cleaning records and the capacity was checked against the records held in the Asset Inventory. It is believed that the Service Reservoir Cleaning records were a more complete and accurate record as it provided confirmation that the SR was in service and provided a detailed breakdown of capacities. Where possible, these records were checked against local Networks records and data used in the area water strategies to ensure accuracy.

According to the WIC definition, the total number and capacity should ‘include treated water service reservoirs at treatment works’. This was understood to include the Clear Water Tanks (CWT) at treatment works. However, the cleaning records did not have records of CWTs for all areas. Missing data was identified by comparing with the list of WTWs recorded for Lines E4.17 – E4.28 and extracting capacities from the Asset Inventory. However, it is recognised that this did not provide comprehensive data as not all WTWs have on-site treated water storage and that the Asset Inventory was missing records of CWTs, particularly for the old ESW area. Capacity for these CWTs was located from local Networks records and the area water strategies.

Table E7 Wastewater explanatory factors – sewerage

General Comments

The figures for much of Table E7 have been produced using the legacy systems of the 3 predecessor authorities including Smallworld GIS (MapInfo queries), address point data from the GIS, EMPAC (including SAPS data), MIMMS and Phoenix. This has been supplemented with the new Scottish Water corporate systems such as the uCSO register, CSO database and WAMS (Asset Viewer) database. Further cross-referencing with DAP/SIIOP Studies

where available has been undertaken. The information contained in Table E7 is consistent with the data produced for Table H.

Due to differences in legislation between Scotland and England and Wales, Scottish Water has a proportionately longer and more expensive network to maintain. The most significant differences in the Law in Scotland relating to Sewerage in comparison with England & Wales are that:

- A drain becomes a sewer when it passes out of the curtilage even if it only drains one property. This means that there are "lateral" sewers connecting the main sewer to the property drains. These laterals are vested in Scottish Water. This situation does not exist in England & Wales where drains are the responsibility of the householder right up to the main public sewer.

- All private sewers connected to the public were automatically vested in the Sewerage Authority in 1968 or on completion afterwards. The only private sewers in Scotland are those connected to Private sewage treatment works. As a result of this difference, Scottish Water has a greater operating liability for the public sewerage system than English & Welsh Plc's. It is estimated that Scottish Water's sewerage network is 33% longer than it would be if the Law in Scotland matched that in England & Wales. This extra length is often the most problematic length.

Lateral sewers tend to be at minimum depth and are more susceptible to damage from other utility companies and traffic. Lateral sewers are more prone to blocking than normal sewers due to the smaller diameter (typically 100mm) and because there is little flow to flush any potential build up of rags away. This is particularly the case where a lateral serves only one household. Clearing such blockages can be extremely problematic, especially if no disconnecting manhole exists. Screening blockage calls at the call centre to ascertain whether or not the blockage is in the private drain or public lateral is also extremely difficult.

E7.0-7 Area data

E7.0 – Sourced from operational areas.

E7.1 - See line E6.1 for a detailed explanation for deriving Scottish Water's total connected population figures. A 93.37% average connection rate was applied for wastewater services.

The information provided in E7.1 correlates to that provided in A3.81.

E7.2 – The information provided in E7.2 correlates to that provided in A3.82.

E7.3 The figures reported in the 2001/02 separate and consolidated submissions can be seen in Table E7.3. These figures were derived using population figures (council tax valuation for former West, address point data for former East and GIS connected population for former North) which were then multiplied by water usage and storm flow factors. The confidence grades were correct but the accuracy bands were optimistic and should have been C4.

For this return, the volume of sewage collected has been calculated from sewer flow per address point with the addition of a storm flows factor. The figure for the average dry weather flow has been derived by using measured flow data from a sample catchment (measured flows are established for a number of periods of dry weather using permanent rainguage installations). The number of connected address points is calculated and from this, the average dry weather flow per connected address point is established (this figure includes infiltration flows, industrial flows and domestic flows). This average flow per address point is applied across all connected address points to establish an average dry weather flow per

Operational Area. A storm flow factor of 1.4 is then applied to each Operational Area flow figure to provide the total volume collected.

This represents a 57% increase on last year's return. This is due to a more accurate and consistent population figure and using a measured DWF figure instead of Water usage. This indicates that the sewerage systems are collecting and passing a far greater flow forward to the WwTW than previously reported.

E7.4 - See line E6.2 for a detailed explanation for deriving Scottish Water's total connected property figures.

E7.5 The 2001/02 returns were produced using the 3 predecessor authority GIS systems.

For the 2002/03 return, the area of the sewerage district has been derived using MapInfo to calculate the size of each Operational Area. This figure represents the total land area of Scotland. The figure has increased by 0.9% from last year as the GIS coverage is more accurate and corrects any previous small errors. This of course means that the geographical area of Scotland is larger than previously reported. The CG has improved from B2 (on the consolidated submission) to A1.

E7.6 The 2001/02 returns were produced using the 3 predecessor authority GIS systems.

For the 2002/03 return, the drained area has been calculated by summing all of the sewered area boundary areas within each Operational Area. This method does not include all areas 50m outwith every existing sewer due to the complexity of setting up these 50m boundaries across Scotland. The figure has decreased by 15.6% from last year as the GIS coverage is more accurate and corrects any previous errors. The exclusion of the 50m boundary around each area does not make a significant difference to this figure (this was not included in the ESW figure from last year either). The CG has improved as this was produced using the corporate GIS. This indicates that the area to be drained has decreased but is dispersed over a larger area (from E7.5 and E7.6).

E7.7 - This data has been abstracted from the monthly Hydrological Summary for United Kingdom (April 2002 – March 2003) and adjusted to produce annual totals for the four Scottish Water Operational Areas. The Hydrological Summary is prepared by the Centre for Ecology and Hydrology and the British Geological Survey and is based on rain gauge data provided by the Met. Office.

E7.8-14 Sewerage data

E7.8 The 2001/02 returns were produced using the 3 predecessor authority GIS systems.

For the 2002/03 return, the figures were produced from Smallworld GIS as previously indicated. The figure has increased from last year as the non-critical sewer element related to lateral sewers has increased, the GIS records have improved and Capital Projects have been undertaken which have also increased the figures. This has increased the length of sewer to be maintained, although construction projects may in future increase this length again.

E7.10 The 2001/02 returns were produced using the 3 predecessor authority GIS systems.

For the 2002/03 return, the figures have been produced from Smallworld GIS as previously indicated. The figure has decreased from last year as the GIS records have improved and capital projects have reduced the amount of combined sewers but have also increased the foul only sewers length. This has reduced the length of sewer to be maintained, although construction projects may in future increase this length again. The confidence grade on the combined submission has remained at B3.

E7.11 The 2001/02 returns were produced using the 3 predecessor authority GIS systems as per Table E7.11.

For the 2002/03 return, the figures were produced from Smallworld GIS as previously indicated (see Table E7.11 below for figures). The figure has decreased from last year as the GIS records have improved. This has reduced the length of sewer to be maintained. The confidence grade on the combined submission has remained at B3.

E7.12 The 2001/02 returns were produced using the 3 predecessor authority GIS systems as per Table E7.12.

For the 2002/03 return, the figures were produced from Smallworld GIS as previously indicated (see Table E7.12 below for figures). The figure has decreased from last year as the GIS records have improved and Capital Projects have been undertaken. This has reduced the length of sewer to be maintained, although construction projects may in future increase this length again. The confidence grade on the combined submission has remained at B3.

E7.13 The 2001/02 returns were produced using the 3 predecessor authority GIS systems as per Table E7.13.

For the 2002/03 return, the figures were produced from Smallworld GIS as previously indicated (see Table E7.13 below for figures). The figure has increased from last year as the GIS records have improved and Capital Projects have been undertaken. This has increased the length of sewer to be maintained. This may change in future as construction projects are undertaken. The confidence grade on the combined submission has improved from C3 to B3.

E7.14 For the 2001/02 return as per Table E7.14 below. The former West and North areas returned figures from a limited dataset and the former East area returned a figure of 0.

The figures for 2002/03 have been produced using the predecessor authority datasets (EMPAC, MIMMS and Phoenix). A query has been run equating “replacement” with collapse supplemented further by information obtained from Networks Operations. See Table E7.14.

The number of recorded collapses has increased due to better information being available. It is believed that these figures are still are most likely under reported, as collapses are currently not recorded consistently in the corporate system. The robust and consistent recording of collapses is therefore a future improvement requirement for the Scottish Water corporate system/processes. A Confidence Grade (CG) of C4 has been allocated to this line which is an improvement on the 2001/02 combined submission. The figures in Table E7.14 are believed to be a more representative picture of the true condition of Scottish Water’s network assets. It would appear that, as a greater number of collapses are indicated, the sewer system is in poorer condition than previously reported and is more likely to collapse.

E7.15-23 Pumping stations

E7.15 The 2001/02 returns were produced using the 3 predecessor authority asset viewer systems, registers and databases as per Table E7.11.

For the 2002/03 return, the data was assessed form Scottish Water’s WAMS Database, which has been derived from the predecessor authority Asset Viewer systems. Asset Viewer does not currently record separately combined pumping stations – an assumption has been made that all non-stormwater stations are combined or foul. The data includes all operating pumping stations, which are on public sewer network, and has been separated into the four operational areas by area tag field. The figures have increased due to construction of new assets and a more complete dataset contained in the corporate system (WAMS).

E7.16 The 2001/02 returns were produced using the 2 legacy asset viewer systems, registers and databases.

For the 2002/03 return capacities have been calculated based on an extrapolation of the 2001/02 station figures. This represents an increase that is due to the increased number of stations.

E7.17 The figures in the former West were produced using the Asset Viewer system for the 2000/01 return, which were brought forward into the 2001/02 submission. The figures for the North were calculated from the annual volumes collected. There was an error on the 2001/02 consolidated submission where the totals from the 3 separate submissions were added instead of averaged.

For the 2002/03 return, the pumping head/capacity rows use last year's data. The Average Pumping Head produced using last year's return figures has been averaged across the 2 areas. This represents a reduction on last year's figure as this corrects the error on the 2001/02 consolidated submission.

E7.18 The 2001/02 returns were produced using the 3 predecessor authority asset viewer systems, registers and databases. The figures were not completely accurate as the GIS systems does not differentiate between foul and combined stations and some assumptions were made. The CG for last year was B3 and this is likely to be overestimated with C4 returned on the combined submission.

For the 2002/03 return, the data has been assessed from Scottish Water's WAMS database/SIIOP/DAP Studies. WAMS does not differentiate between foul and combined stations and the figures have been calculated based from an allocation of the 2001/02 combined station figures extrapolated to this year's datasets. The figures have increased due to construction of new assets and a more complete dataset contained in the corporate system (WAMS).

E7.19 The 2001/02 returns were produced using the 2 predecessor authority asset viewer systems, registers and databases for the former North and West.

For the 2002/03 return, capacities have been calculated using an average capacity from the 2001/02 submission for each area multiplied by the 2002/03 submission total number of combined stations. This represents an increase that is due to the increased number of stations.

E7.20 The 2001/02 returns were produced using the 3 predecessor authority asset viewer systems, registers and databases. The figures were not completely accurate, as the GIS systems did not always include Scottish Water Pumping Stations. The CG's for last year are therefore likely to be overestimated and should have been C4 on the consolidated submission.

For the 2002/03 return, the data has been assessed from Scottish Water's WAMS database/SIIOP/DAP Studies. WAMS system does not flag Stormwater PS separately and the figures have been calculated based on the 2001/02 combined station figures allocated to the new areas. The total has remained the same as last year but the Confidence Grade of C4 is an improvement on the corrected CG from the 2001/02 submission.

E7.21 The 2001/02 returns were produced using the 2 legacy asset viewer systems, registers and databases for the North and West. The East returned a 0 which was not used for the combined submission. The CG's for last year are likely to have been overestimated and should have been C5 on the combined submission.

For the 2002/03 return, capacities are not available from the WAMS system as it does not contain a field for this information (as per E7.16). This is a future improvement requirement for the Scottish Water corporate system/processes. Capacities have been calculated using the capacity from the 2001/02 submission for each (see Table E7.16). The total is the same as last year and the Confidence Grade is C5 which is also equivalent to last year's corrected CG.

E7.22 The 2001/02 returned figures are contained in Table E7.22. The figures for North were produced via a desktop exercise from the NOSWA core database. The East figures were produced using the SIIOP Study outputs, CSO Outfall assessment datasets and GIS/SAPS databases (excluding EO's). The West figures were produced using GIS records and CSO outfall assessment datasets.

The 2002/03 return has been produced using a GIS query cross-referenced using the Scottish Water CSO database. The figure is more accurate than last year and has increased as per Table E7.22. The figures have increased due to construction of new assets and a more complete dataset and include the removal of EO's and WwTW CSO's from the figures returned. The final total is 3099 and the Confidence Grade is B4, which is poorer than last year's combined submission. The CG on the 2001/02 combined submission was overestimated (particularly as it included EO's and WwTW outfalls) and should have been B4. This years return is closer to B3 than last year's return. The implication of this rise in combined CSO's is that Scottish Water has more assets to operate and maintain than previously reported.

E7.23 The 2001/02 returned figures are contained in Table E7.22. The figures for North were produced via an estimated desk top exercise from the NOSWA core database as the exercise to add screens to the CSO dataset had not been undertaken at the time of submission. The East figures were produced using the SIIOP Study outputs and CSO Outfall assessment datasets. The West figures were produced using GIS records and CSO outfall assessments datasets. These figures included all types and size of screen.

For the 2002/03 return, the East the data is good and has been produced using SIIOP Studies and CSO surveys that indicate screened CSO's. In the West it is only known if a CSO has a screen from the DAS survey and this has been extrapolated to the whole record set. In the North there is no source data, so last years figure was taken plus 6 new screens installed this year from the uCSO database. The area split was taken to be the same as for the CSO's. From the database the split on the known CSO's with screens and the split on CSO's in general is in a similar ratio.

The total percentage of screened CSO's is now 18.9% (of all CSO's) which is also an improvement on last year's return which was 15.7%. The 3.2% increase would have been greater if were not for the increase in the total number of CSO's (see E7.22). The figures have changed due to CSO investment within the Q&SII period and a more complete datasets. The Confidence Grade is B4 which is an improvement on last year's combined submission CG of D6. The implication of this is that the number of CSO assets which are screened and are therefore at a smaller risk of causing pollution is greater (100 more than last year). However the number of assets has gone up, hence more CSO's are at risk of causing pollution (2487 unscreened in 2001/02, 2513 unscreened in 2002/03).

Table E8 Wastewater explanatory factors - sewage treatment works

General Comments

The asset list on which the information in this table is based is derived from the new corporate Scottish Water Asset Inventory (WAMS) system, which is a single register consolidated from the three inventories of the former Water Authorities. WAMS provides a framework structure for the single asset database that is currently being developed.

The list is based on those sites that were operational at the end of the reporting year, and includes both PFI and non-PFI sites. Where treatment works have been decommissioned and replaced during the year, only the new works have been reported, to avoid double counting the load.

Information relating to PE, size bandings, and wastewater treatment works loading has been sourced from legacy Authority systems, as updated with information from the corporate Laboratory Information Management System (LIMS). The LIMS system contains results from internal sampling work carried out at a proportion of Scottish Water's wastewater treatment assets. Although the E tables have been updated with information from LIMS where available, much of the base data was sourced from legacy Authority systems, which are now out of date. This information is subject to a data improvement project. Correspondingly, the loading figures (and related size banding allocations) contained in Table E8 are expected to rise, as improved information becomes available.

E8.1-10 Numbers

E8.1-8 The number of works in each Category has been determined from information held on the Asset Inventory (WAMS). The size bandings have been determined from the loads received at the works, based on information contained in existing legacy systems updated with information contained in the Laboratory Information Management System (LIMS). These numbers have not been corrected for non-resident population, as this is not known on a works-by-works basis and is in any case an insignificant proportion of the total.

The total number of treatment works has increased by 29, from 1867 to 1896: (however it should be noted that last year there was a discrepancy of 28 between Table A and Table E, and the increase over the Table A figure is only one). The main increase (42 no.) is in the number of primary works, and this has come about through checking of the information held in the asset register. Approximately 10 tertiary treatment works have been reclassified as secondary, again through checking of information held on the asset register.

The number of outfalls has decreased from 819 to 229. (In Table A4 the number of outfalls reported last year was 319). The main reason for the decrease is that the list from the former West area previously included a large number of outfalls that carried either treated or intermittent discharges (Table E is concerned only with untreated continuous discharges). This accounts for about 470 of the reduction. The list from the former North area has been reduced by about 100, mainly through the construction of new treatment works and interceptor sewers.

A confidence grade of C5 has been placed against the numbers of sea outfalls, as the list is still tentative and will be subject to further checking and revision. In the case of most of the sea outfalls in the former West area, it is not known whether the outfalls are screened or unscreened, and the numbers have been split evenly between these two categories, as have the loads in Lines E811 to E8.18. Further work will be carried out to improve the data on outfalls held in the Asset Inventory (WAMS).

E8.9, E8.10 The ammonia consent conditions are known and have been attached to the appropriate treatment works as held in the Asset Inventory, thus enabling them to be categorised as shown here.

The number works with a consent between 5 and 10 mg/l has decreased by 8, while the number with a consent of less than 5 mg/l has increased by 15. This is a reflection of a general tightening of consent standards.

E8.11-20 Loading (average daily load)

E8.11-18 As noted under the determination of size bandings above, the information on loadings received at works is based on information contained in existing legacy systems updated with information contained in the Laboratory Information Management System (LIMS).

The total load (including septic tanks) has decreased from 459,000 kg BOD/day to 409,000 kg BOD/day. However, this is believed to be due to discrepancies in last year's reporting. This is explained more fully in the footnote to the commentary on these lines.

The most significant changes that have occurred are a result of the progress made by Scottish Water in upgrading Primary and Preliminary works to Secondary, particularly in Size band 6. Some differences are due to the removal of discrepancies found in last year's submission which are discussed in the footnote

Footnote to E8.11-E8.18 Last year the total load given in E8.18 was equivalent to 167,700 tonnes BOD/annum compared with 148,900 tonnes BOD/annum in Line A4.34. This year, the figure in A4.34, that is 151,360 tonnes BOD/annum, has been taken from E8.18, and this is believed to be more accurate than the figure given in E8.18 last year

The principal difference between the two years is found mainly in the Size Band 6 works in the former West Area. In last year's submission for that Area, Table E8 exceeded Table E9 by 10,000 tonnes BOD/annum, and E8 contained 3 Secondary Treatment works not listed in E9. These were probably the new PFI works, Meadowhead, Stevenston and Inverclyde which came into service during the year, but since these discharges already appeared as preliminary treatment in E8 last year, the discrepancy appears to represent a double count. In E9 itself there was a clear double count, representing a load of 10,000 tonnes BOD/annum, because Dalmuir Primary and Dalmuir PFI were listed separately, and this appears to have been replicated in E8. The combination of these discrepancies matches the difference in load between the two years.

E8.19, E8.20 The figures reported here have been determined from the loadings on the held in LIMS for those works subject to ammonia consent standards specified. The changes in total loading for each consent category reflect the changes in numbers of consents noted under E8.9/E8.10 above.

E8.21-30 Compliance

E8.21-E8.28 Percentage compliance has been calculated on the basis of SEPA results using the methodology specified in the Guidance Notes. In the case of two-tier consents, only upper tier failures have been counted. Works that are not sampled are not included in the averaging process for individual treatment categories and size bands.

The percentage compliance figures have all improved. The most significant category increase is Secondary Biological which has increased from 94.4% to 99.3%.

The lowest figure for any group is now 98.2% compared with 94.4% last year. Some of the change may be the result of differences in the way the information has been collated, but overall the results indicate a general raising of standards through a combination of investment to upgrade works and improved operational practices.

E8.29, E8.30 The compliance figures for works with ammonia consent conditions reflect the general improvement in standards noted above.

Also, in general, compliance at these works is higher than the overall compliance figures, and the figure for works with the tighter standard is 100%. The exception is the 5-10 mg/l standard at secondary activated sludge works: this figure has been lowered by a poor compliance figure at Underwood (Cumnock) WWTW.

E8.31-42 Costs

The total sewage treatment costs from E2b have been allocated to size bands and treatment categories using data provided by asset operations. Confidence grades have been lowered due to the levels of extrapolation required to extract sludge treatment costs.

Table E9 Large sewage treatment works information database

E9.0 There are 37 large works compared with 39 last year. Added to the list as part of the Scottish Water programme of upgrading treatment standards are the following new works:
Kinneil Kerse
Buckie – new asset commissioned in August 2002.
Lossiemouth – new asset commissioned in August 2002.
Inverclyde – Flow from Greenock transferred to Inverclyde in March 2002.

Those removed are:
St Andrews (at 25000p.e. strictly in Size Band 5 not 6)
Montrose (loss of major trade effluent contribution: now Band 5)
Dalmuir Primary (double count with Dalmuir PFI)

The following works also are no longer listed in E9 because the load is treated elsewhere:
Deerdykes (Load now transferred to Dalmuir)
Castlegreen (Load now transferred to Ardoch)
Greenock (Load now transferred to Inverclyde)

E9.1-5 Works size

E9.1 Where necessary, revised figures for resident population have been used, but in general last year's data has been used. The former East authority extracted their data from SAPS (Sewerage Asset Planning System). Catchment boundaries were defined within SAPS for each works. Last year West's data was based on GIS info and North's data was based on customer property data at December 2001, with occupancy factors from Scottish Executive.

E9.2 The non-resident population has been estimated from the data used to calculate the summer population in line A3.82, which is available on a regional basis. Annual average figures have been obtained by assuming that the non-resident load applies for 4 months of the year, in accordance with the OFWAT definition. Figures for individual works have been estimated pro rata from the regional figures.

The substantial reductions compared to last year's data are a result of rebasing the estimates to correspond with line A3.82. The overall non-resident population figure has in fact increased since last year by 92,000 to 214,000[4]. However, the figures quoted in E9 last year were not related to the data used in Table A3. The low confidence grade reflects the global nature of the estimates, which have not been verified against measured data.

E9.3 COD is a gross figure, calculated from the settled COD, on the basis that COD_{gross} = 1.5 x $COD_{settled}$. It is the COD load entering the WWTW.

Loads are based on available analytical data and flows. Changes in comparison to last year are a result of more consistent sampling.

E9.4 - This is the amount of sludge received from other sources including waterworks and septic tank sludges. Calculation of daily load was from yearly totals/365 and using 30,000

[4] Rounded figure

kg/COD/m3 for septage and 48,000 kg/COD/m3 for water works sludge. The annual quantities were derived from the Gemini Sludge Management System

E9.5 The population equivalent has been assessed from the load received on the basis of 60g BOD/head/day.

The loading information has been updated where necessary, but in general last year's data has been used. The loading is not directly assessed from trade effluent loads, and so changes in trade effluent are not necessarily reflected in the total load figures.
The figures for Dalmuir and Ardoch have been updated to include the loads from Deerdykes and Castlegreen respectively.

E9.6-10 Treatability

E9.6-10 These are the averages for each parameter for the report year. The results are from Scottish Water's own sampling programme and the information is retrieved from the LIMS system.

Influent samples are not normally analysed for Total Organic Carbon (TOC), and this has been indicated by applying a confidence grade N. At a number of PFI works, influent samples are not analysed for ammoniacal nitrogen as this is not included in the tariff structure.

E9.11-16 Compliance

E9.11-16 Figures are the lower consent values taken directly from the discharge consent document as issued by SEPA. Where a parameter is not included in the discharge consent, this is indicated by a confidence grading of N.

Comparison with last year shows that there has been a tightening of the BOD consent standard at 10 of the 37 works, and this a reflection of the general pattern of more onerous consents being placed on Scottish Water.

The percentage compliance has been calculated on the same basis as the figures in Lines E8.21 –E8.30: that is, SEPA compliance data using the number of sanitary determinands (BOD, SS and Ammonia) analysed for and counting gross (upper tier) failures only.

Generally, compliance results are much higher than last year (see note on E8.21-E8.30). The result for Meadowhead is up from 43% to 100%, and the lowest is now Dalmuir at 85%, which was reported as 0 last year.

E9.17-18 Flow

E9.17, E9.18 The record of flows is held in LIMS, and this has been updated where known. Some variations from last year's figures have been noted, but there are no significant changes.

E9.19-25 Treatment works category

E9.19-25 The information is held in the Asset Inventory (WAMS). As a result of capital investment to upgrade treatment standards, there has been an increase in the number of secondary and tertiary treatment works. There are no longer any large works with preliminary or primary treatment only. The numbers of works in each category for the two years is as follows:

	2001-02	2002-03
Primary/Preliminary	6	0

Secondary	25	30
Tertiary	8	7

E9.26-32 miscellaneous data

E9.26 Positions of works have been taken from GIS and the straight-line distance to the nearest works measured from this.

E9.27 Outfall information is held on the Asset Inventory (WAMS). Any outfall discharging to tidal waters has been deemed to be a sea outfall.

E9.28 The presence or otherwise of a terminal pumping station is recorded in the Asset Inventory.

E9.33-42 Works cost

Where there is a one to one relationship between an asset and a cost centre, the costs reported in E9 have been derived from cost data, which is directly captured with an allocation of general and support costs. Where this is not the case i.e. where more than one asset is included within one cost centre, the total costs directly captured have been allocated to the individual assets based on the design capacity of each asset. Confidence grades have been lowered to reflect the levels of allocation that were required. For 2003/04 there is a one to one mapping relationship for each asset, which will allow more direct cost, capture and improve the quality of information reported.

E9.28 and E9.42 - Terminal pumping stations are the last pumping station within the works boundary before the waste water treatment works. An estimate of the terminal pumping station costs is made in line *E9.42.* In the absence of direct costing*,* these costs have been calculated as a percentage of the total power costs in line E9.34.

Confidence grades for E9 have been lowered due to the levels of extrapolation required to extract sludge treatment costs.

Table E10 Wastewater explanatory factors - sludge treatment and disposal

E10.1-2 Sludge volumes

E10.1 Population figures are not held on a works-by-works basis so the resident population from line A3.83 has been used and allocated to disposal categories in the same proportion as the sludge loads in Line E10.2. The slightly lower confidence grade reflects the approximation inherent in this estimate.

E10.2 – This information was based on information from several sources:

- The three authorities Gemini Sludge Management data base of sludge movements
- Scottish Water Sludge Model
- Paper records maintained at the treatment centres
- Data bases maintained by a recycling company of the sludge taken to agricultural land.

All figures were based on tds, which was derived from the wet weight information held on these data bases and sludge solids analysis carried out both on site and in the laboratory.

The accuracy of the data shall improved as Scottish Water are currently upgrading the Sludge management System to Gemini II incorporating the three previous authorities sludge management system data and improving data capture. Data on dry solid content should also

improvement through investment in data loggers which measure actual sludge quantity and solid content.

E10.3-11 Sludge treatment and disposal costs

The total sludge treatment costs from E2b have been allocated to size bands and disposal categories using data provided by asset operations. Confidence grades have been lowered due to the levels of extrapolation required to (a) extract sludge treatment costs and (b) to allocate costs to disposal categories. These reporting issues are being addressed for 2003/04.

E10.12-18 Sludge treatment type

E10.12-18 – This year's figures include new sludge treatment facilities becoming available at Lossiemouth, Kinniel Kerse and Daldowie.

Table E11 Employee numbers

This information is consistent with that provided in the Statutory Accounts.

F Tables Statutory Accounts

General comments

The F tables for 2002/03 have been prepared from the Statutory Accounts in accordance with WIC definitions. The 2001/02 figures have been compiled from the consolidated Annual Return submitted in July 2002. Comparison with last year's results on a line by line basis could be misleading due to the various interpretations of definitions applied in last year's returns by the three previous authorities. Consequently, the commentary below compares actual performance against budget for this, the first year of Scottish Water.

With the exception of accruals for potential contractual claims with regard to PFI schemes, there are no atypical costs included in the return for 2002/03.

Table F1 Income and Expenditure Account

F1.1 Total income includes all core and non-core income. See F10 comments for further details.

F1.2 Employment costs have reduced by £10.7 or 6.6% from 2001/02.

In total, staff costs for the year were £1.8m lower than budget at £150.9m, although there were some significant variances within component elements. The main variances are summarised below: -

	Actual £m	Budget £m	Variance Year £m
Basic staff costs	126.4	133.3	6.9
Overtime/call out payments	14.0	12.7	-1.3
Agency staff	5.5	3.9	-1.6
Bonus	4.3	2.2	-2.1
Other allowances	0.7	0.6	-0.1
Total staff costs	**150.9**	**152.7**	**1.8**

The headcount at 31 March was 4,927 Full Time Equivalents (FTE) including temporary staff, which compares to an opening position for the year of 5,196. This 269 headcount reduction, resulted in a net saving in basic staff costs for the year of £6.9m. However, this was offset by overspends on overtime, call out payments, agency staff and an adjustment of £2.1m to reflect the unbudgeted liability for employee bonus payments.

While the 31 March 2003 headcount was 4927, the opening headcount on 1 April had reduced to 4592 because 335 staff left Scottish Water at the year end, giving an overall reduction of 604 from the start of the year.

F1.3 PFI costs increased by £67.3m from 2001/02. Four new schemes were commissioned during the year (Daldowie, MSI, Levenmouth and Moray) and the Aberdeen, Tay and Dalmuir projects which were commissioned part way through 2001/02, had a full year impact on operating costs in 2002/03.

PFI costs were £1.5m lower than budget for the year. The major savings against budget resulted from the later than scheduled commissioning of the Daldowie project, lower than budgeted charges at Seafield and the conclusion of a long running dispute in favour of Scottish Water on the Inverness / Fort William project. Further savings were also made on the Levenmouth project, primarily due to lower than anticipated business rates and the later than scheduled commissioning of the project.

These savings were partially offset by cost overruns on the Tay & Aberdeen projects, which have just completed their first year of operations. Base flow levels at both these projects have been higher than expected, compounded by higher than average rainfall during the year. Contractual claims were settled in the Tay project (£0.67m) at around 15% of the value of the claim originally lodged.

Expenditure by project is analysed below: -

	Actual £m	Budget £m	Variance YTD £m
Dalmuir	7.5	8.0	0.5
Daldowie	11.2	16.0	4.8
Meadowhead, Stevenston, Inverclyde	8.6	9.0	0.4
Inverness and Fort William	7.1	8.0	0.9
Tay	20.1	17.0	-3.1
Aberdeen	20.1	13.0	-7.1
Moray	6.1	6.0	-0.1
Almond Valley/Seafield	20.1	23.0	2.9
Levenmouth	2.8	3.0	0.2
Other costs	1.8	3.9	2.1
Total costs	**105.4**	**106.9**	**1.5**

F1.4 Other operating costs reduced by £11.3m, 5.8% from 2001/02 due to efficiency improvements.

Other operating costs in the year were £0.4m below budget, even after recognising costs associated with additional unbudgeted 'other income'. Variances from budget are detailed below:-

	Actual £m	Budget £m	Variance YTD £m
Training	2.1	3.9	1.8
Travel and Expenses	6.7	6.2	-0.5
Supplies and Services	14.7	14.6	-0.1
Repairs and Maintenance	27.5	25.5	-2.0
Chemicals and Materials	13.2	15.2	2.0
Power	17.8	17.5	-0.3
Transport	19.7	17.9	-1.8
Property	34.4	34.3	-0.1
Insurance	7.9	8.2	0.3
Administration	26.3	27.6	1.3
Telecoms and IT	12.9	12.7	-0.2
Total other operating costs	**183.2**	**183.6**	**0.4**

Training – The training budget was underspent by £1.8m with 'business as usual' corporate training reduced during the transition phase.

Travel and Expenses - Business mileage and excess mileage costs were both ahead of budget, with the increased volume of travel resulting in a £0.5m overspend.

Supplies and Services - Sludge removal costs were £0.5m under budget as a result of operational efficiencies and a reduction in the price per tonne. This was offset by a £0.5m overspend on small tools and safety equipment with spend incurred to kit out multi-functional teams to work on both water and sewer networks.

Repairs and Maintenance -

	Variance £m
Sewer jetting and maintenance	-1.0
External contractor costs	-1.3
Service reservoir costs	0.9
Costs arising from health & safety audit	-0.3
Other	-0.3
	-2.0

Payments to external contractors for sewer jetting and maintenance were £1.0m over budget in the South West area. The process for letting work to external contractors has been reviewed and a change has been made to centralise the process, which should help to control costs in the future.

External contractor costs were £1.3m over budget, partly as a result of staff reductions but also due to the increased volume of internal and external work undertaken by Contract Services. This additional spend was partly offset by an increase in external income.

Savings to budget in service reservoir repairs of £0.9m in the South East area.

£0.3m of unbudgeted costs were incurred in the first six months following the outcome of a health and safety audit.

Chemicals and Materials - Costs incurred on chemicals were under budget by £2.0m as a result of improved dosing regimes and reduced contract rates.

Power - Power costs were £0.3m over budget. A detailed review of costs by site is currently being carried out with Scottish Power.

Transport -

	Variance £m
External hire of plant and vehicles	-1.6
Vehicle repairs and maintenance	-0.6
Roads and highway equipment	-0.3
Vehicle running costs	0.6
Other	0.1
	-1.8

External hire costs for vehicles and plant were £1.6m over budget in the year. £1.1m of this overspend was as a result of the increased level of activity in Contract Services, which was partially offset by increased external revenue. A further £0.2m of the overspend was due to the external hire of large pumps in the North West area.

Vehicle repairs and maintenance costs were £0.6m higher than budget, as a result of higher than budgeted contract rates with Lex Transfleet. The contract is currently being re-negotiated.

Costs incurred on roads and highway equipment were over budget by £0.3m, due to increased activity in Contract Services. These overspends of £2.5m were partially offset by

£0.6m of savings on vehicle running costs, £0.3m of which resulted from the new fuel contract signed with BP.

Administration - Savings of £2.3m on consultancy fees were partially offset by overspends in the following areas: -

- In the former West area, the costs incurred in collecting household income from local authorities were previously netted off against the associated income. This treatment was changed with effect from 1 April 2002, with costs now being directly allocated to overheads. As the budget was prepared using the previous treatment, it resulted in a £0.5m adverse variance, but this is offset by an equal and opposite favourable variance in income variance, but this is offset by an equal and opposite favourable variance in income.

- £0.3m for costs incurred following the August cryptosporidium incident in Glasgow.

Telecoms and IT – Telephony costs were £0.5m higher than budget, this was partially offset by savings of £0.3m on IT related costs.

F1.5 The bad debt charge for the year increased by £3.5m from 2001/02. The policy for bad debt provisioning was reviewed and harmonised across Scottish Water. The non domestic element of the charge was calculated as a percentage of aged debt, with all debt greater than a year old being full provided. The domestic bad debt charge was calculated as a percentage of turnover, based on local authority collection rates.

F1.7 Own work capitalised is in line with 2001/02 in nominal terms, although the percentage of salary costs capitalised remains low compared to the English and Welsh PLC's.

F1.9 Total nominal operating costs excluding PFI reduced by £19.3m, 5.8% (approx. £30m in real terms) from 2001/02 due to efficiency savings.

F1.12 During the year, the former authorities asset registers were consolidated and asset lives were harmonised. This generated a cumulative catch up depreciation charge of £30.1m, which was charged to opening reserves. The annualised depreciation charge increased to £105m. A further £1.2m of depreciation was incurred on PFI assets

F1.13 The long term normative infrastructure maintenance charge was calculated, with the assistance of independent engineers as part of the development of the Scottish Water long-term asset maintenance plan. Although there was considerable range in the potential charge that could have been applied, the £140m charge was considered prudent and reflective of the long-term investment required to maintain the network in steady state.

F1.20 The tax charge reflects the deferred tax charge for the year, consequently no corporation tax is payable.

F1.22 Exceptional costs charged total £24.6m and relate to restructuring and transformation costs undertaken as part of the £200m Spend to Save programme. These exceptional costs incurred during the year include staff severance costs of £9.3m and £15.3m of other costs, predominantly IT related, associated with the fundamental restructuring and transformation of the business.

WIC Control Checks

F1.9-F1.3 = E1.26+E2.26

Operating costs per F tables		Operating costs per E tables	
Total costs F1.9	436,204	Total water costs E1.26	192,258
Less PFI costs per Statutory Accounts F1.3	-105,396	Total waste water costs E2.26	204,739
Less additional costs apportioned to PFI in Regulatory Accounts	-1,095		396,997
	329,713		
Add exceptional costs F1.22	24,641		
Add PFI estimated running costs E2.4	35,401		
Add PFI operating costs incurred within SW included in E2.26	7,239		
	396,997		

F1.3 = E1.37+E2.37

PFI operating costs per F tables		PFI annual charge per E tables	
Total costs per Statutory Accounts F1.3	105,396	Total costs per E2.37	99,252
Additional costs apportioned to PFI in Regulatory Accounts	1,095	Add PFI operating costs incurred within SW included in E2.26	7,239
	106,491		106,491

F1.9 –E1.38 –E1.37 = E1.39+E2.39 (disagree)

Total operating costs per F tables		Total operating costs per E tables	
Total costs per F1.9	436,204	Total costs per E1.39	343,510
Asset depreciation F1.12	106,253	Total costs per E2.39	363,589
Infrastructure depreciation F1.13	140,000		
Exceptional items F1.22	24.641		707,099
	707,099		

Table F2 Balance Sheet

The opening balances inherited from the three previous water authorities have been restated to reflect the harmonisation of accounting practice across Scottish Water, see attached schedule for details.

F2.20 This balance represents all reserves, not just the Income and Expenditure Reserve. The Income and Expenditure Reserve is £34.9m.

Table F3 Analysis of Borrowing

F3 and F3a Analysis of Borrowings

The analysis of borrowings for 2001/02 has been restated on a consistent basis for Scottish Water.

F3a 1-12 Opening Balance

This is effectively the balancing figure and reflects the closing analysis of debt at 2001/02 updated to recognise the fact that the repayment profile of the debt has now moved on by a year.

F3a-24 New Debt in the Year

This reflects the profile of net new borrowings in the year.

F3a 25-36 Closing Balance

This is consistent with the analysis of closing debt provided in the Statutory Accounts.

Table F4 Analysis of Debtors and Creditors

The 2001/02 balances have been restated to reflect the harmonisation of accounting practice across Scottish Water, see attached schedule for details.

F4.8 and F4.9 The creditors ledgers report total purchases and trade creditors by supplier, but they do not differentiate between capital and revenue expenditure. A degree of judgement has therefore been used to split creditors between trade and capital in this table..

F4.15 to F4.20 The billing systems report trade debt by customer and by age of debt, this is used as the basis for the Scottish Water policy on bad debt provisioning. They do not however report debt by type of service, we have therefore used extrapolation to populate F4.15 to F4.20. For lines F4.15 to F4.16, the total domestic provision has been pro rated between categories in proportion to income. Likewise lines L4.17 to L4.20 have been populated by pro rating the non domestic provision in proportion to income..

Table F5 Cash Flow Parameters

F5.1 Figure calculated by adding trade debtors (F4.2) plus bad debt provision (F10.61) divided by turnover (F1.1) times 365 days. The 2001/02 figure has been restated recognising the restated trade debtors balance.

F5.2 and F5.4 The creditors ledgers report total purchases and trade creditors by supplier, but they do not differentiate between capital and revenue expenditure. A degree of judgement has therefore been used to split creditors between trade and capital in this table.

Table F6 Working Capital

Details of material variances are as follows

F6.3 Other debtors - £14m due to a reduction in outstanding VAT debtor at 31/0/03

F6.9 Accruals +£30m. This includes £15m increase in PFI accruals and £11m income uncertainty accrual associated with meter rightsizing and the ongoing data cleansing projects.

F6.12 Prepayments + £8m. £10m increase in the unbilled income accrual income. The unbilled accruals at 31/03/02 were understated by c£12m predominantly in the West. This was highlighted by the WIC 22 process, which calculates unbilled income at customer level.

Table F7 Cash Flow Statement

This has been prepared on a cash basis and is consistent with the Statutory Accounts.

Table F8 Reconciliation of Operating Surplus (Deficit) to Net Cash Flow from Operating Activities

F8 has been prepared on a cash basis consistent with Statutory Accounts. Refer to earlier comments on movement in balances year on year.

Table F9 Analysis of fixed assets by asset type (for report year)

The classification of inherited assets between categories was harmonised during the year, resulting in the opening costs and accumulated depreciation being restated across the categories of asset. In addition, the opening accumulated depreciation at 1 April 2002 was restated to reflect the harmonisation of asset lives. This resulted in a cumulative catch-up depreciation charge of £30.1m, the impact of which was charged to opening reserves.

Table F10 Analysis of income

The approach taken to extracting this data has changed from that taken in 2001/02, for two main reasons.

- The existence of the WIC22 report which has been used to analyse income to a level that was not previously possible.
- The formation of Scottish Water as a single entity which has allowed a single and consistent approach to gathering information.

Both of these factors contribute to the information being more accurate and allocated to the lines in the Annual Return on a consistent basis for SW.

Total income for 2002/03 includes £20.8m of non-core income.

F10.1-16 Water

F10.1 & F10.17 Domestic unmeasured income has risen in line with expectations and reflects the increase in tariff to harmonise charges in the former East and West areas combined with a slight increase in customer base.

F10.2 & F10.3 These figures are provided directly from the 3 billing systems and as such their accuracy is reliant on the completeness of flags being placed on customers. Data cleansing work over the year will have improved the level of accuracy on these lines.

F10.5 to F10.8 Non-domestic measured water volume income is in line with the SOC and reflects an increase in tariff. Whilst the income total is extremely robust as it is generated from WIC22, the split between bandings of consumption is done by extrapolation using a series of detailed reports from the billing systems. This detailed analysis of consumption suggests that the split now applied is more accurate than that used in 2001/02.

F10.11 Non-domestic measured fixed water income is £3.2m higher than the SOC, due mainly to a favourable mix of meter sizes (£2.7m) and a favourable price variance (£0.5m).

F10.12 Non-domestic unmeasured water income is £1.7m higher than the SOC due primarily to the higher theoretical conversion rates used in the East (SOC assumed 40m3/£1000 RV, actual rate used was 90m3/£1000 RV).

F10.17-34 Wastewater

F10.18 to F10.20 – as for **F10.2 & F10.3** above.

F10.23 Non-domestic measured fixed wastewater income is £2m lower than the SOC reflecting an adverse mix of meter sizes compared to that anticipated, combined with lower volumes.

F10.24 Non-domestic measured volume wastewater income is £0.7m lower than the SOC reflecting an adverse price variance of £1.2m on Deals customers, partially offset by increased volumes.

F10.25 Non-domestic measured surface water drainage income is £3.8m higher than the SOC due to higher than anticipated Rateable Value.

F10.26 Non-domestic measured highway drainage income is now included in line **F10.25** in 2002/03 to ensure consistency of reporting across SW and to reflect the current tariff structure. This information was previously reported for the West area only.

F10.28 Non-domestic unmeasured wastewater income is in line with the SOC.

F10.30 Non-domestic surface water drainage now included in line **F10.25** in 2002/03 to ensure consistency of reporting across SW. This information was previously reported for the North area only.

F10.33 Trade Effluent income is £2m higher than the SOC due to the unbilled accrual at 2001/02 being understated by £2m

In future years, we will produce more detailed income variance analysis as both the Scheme of Charges income budget and actual income will be reported from WIC22.

F10.55 – F10.61 For domestic debt, the Bad Debt Provision (BDP) for the current year was calculated as follows:-

	% of Turnover	£m
West	7.85%	18.4
East	4.20%	7.1
North	3.15%	4.3
		29.8

The percentages reflect the anticipated collection performance of Local Authorities for debt billed during the year 2002/03. Please note that 90.6% collection rate referred to reflects collection debt in the current year only. It does not take account of cash collected for the current years bills in future years.

For non-domestic debt, the level of BDP required on the total debt outstanding at 31/03/03 was reviewed and harmonised across Scottish Water. The figures provided for 57 to F10.61 represent the total amount that the BDP at 01/04/02 had to be topped up by, to provide the required level of provision.

To calculate the provision required, the outstanding debt at 31/03/03 was aged by financial year. We provided for 100% of all debt > 1 year old (A) and 50% of all debt >4 months but < 1 year old (B).

Opening BDP at 01/04/02	£25.802m
Plus top up to provision required in year	£7.119m
Total provision required at 31/03/03	£32.921m

Opening SW Balance sheet as at 31 March 2002

£'000

	West	East	North	Total
Tangible Assets	1,012,791	713,050	619,780	2,345,621
Investments	50	16	12	78
	1,012,841	**713,066**	**619,792**	**2,345,699**
Stocks	842	1,733	1,321	3,896
Debtors	79,354	74,410	48,618	202,382
Cash	8	5,554	2,607	8,169
Creditors due within one year	-72,219	-72,768	-52,066	-197,053
Net current assets	**7,985**	**8,929**	**480**	**17,394**
Total Assets Less current liabilities	**1,020,826**	**721,995**	**620,272**	**2,363,093**
Creditors > 1 year		**-40,419**		**-40,419**
Deferred Tax	-23,446		-684	-24,130
Provisions	-2,526	-24,075	-8,202	-34,803
	-39,209		-24,041	-63,250
Net assets	**955,645**	**657,501**	**587,345**	**2,200,491**
Government and other loans	891,022	676,722	488,436	2,056,180
Other Reserves	64,623	-19,221	3,917	49,319
	955,645	**657,501**	**492,353**	**2,105,499**

Adjusted balance sheet

£m

	Note	Total	1 Deferred tax asset	H 2 Harmonised asset lives	H 3 Non-gov loans W&N	H 4 Unmatched creditor balances	H 5 Presentation of insurance and other claims liability	6 Adjust to prior year tax liability	Revised Opening Bal sheet	Mvt
Tangible Assets		2,345.6		-30.1					2,315.5	-30.1
Investments		0.1							0.1	0.0
		2,345.7	**0.0**	**-30.1**	**0.0**	**0.0**	**0.0**	**0.0**	**2,315.6**	**-30.1**
Stocks		3.9							3.9	0.0
Debtors		202.4				6.6			209.0	6.6
Cash		1.9							1.9	0.0
Creditors due within one year		-198.4			-26.1	-6.6	-5.9		-237.0	-38.6
Net current assets		**9.8**	**0.0**	**0.0**	**-26.1**	**0.0**	**-5.9**	**0.0**	**-22.2**	**-32.0**
Total Assets Less current liabilities		**2,355.5**	**0.0**	**-30.1**	**-26.1**	**0.0**	**-5.9**	**0.0**	**2,293.4**	**-62.1**
Creditors > 1 year		**0.0**			**-79.8**				-79.8	-79.8
Deferred Tax		-24.1	4.4					14.8	-4.9	19.2
Provisions		-87.3					5.9		-81.4	5.9
									0.0	0.0
Net assets		**2,244.1**	**4.4**	**-30.1**	**-105.9**	**0.0**	**0.0**	**14.8**	**2,127.3**	**-116.8**
Government and other loans		2,099.8			-105.9				1,993.9	-105.9
Other Reserves		144.3	4.4	-30.1				14.8	133.4	-10.9
		2,244.1	**4.4**	**-30.1**	**-105.9**	**0.0**	**0.0**	**14.8**	**2,127.3**	**-116.8**

Notes

1 This adjusts for the deferred tax asset in the former East authority which at 31 March 2002 was not recognised due to the fact that ESWA was not an ongoing concern.

2 This reflects the harmonisation of asset lives across Scottish Water's non-infrastructure assets.

3 This adjustment harmonises to the former East policy and transfers non-government loans (predominantly EIB) into short and long term creditors as appropriate

4 This adjustment harmonises to the former West policy and transfers unallocated credit balances on debtor accounts to liabilities under creditors

5 This harmonises to the former North policy of disclosing liabilities for insurance claims and sundry items as accruals rather than provisions

6 Adjustment to prior year deferred tax liability

H Tables – Asset Inventory and System Performance

Table H1-H6 Asset inventory

Background to Improvements in Asset Information in Scottish Water

During 2002/03 Scottish Water has progressed with a programme of information systems consolidation and rationalisation. The following activities were undertaken and have contributed to asset information improvements within Scottish Water:

- Development of a Corporate Data Model
- Review of all major corporate asset information systems and commencement of delivery programmes, including:
  - Single Asset Inventory – constructed to regulatory reporting level for this return;
  - Consolidated GIS – programmed for single system delivery by August 2003;
  - Expansion of INMS accessibility – to proceed in parallel to DMA establishment;
  - Commencement of Work and Asset Management system processes;
- Review of 150 smaller information applications used within Scottish Water against business benefit and applicability;
- Development of Business Critical Data (BCD) Action Plans
- Development of an in depth Asset Management Business Process Model
- Development and trial of best practice Operation and Maintenance procedures
- Review and development of asset risk management techniques defining new information (and knowledge) needs, to facilitate asset serviceability and criticality understanding
- Development of an asset specific critical data list
- Benchmarking of Scottish Water's asset information competency
- Establishment of an asset information improvement programme management office to co-ordinate improvement initiatives and maximise efficiency in benefit delivery
- Development of a communication action plan for facilitation of cultural change in asset information management

A major asset data improvement programme has commenced, derived from the outputs of the afore mentioned activities. Priority is to be given to investment analysis needs, operational risk management needs, opportunities for efficiency (such as energy use or telemetry), and opportunities for efficiency gain through consolidation of data sets (i.e. savings on information handling).

For this year's return, significant improvement has been achieved in utilising common data sources, processes, terminologies and statistical methodologies. This has resulted in a net improvement in data quality.

Scottish Water is in the process of developing a common and detailed assessment for performance built upon its IT platform to permit an accurate evaluation of asset performance. That process includes expansion of the INMS system for water infrastructure, improved reporting on waste water infrastructure through a combination of Drainage Area Study results with Work and Asset Management System information and, development of non-infrastructure Asset Performance Monitoring.

Non-infrastructure Asset Reporting

Single Asset Inventory

Scottish Water has completed the first phase in the production of a new consolidated non-infrastructure asset inventory for the whole of Scotland. The first phase of the asset inventory has been designed to meet the requirements of the June 2003 Annual Return. As such, it currently excludes electrical & mechanical (E&M) assets, but includes site level and sub-level assets, such as tanks and pumping stations.

Confidence Grade

Much of the non-infrastructure H table submissions from the three former authorities were given a data confidence grade of B3 or B4, dependent on asset type. These grades are mostly unchanged in this first Scottish Water submission (see specific line commentary for exceptions).

The July 2002 consolidated Annual Return was created from the three former authority submissions. As such the background data feeding into Table H came from 3 different legacy systems (MIMS, AssetViewer and EMPAC), contained 3 different terminologies and asset definitions, contained 3 different asset hierarchy structures, and worked on 3 different levels of granularity. The data for non-infrastructure in this submission originates from the new Single Asset Inventory, and therefore has one consistent terminology set, and one consistent asset hierarchy structure.

The confidence grade 'B' in this year's submission reflects the fact that, although a single system is now in use, the data still comes from multiple sources with the same limited data. It is expected that this grade will be raised to an 'A' for the 2004 submission, by which time Scottish Water will have commenced a major data improvement and validation programme.

Within the three former authority (legacy) systems, Scottish Water has inherited a poor data set. A data improvement project has given priority to defining business processes, information needs and system specifications to suit efficient asset management practice.

AMP Data History

The three former water authorities first undertook AMP site surveys assigning condition and performance gradings to non-infrastructure assets in 1997/8. That work was relatively extensive in both the former West and East authorities, and limited to larger sites in the former North.

In 2002 the former North extended the coverage of their asset information with a significant programme of further surveys. The North's approach was a modified version of the Severn Trent methodology, and still contained significant gaps in sub-asset and asset coverage compared to the former West and East 1997/98 surveys.

In 2002 the former East re-surveyed approximately 60 sites where capital investment had taken place, undertook a desk top review of static asset data and undertook a further desk top review of condition and performance, for 80% of assets. The former review was undertaken by questionnaire, the latter through discussions with Operational Team Leaders.

During the period 2000 to 2002 the former West re-surveyed of 25 to 30 non-infrastructure asset sites per year and also undertook yearly desk top discussions with Operational Team Leaders, covering 100% of non-infrastructure asset data maintained.

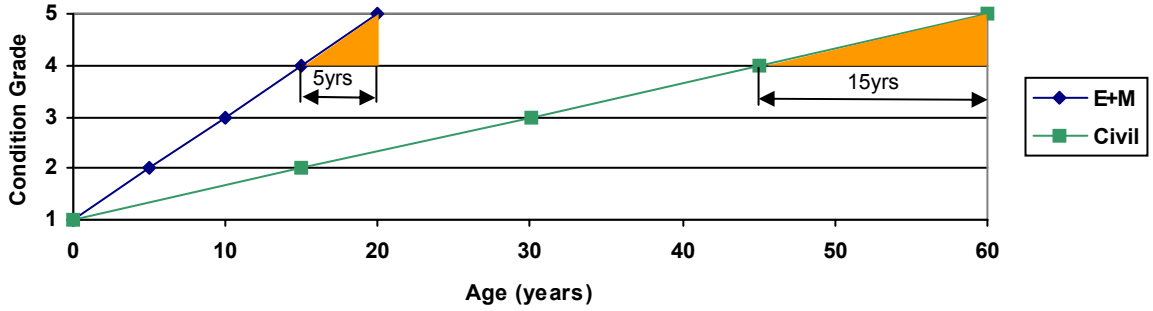
Desk top discussions concentrated on significant asset changes.

General Data Issues

All three legacy data systems contain gaps, and these have carried through to the single asset inventory.

10-20% of sub assets do not have condition and performance data. These gaps have been filled by profiling in existing condition and performance grades in to the gaps. All known data for each site type was summed to give the EARC profile according to condition grade and performance grade for building and civils and E&M assets. The resulting profiles were applied to the sub-asset data gaps, according to the EARC of the sub-asset and this maintained the profile from the actual recorded data.

The majority of site survey data is 5 years old. Theoretically in the intervening time period it might be expected that all E&M sub-assets (life 15 to 25 years) would degrade by at least one condition and performance grade, some by two or more. It might similarly be expected that 50% of civil and building assets (life 40 to 60 years) would degrade by one condition grade (excluding those few assets refurbished or replaced).



The data did not show the levels of deterioration expected, which maybe due to two factors. Firstly, the former authorities and Scottish Water have managed successfully to “sweat” the operation of many assets beyond their natural design life. Secondly, there may be a significant proportion of underestimation within the data of actual condition/performance degradation.

Desk top surveys discussions with operational personnel are clearly not as accurate as site based surveys. Scottish Water has investigated the statistical difference between the two forms of analysis. The data set used for that investigation involved matched sub-assets that were graded circa 1997 and re-graded circa 2002.

It was found that although the desk top survey results for performance degradation were similar to that for site surveys, they were not similar for condition.

The apparent correlation between desk top review and site survey conclusions for performance is reasonable, since both rely on discussions with Operational personnel.

The level of accuracy of condition assessments by desk top discussion is very questionable, since condition grade definitions require specific visual inspections, which were clearly not undertaken. It was found that the average condition grade degradation identified during site surveys was greater than that resulting from desk top discussions. A technique was therefore developed to adjust for this inaccuracy. This technique involved interrogation of the data from matched and unchanged sub-assets from the 1997 to 2002 sample data sets and derivation of a statistical adjustment for consistent application over the condition profile. The adjustment derived from the sample data set was reduced prior to application to account for the fact that some assets had been surveyed recently, in particular through the 2002 former North area surveys.

The available site re-survey data set used for matched comparison purposes was predominantly from waste water sites and not felt to be wholly representative for water. Although, subjectively it might be considered that desk top discussion conclusions might be more accurate for water assets than waste water (fewer assets, proportionately greater manning, therefore greater knowledge by Operational personnel), this can not be verified at this time. It is also of note that the major water sites which have been subjected to water investment in recent years are still operated by Scottish Water, whilst many of the major waste water sites are PFI and therefore precluded from Table H. This might also have a positive impact on Water grading proportions. With these points in mind it was felt inappropriate to adjust water gradings without further investigation and the statistical adjustment was therefore limited solely to wastewater, non-infrastructure asset condition.

The planned data collection activities will improve the accuracy of the condition and performance data.

Methodology Development Needs

The H tables record condition and performance at a sub asset level and record costs on the basis of equivalent asset replacement costs. This has led to a misleading picture of the assets within Scotland, particularly where assets of very little value are currently in place. The tables cannot therefore be read in isolation from the G tables.

Water Treatment Works in particular should all be considered in the context of current condition and performance grades being a misrepresentation of the fact that, with undertakings and relaxations in place, the works are not fit for purpose. Although not as extensive, similar consideration applies to some Waste Water treatment works.

Similarly the majority of sub-asset performance data is based upon the capability of the sub-asset to perform a discreet task. It is not fully linked to overall site performance, for example a 25mm screen might successfully do the job expected of it, but the works may require a 6mm screen and as a result have a poor works level performance.

Scottish Water currently bears significant ‘prop-up’ costs associated with maintaining acceptable performance at older, under-capacity and poor condition works. Neither condition nor performance gradings allow for power or manually intensive operational assets. For example at Stornoway Water Treatment Works, Scottish Water is required to provide 24 hour manning 7 days per week in order to ensure compliance. Automation of the existing works is not possible given its age and technology. It may be impossible to operate such assets at levels of efficiency expected without significant asset investment, the need for which is not captured within the tables.

Scottish Water would welcome the opportunity to discuss a reporting regime that is more closely linked to the overall performance of the works.

Infrastructure Asset Reporting

Table H Infrastructure Assets have been analysed to UK Infrastructure Network Management Methodologies across the whole of Scottish Water. Infrastructure Network Management is the process whereby all infrastructure business activities are considered interactively instead of in isolation. At the strategic level it is therefore about achieving corporate goals in improved customer service, operational efficiencies and customer value for money.

Key components of Scottish Water's Infrastructure Network Management methodologies include:

- Asset condition and performance analysis
- Geo-referenced customer information

- Geo-referenced asset failure records
- Maximising the quality of existing and future asset records
- Establishment of Management reporting areas
- Levels of Service monitoring, tracking and trending
- Operational Management and Performance Reporting
- Network Modeling
- Investment Planning
- Risk Management and Emergency Planning

This methodology enables the prioritisation of investigations into infrastructure service shortfalls.

Supported from Scottish Water corporate databases, the prioritisation process delivers a ranked list of zones which indicates the optimum order in which detailed investigations should take place. These investigations lead to the identification of measures to correct shortfalls in service in the most effective way.

Scottish Water has completed the first phase in the production of a new consolidated infrastructure asset inventory for the whole of Scotland under INMS. This initial asset inventory has been designed to meet the requirements of the June 2003 Annual Return.

The Infrastructure condition and performance methodologies and documentation will be enhanced by the rollout of INMS, SIIOPs and GIS supported Business Data Improvement Programme, which will improve data for the 2004 return.

Confidence Grades

The infrastructure H table submissions from the three former authorities were given a data confidence grade dependent on asset type. These grades are mostly unchanged in this first Scottish Water submission except for some particular lines.

Line H3.4 Potable Water Mains. The performance grade confidence grade has moved from B3 to B4 due to the ongoing amalgamation of corporate systems which is reducing the interim availability of uniform data sets on asset performance failures.

Lines H3.6 & 7 Communication Pipes. The overall confidence grade has improved from a D to a C. This is due to the implementation of an authority wide communication pipe database, the details of which are given in the detailed line commentary.

Lines H4.6 & 7. Sea Outfalls. The condition and performance grades have been reduced from a B to a C grading. This is in recognition of the situation that there is in fact very limited data on the condition and performance of these assets.

The IT platforms are now being implemented that will enable confidence grade improvements for future submissions.

Data History

INMS systems were implemented over differing time periods within the previous authorities, using similar methodologies with data sets from legacy systems. These have now been consolidated into a standard platform using Access Tables. As part of the Scottish Water wide rollout of Infrastructure systems these will be migrated onto an Oracle platform.

General Data Issues

As part of this year's Annual Return an assessment of data strengths and issues have been carried out, with detailed proposals developed to address these issues. These will now be fed into the Business Critical Data Improvement Plan.

Methodology Development Needs

A standard methodology has now been implemented for the major infrastructure assets - potable mains and sewers. These now need to be expanded to incorporate the other infrastructure assets such as sea outfalls, which have historically received less investigation.

In addition, further analysis and investigations are required to underpin the methodologies applied to the major asset types. In general methodologies are based on steady state analysis of assets, but first indications are that it is non-steady state events that have a greater impact on level of service to customers and hence high prop-up costs.

Table H EARCs (Equivalent Asset Replacement Costs)

Summary

- Last year's return was a consolidation of the former North, East and West individual valuations. The basis for each valuation was different this year as the whole Scottish Water region was calculated consistently.
- All assets were valued consistently, using the principle of aggregating the individual costs of process components of an equivalent replacement asset of the same size as the actual asset, and linking those costs to the sub-assets listed.
- The methodology described above is considered more accurate than the methods used by the predecessor authorities as it is based on a larger number of smaller process components, each of which represents a smaller proportion of the total asset. It is also compliant with the Reporting Requirements.
- This year's EARC process is compatible with the methodologies employed in costing Table J (Cost Base) and Table G (Investment Programme), also a WIC requirement. Benchmarking of projects also uses the same EARC process.
- Scottish Water's assets may be slightly under-valued as, in general, the size recorded is the output amount rather than the design size.
- A consistent methodology for infrastructure assets was employed across the whole of Scottish Water with the exception of gravity sewers which are now categorised by depth band. Previously, all gravity sewers were assumed to be at the WIC-spec depth of 2m to crown of pipe; now we can band them into: up to 2m, 2m to 4m; 4m to 6m; deeper than 6m. This has greatly increased the gross value of this asset category.

Methodology for deriving Infrastructure Asset EARCs

The process developed for the submission of unit costs in the Cost Base, Table J, formed the basis of the unit costs underpinning the valuation of Scottish Water's current asset stock. That process is described in detail in the Section J commentary. This commentary is limited to the method of applying those unit costs to the asset inventory which comprises Scottish Water's Table H.

For infrastructure assets, the lengths and diameters were taken from data in Scottish Water's GIS system. Unit costs were as derived for Table J (the Cost Base), but with the addition of site specific costs. Table J costs exclude site specific costs – such as rock or deep excavation – as they provide a comparator with other water companies, but when projects were analysed for the production of these unit costs, the costs particular to each contract over and above the WIC specification were determined. For Table H, these were added back as an average percentage uplift.

Table J determines unit costs for different sizes of pipe, and for different types of terrain (ie grassland, suburban roads and city streets). The variations in cost associated with these terrain types are mainly for differences in re-instatement and traffic management. The percentages highlighted in the J table commentary (composition of investment by asset type) has been used for the calculation of the total EARCS for infrastructure assets.

A major improvement in the valuation of the sewer assets is that this year we have been able to assess the proportion of our stock at different depths. In previous years, the estimation has assumed that all gravity sewers were at the depth specified by WIC for pricing Table J, ie 2 metres to crown of pipe. We have this year graded gravity sewers by depth band, using bands of up to 2m; 2m to 4m; 4m to 6m; and > 6m. This has increased the value of these assets very greatly. The depth multipliers were determined by analysis of several projects, for all types of terrain, at all diameters and in all regions and are as follows:

Depth	Multiplier
<2m	1
2-4m	1.7
4-6m	2.46
>6m	3.22

These multipliers are applied to the composite unit rates derived from the aggregation tables above for those sewers in the various depth bands.

As the sewers are the assets which have changed the most from 2001/2 to 2002/3, an in-depth analysis of the changes are presented. This covers H4.1 and H4.2.

	2002 Length km	2002 £ M	2002 £/m unit cost	2003 Length km	2003 £ M	2003 £/m unit cost
Critical sewers	7137	3485	488	7888*	7969	1010
Noncritical sewers	22600	6757	299	31415*	9923	316

Note – these figures include 10,000km of lateral sewers.

Additional cost due to depth multipliers:

	Depth band	Length in band km	EARC in £ M	Additional cost due to depth £ M	EARC at WIC spec depth £ M
Critical sewers	Up to 2m	1240	515	0	515
	2m – 4m	4410	3677	2163	1514
	4m – 6m	1610	2221	903	1318
	>6m	627	1555	483	1072
Noncritical sewers	Up to 2m	22921	5727	0	5727
	2m – 4m	8495	4212	2478	1734

Therefore, total 'additional' cost due to more accurate assessment of depth £5638M.

So, for a comparison with 2001/2:

Cost (02/03) £17392M less 'additional depth' cost of £5638M = £11754M, for a total of 39303 km (NB 10000km of laterals added to the noncritical sewers stock, compared with last year, all at the smallest size band). Unit Cost = £299/m
Cost (01/02) £10242M for a total of 29737 km. Unit cost = £344/m

The reduction in unit cost from 01/02 to 02/03 (if compared on a like-for-like basis) is due to the increased proportion of smallest size band sewers in 02/03.

Methodology for deriving Non-Infrastructure Asset EARCs

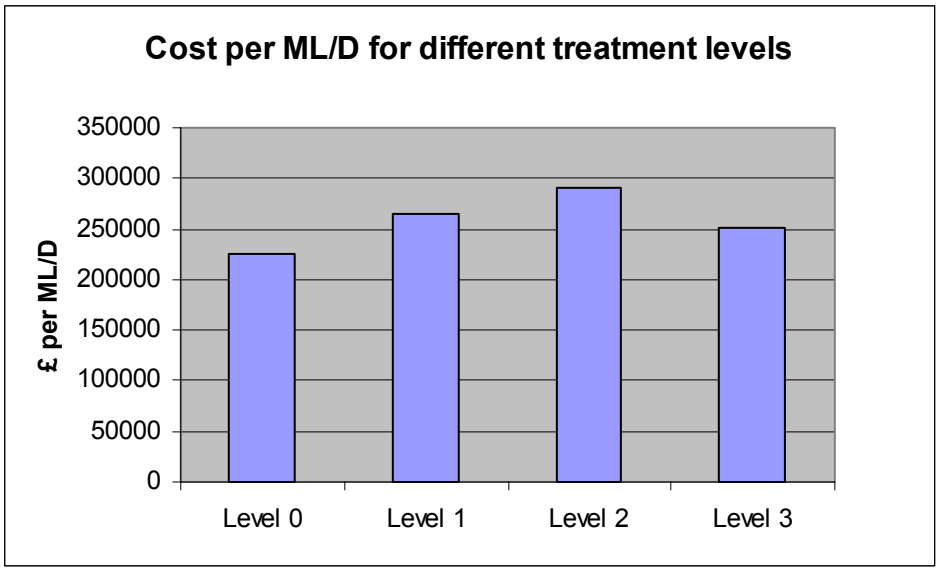
The process developed for the submission of unit costs in the Cost Base, Table J, formed the basis of the unit costs underpinning the valuation of Scottish Water's current asset stock. That process is described in detail in the Section J commentary. This commentary is limited to the method of applying those unit costs to the asset inventory which comprises Scottish Water's Table H.

This year Scottish Water can confirm that the basis for the derivation of the unit costs for the purpose of calculating the gross Equivalent Asset Replacement Cost (EARC) is the same as that used to estimate the standard costs required in Section J: The Cost Base, and to prepare estimates of future expenditure requirements. Scottish Water has, however, included an uplift for average site specifics, which are expressly excluded from Table J standard cost models. This was determined from analysis of the projects at the same time as the standard cost process component data was developed.

As the valuations of several of the asset categories have changed markedly from last year's consolidated submission, detailed analysis was carried out to determine the homogeneity of the data across related categories.

Generally, for any given size of plant, the more complex the treatment process, the more each asset should cost, compared with simpler processes, in which the assets have fewer process components. The other unit cost variable is size: at the process component level, smaller sizes cost more per unit (say per m^3) than larger sizes – usually the gradient of cost is a power function of the size.

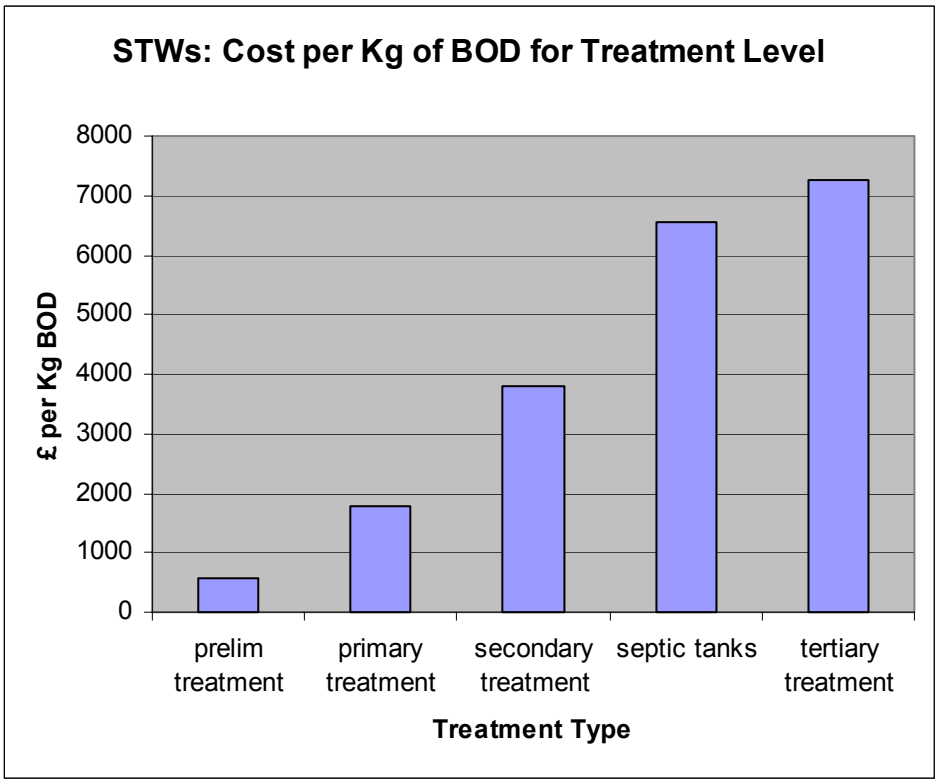
For water treatment, SW0 and GW0 assets should, on the reasoning above, be cheaper as a category than SW1/GW1 assets, and progressively SW1/GW1 cheaper than SW2/GW2. This is in fact borne out by the following graph, based on the assets in categories H2.1 to H2.8:



Note that this demonstrates the progressive increase in asset category cost per unit (in this case ML/D) with increasing complexity of process, until treatment level 3. This is in spite of the increasing size of the plant in the categories (see table below). Treatment of raw water of quality SW3/GW3 is cheaper than SW2/GW2 because of the lower unit cost of larger process component sizes (also the cost of an additional stage of treatment for pesticides, nitrates or plumbosolvency is not as great as the addition of, say, flocculation to a filter plant).

Treatment level	Cost per ML/D	Ave ML/D per asset
Level 0	224629	1.40
Level 1	265363	5.29
Level 2	291183	9.97
Level 3	250735	15.86

A similar exercise for WwTWs based on the asset categories H5.3 to H5.7 shows the following:



The only asset category apparently out of sequence is septic tanks (for which, it could be argued based on effluent quality, the treatment process is equivalent to secondary, although requiring fewer process units) but this is accounted for when average plant size is tabulated against cost per kg of BOD_5

WIC description	Cost per Kg BOD_5	Ave Kg BOD_5 per asset
septic tanks	6558	5
prelim treatment	568	1225
primary treatment	1785	407
secondary treatment	3812	425
tertiary treatment	7266	277

Septic tanks demonstrate the size principle, being two orders of magnitude smaller than the other asset types.

A last example, to validate the cost calculations underlying the EARCs of pumping stations, based on categories H2.11, H2.12, H2.13, H5.1 and H5.2 is shown below:

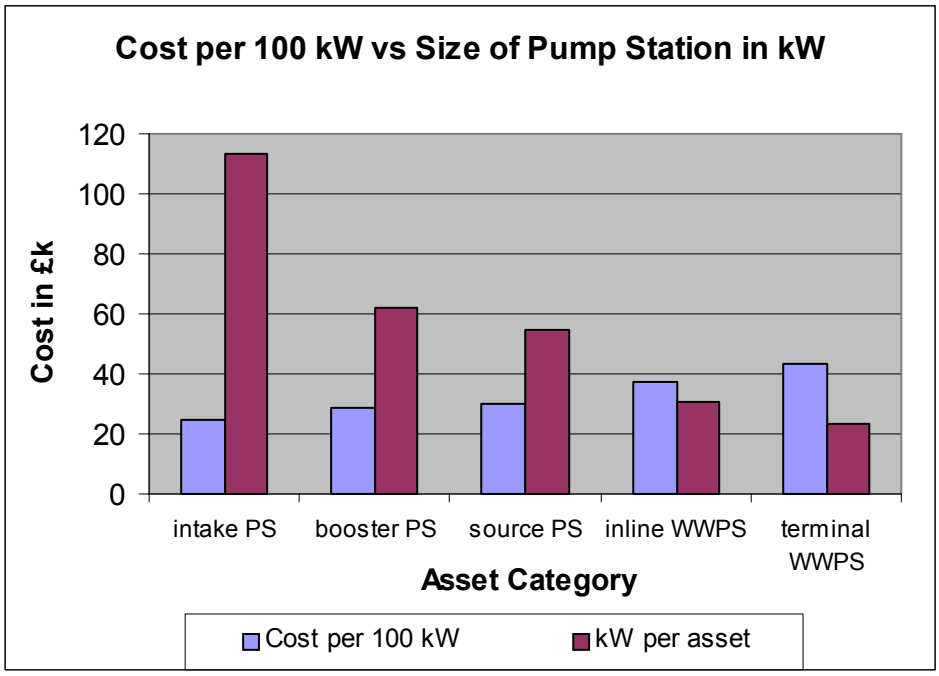


Table H1 **Asset inventory – summary**

Table H1 **Waste Water Infrastructure**

H1.4-5 **Water infrastructure**

H1.6-8 **Wastewater infrastructure**

H1.9-11 **Wastewater non-infrastructure**

H1.12 **Support services**

Table H2 **Water non-infrastructure**

H2.1-8 **Water non-infrastructure**

The most significant change to last year's data is a reduction of some £400m in EARC for Water Treatment Works. This reduction is due to the revised methodologies described in the previous section.

Examination of the current WAMS condition and performance data for civil, mechanical & electrical assets highlights a large number of sites with predominately grade 1 and 2 (better than average) values, that have major ongoing Q&S2 capital investment driven by legislative requirements.

Analysis of 169 sites with WQ Undertakings shows a range of 70 assets where the current project budget is in excess of the total civil and M&E EARC. The difference in values ranges from plus £18,000 to plus £71million.

Further detailed analysis of asset condition and performance data relative to legislative and Levels of Service investment drivers is likely to demonstrate additional sites where the difference between current EARC and project budgets are substantial.

H2.9-10 Water storage

None

H2.11-13 Water pumping stations

None

Table H3 Water infrastructure

H3.1-2 Dams, Impounding Reservoirs and Raw Water Intakes

The Single Asset Inventory was used to derive base data for this part of the submission, as populated from the legacy systems. The condition and performance data for these particular asset types was relatively sparse, and confidence in asset stock details was relatively low. It was, however, supplemented by data from the Water Resource and Reservoir Team within Asset Strategy and Planning. This resulted in a modified raw water transfer asset data set being analysed for partial condition and performance grading using techniques utilised for other treated water infrastructure. Boreholes have been included in this section.

Strengths of submission

The accuracy of data regarding Dams, Impounding Reservoirs and Raw Water Intakes has been improved due to a data collection exercise carried out by Scottish Water in 2002. This exercise has improved the accuracy of the total figures for dams, impounding reservoirs and raw water intakes. There is an increase in the number of intakes being reported and this can be attributed to the data collection exercise and a change to the methodology adopted by the legacy authorities. The change in methodology lists all catchwater intakes supplying a reservoir or aqueduct. It also identifies all spring sources at the same site separately.

Issues with data

There is very little Condition and Performance data available for dams, impounding reservoirs and intakes across all of Scottish Water. A raw water Asset Management Planning survey is only partially complete (former East of Scotland Water only). This and other ongoing data collection exercises will mean that Scottish Water will have significantly better Condition and Performance data for dams, impounding reservoirs and raw water intakes for next year's submission.

H3.3 Raw Water Mains and Aqueducts

Methodology

The base data on raw water mains and aqueducts has been taken from the Geographical Information System (GIS), with the condition and performance assessment carried out using the methodology developed under the Integrated Network Management System (INMS) for the water infrastructure.

Condition has been analysed using the INMS condition grading methodology, which is documented in Procedure P0956_02. Performance has been analysed using the INMS performance grading methodology, which is documented in Procedure P0956_01.

Issues with data

A standard analysis has been used to assign condition and performance grades to raw water mains and aqueducts throughout the whole authority.

Weaknesses of submission

The results of surveys of individual sub assets were held on separate corporate systems across the former three areas. These are being integrated into one system and this will lead to an improved return next year.

Comparisons with Previous Return

The methodology used for this return is similar to that used by the former North area. The former West area returned no condition or performance assessment last year, and the former East area used a simplified assessment which put all assets in condition grades 1 or 2.

The majority of the assets using this common methodology now fall into condition grades 2 and 3, which is consistent with the results of studies recently completed on a number of raw water aqueducts in the former East area.

This is the first year that the INMS condition and performance grading has been used for raw water aqueducts. It is intended during this reporting year to further calibrate the model to take into account the specific characteristics of raw water mains and aqueducts, and to incorporate information from past and future detailed site surveys, where these have been carried out.

H3.4 Potable Water Mains

Methodology

The base data on water mains is held on the GIS, with the further analysis required to assign condition and performance grades carried out through the application of fully documented INMS methodologies.

The condition of the mains has been analysed using the INMS condition grading methodology, which is documented in Procedure P0956_02.

The performance of the mains has been analysed using the INMS performance grading methodology, which is documented in Procedure P0956_01.

Strengths of submission

A common methodology has been used for assessing the condition and performance of the whole potable water network.

Issues with data

The data on water quality and customer complaints required for the performance assessment is held on multiple corporate legacy systems which are still being integrated into one platform. This process has resulted in significant data being currently unavailable. Due to the reduced data available on performance failures, it is believed that an over optimistic assessment of asset performance has been produced.

Further pipe samples across Scottish Water are still required to enhance the calibration of the condition model.

Comparisons with Previous Return

The most significant change in the condition grading compared to the previous return is that the percentage of mains reported as being in grades 4 & 5 has increased from 38% to 45%. This is due to the application of a standard methodology across the whole water network, rather than an actual deterioration in the asset. Whereas the former East and North areas followed the same INMS methodology in the previous return, the former West area applied a separate method. Now that the former West asset stock has been analysed to the same common standard, there has been a marked increase in the mains assessed as being in grades 4 & 5 in the West area.

The percentage of mains reported as being in performance grades 4 & 5 has decreased from 42% to 19%. This is partially due to the application of a standard methodology across the whole water network. In the previous return the former West and East Areas calculated a performance grade using INMS methodologies, whereas the former North did not complete a performance assessment, instead using the condition assessment as a substitute for this figure. Whereas the former North reported 62% of water mains being in performance grades 4 & 5 in the previous return, the figure for the mains within the former North Area for this year is only 10%, and has therefore had a marked impact on the overall figure for Scottish Water.

H3.5 Mains Potable (Other)

Methodology

The length of this asset is only 564Km, compared to 45,870Km of potable water main.

Given the need to determine and implement a common condition and performance grading for potable water mains, which has been a major undertaking, no additional analysis has been done on mains (other) since the previous submission. The figure entered in this line is therefore the same as for the previous return.

An analysis of this asset will be carried out during the current report year to ensure that updated information is available for the next return.

H3.6-3.7 Communication Pipes

Methodology

The strategy for this section of the table is to ensure that Scottish Water has accurate and comprehensive data on its communication pipes, including their number and material type. Particular analysis has been undertaken into the number and location of lead communication pipes, in accordance with information requirements for Scottish Water's Lead Strategy.

Information on communication pipes is generally not recorded on the GIS and the INMS Communication Pipe Database has therefore been expanded in coverage since the previous return to hold information on communication pipes to a common format for the whole of Scottish Water.

This database has a record of all the properties within the area of supply and has an inferred connection to the nearest main, as recorded on the GIS. The age of the communication pipe is then assumed to be the same as that of the main to which it is connected. As different material types were used in distinct time periods, the material of the communication pipe can

then be derived from its age. It has been assumed for these purposes that lead was used for communication pipes up to 1963.

Although properties were originally connected to the supply through a lead service connection, a significant number will have since been replaced. Where information exists in Scottish Water's works management systems, or other historical records, that a lead replacement has occurred, this information is recorded in the communication pipe database, and hence reduces the first pass estimate of the number of lead communication pipes

The processes are fully documented in INMS Procedures P0956_03 (Communication Pipe Condition Grading) and P0956_04 (Communication Pipe Performance Grading).

Strengths of submission

The INMS Communication Pipe Database has been expanded from covering only the former East area to covering the whole of Scottish Water. The number, material type, and condition and performance grading of communication pipes is now being assessed through a uniform, carefully documented process.

The database holds a record for each individual property, including for each property estimated to be supplied through a lead connection. This is therefore a very powerful tool from a planning perspective and is a vast improvement on previous estimates, which were only statistical extrapolations from small scale surveys and did not produce records for individual properties across Scottish Water.

Issues with data

The records that Scottish Water has inherited on lead replacements are very limited and of poor quality. It is therefore certain that a significant number of lead replacements have occurred that are not accounted for in the communication pipe database. Over time however, as rehabilitation, lead surveys, communication pipe surveys and the incorporation of additional historic information takes place, the accuracy of this assessment will improve.

Comparisons with Previous Return

The total number of communication pipes (lead and other) is little changed from the previous year – c. 1.7m, compared to c. 1.6m in the previous return. The number of communication pipes estimated as being potentially lead has however shown a marked increase from c. 600,000 to just over 1m. This, as discussed above, is due to the methodology employed, and the estimate for the number of lead communication pipes will reduce over future submissions as more accurate data is incorporated.

H3.8 Water Meters

Methodology

A metering strategy group has recently been set up to determine current position of meter assets and to develop strategy for replacement/additional customer meters. Strategy conclusions are currently under development for Scottish Water.

An Oracle Programming Language/Structure Query Language System has been created, called "The WIC22 Processing Engine". This extracts and summarises data for the 3 regional billing systems, Custima in the former North and East and Rapid in the former West.

Table H4 Wastewater infrastructure

H4.1-3 Sewers

Methodology

The summary of asset stock comes directly from the Scottish Water corporate GIS system and other asset inventory systems. Some data improvements produced by Scottish Water's contractors as part of the DAS programme have been fed back in to the sewers data set and Examiner (CCTV) databases have also been queried. The data has been bulked up to cover mains/sewers with unknown size or criticality (the same distribution as the known sample is assumed to cover the unknown part of the sample). Further analysis using the EMPAC, MIMS and Phoenix legacy work management systems has been used for system performance.

Due to differences in legislation between Scotland and England and Wales, Scottish Water has a proportionately longer and more expensive network to maintain. The most significant differences in the Law in Scotland relating to Sewerage in comparison with England and Wales are that:

A drain becomes a sewer when it passes out of the curtilage even if it only drains one property. This means that there are 'lateral' sewers connecting the main sewer to the property drains. These laterals are vested in Scottish Water. This situation does not exist in England and Wales where drains are the responsibility of the householder right up to the main public sewer.

All private sewers connected to the public were automatically vested in the Sewerage Authority in 1968 or on completion afterwards. The only private sewers in Scotland are those connected to private sewage treatment works. As a result of this difference, Scottish Water has a greater operating liability for the public sewerage system than English and Welsh Plcs. It is estimated that Scottish Water's sewerage network is 33% longer than it would be if the Law in Scotland matched that in England and Wales. This extra length is also usually the most problematic length. The additional length equates to some 10,000km.

Lateral sewers tend to be at minimum depth and are more susceptible to damage from other utility companies and traffic. Lateral sewers are more prone to blocking than normal sewers due to the smaller diameter (typically 100mm) and because there is little flow to flush any potential build up of rags away. This is particularly the case where a lateral serves only one household. Clearing such blockages can be extremely problematic, especially if no disconnecting manhole exists. Screening blockage calls at the call centre to ascertain whether or not the blockage is in the private drain or public lateral is also extremely difficult.

Blockage clearance is the single largest task undertaken on these sewers. Increased blockages lead to an increased level of internal and external flooding. It is estimated that there is a yearly operating cost of £3.3 million in dealing with these issues. There is also an ongoing capital cost in replacing collapsed sewers.

Examiner databases CCTV analysis have been queried for condition data. Further analysis using the legacy works management systems (Enterprise Maintenance Planning and Controls Asset Management System (EMPAC), Minicom Information Management System (MIMS) and Phoenix) has been used to assess performance.

In the 2001/02 submission, the former East area used a methodology for estimating condition and performance that involved creating distributions between grade/size for the DAS Zones. For the former North area, the method used for condition and performance was based on the age of pipes. Grade 5 implied age >80 years, Grade 4 was 80-60y, Grade 3 was 60-40y, Grade 2 was 40-20y, Grade 1 <20y and estimated ages were assumed where the date field was missing. For the former West area, the condition data was derived using revised analysis of raw Examiner data sets. Performance was based on a formula using the number

of DG5, DG10 and Over Flooded Areas (OFA) properties for each Drainage Area applied to every sewer within that area. Grade 5 corresponded to >1 property per 1000 properties, Grade 4 was 0.3-1, Grade 3 was 0.1-0.3, Grade 2 was 0-0.1 and Grade 1 was 0.

For the 2002/03 submission, asset stock lengths have been produced using the Scottish Water GIS system. Some adjustments have been made (e.g. pipes of size greater than 600mm or depth greater than 4 m are critical by definition and have been re-classified if necessary and, an allowance of 10,000km has been made for "lateral" sewers between property boundary and main sewer). Conversion from length to EARC in the rest of the table has been carried out using parameters of depth, size and reinstatement surface. Separate summations are maintained throughout the calculations using parameters of depth and size (5 by 5 bandings) but reinstatement surface assumes global and independent distribution between Urban, Rural and Grassland.

Analysis of condition grades is based on a statistical up-scaling from the CCTV survey data sample from the whole of Scotland graded using the Sewer Rehabilitation Manual method. This sample is assumed to be unbiased with respect to condition since sewers to be surveyed are generally selected on the basis of criticality which is unrelated to condition. The previous five years of CCTV data analysis is used and this gives coverage of about 7.2% this year.

The performance grades 4 and 5 are based on the actual records of chokes, blockages and flooding recorded over a 5-year period by Operations, according to criteria laid down in Table A3.3 'Asset Inventory and System Performance – Reporting Requirements and Definitions'. The Water Industry Commissioner (WIC) definitions take some account of incidents at a 5-year return period, so a record of at least five years duration is necessary. Pipes recording more than one event over the 5-year period are allocated to grade 5 and pipes with one event are allocated to Grade 4. At present, this data is only available in detail for the former East area via EMPAC. One-year counts are available for former West (Phoenix) and former North (MIMS) so the East's distribution of Grade 4 and 5 (and distributions between sizes) have been multiplied up to match the former West and North totals.

CCTV survey data (again treated as a sample of the entire network) is used to estimate the split between grades 1, 2 and 3, based on recorded silt depths. If the recorded silt depth is zero, Grade 1 has been allocated and if between zero and 5% Grade 2 is allocated. The distributions are then upscaled to the entire network, as with Condition (removing bias due to size or depth by using the same 25 bandings). All other pipes were defined as Grade 3.

It should be noted that the above method of performance assessment takes no account of an asset's hydraulic performance in relation to sewer flooding and unsatisfactory combined sewer overflow (CSO) performance due to inadequate hydraulic capacity. Both of these are major performance/ serviceability issues, for which Scottish Water will require to make significant capital investment to improve performance.

Condition Grade on the CCTV analysis has been calculated using the industry-standard Sewer Rehabilitation Manual method. In practice this is done using the commercial program 'Examiner'.

Strengths of submission

A common methodology has been used for assessing the condition and performance of the whole network. This is a major improvement on last year's return where three different methods were used and performance information was not available for two of the three regions. The asset stock is now held on a single corporate database covering the whole of Scotland.

Issues with data

The main weaknesses are that the corporate asset stock system does not have complete coverage, particularly for size, depth and criticality. The validity of the CCTV data as an unbiased sample is unproven and the CCTV data is not held on a corporate system.

The accurate capture of performance data is required in a single corporate system which is a future action for Scottish Water. The existence of a 5-year time period of good blockage data linked to the individual asset is 5 years away as a result.

The assumption that there are an extra 10,000km of lateral sewers requires further review to confirm this length.

Comparisons with Previous Return

The total EARC value for Critical Sewers has increased significantly from that of last year, some 230%. This is in part due to the small increase in the length of critical sewers (4.5%) but is primarily due to the more accurate calculation of EARC for these assets, accounting for the fact that a significant proportion of sewers are laid at a depth greater than 2m.

For Non-critical Sewers, the total EARC value has also increased significantly, albeit of lesser magnitude, some 47%. This is due to the allowance made for the additional 'lateral sewers' (10,000km).

The condition grade profile for Critical Sewers has shown some small movements from that reported last year, with grade 1 reducing and grades 2 and 3 increasing. The percentage of grade 5 critical sewers has reduced by some 34% but the combined percentage of grades 4 and 5 has increased by 31%. The profile is based on a larger sample of CCTV and improved data analysis.

The condition grade profile for Non-critical Sewers has shown some movements from that reported last year, with grades 1, 4 and 5 increasing and grades 2 and 3 decreasing accordingly. The percentage of grade 5 non-critical sewers has increased by some 50% and the percentage of grade 4 sewers has increased by 100%.

The performance grade profile for Critical Sewers has shown significant movements from that reported last year, with there being a general shift from grade 5 to grade 1. The change is primarily due to a consistent methodology being applied in the determination of the data. Last year there was no methodology for former East and North and an extremely pessimistic one for former West (resulting in 25% Grade 5). Again, it is noted that the above methodology does not take account of poor performance due to the hydraulic deficiencies within the sewer systems, i.e. sewer flooding and uCSOs.

As with the Critical Sewers, the performance grade profile for Non-critical Sewers has shown significant movements from that reported last year, with there being a general shift from grade 5 to grade 1. The same comments apply.

H4.3 - Sewage and Sludge Pumping Mains

Methodology

The summary of asset stock comes directly from the Scottish Water corporate Geographical Information System (GIS). For the 2002/03 submission the method employed for assessment of condition and performance is the same as that used by the former North area for the 2001/02 submission. This involves a simple categorisation based on age. Grade 5 implies age greater than 40 years, Grade 4 is 40-30y, Grade 3 is 30-20y, Grade 2 is 20-10y, Grade 1 <10y. The data has been bulked up to cover mains with unknown age. (i.e. the

same distribution as the known sample is assumed to cover the unknown part of the sample).

Performance data is assumed to follow the distribution of condition data.

Strengths of submission

A common methodology has been used for assessing the condition and performance of the whole network. This is a major improvement on last year's return where data returns were basic estimates. The asset stock is now held on a single corporate database covering the whole of Scotland.

Issues of data

Since rising mains are not inspected by CCTV (as sewers) nor sampled (as water mains), using age to assess condition is considered a reasonable if simplistic approach. This could be calibrated in the long-term against replacement requirements – in the meantime the bandings are arbitrary. An improvement in coverage of age data is the major requirement.

The current works management systems are not recording performance failures in rising mains. It needs to be established whether this is a recording failure or simply that the pipes are performing well. Ultimately a method based on recorded performance would be preferable.

Since rising mains form such a small proportion of the waste water network, there is a limit to how much effort will be expended developing pro-active strategies.

Comparisons with Previous Return

In the previous submission the method for assessing rising mains was the same for the former North (except that unknowns were classified as Grade 3 rather than given the same distribution). The former East and West's approaches were based on the regional operator's opinions.

The condition grade profile for Sewage & Sludge Mains has shown a general movement from that reported last year, from grade 1 to grade 5. The percentage of grade 4 & 5 Sewage & Sludge Mains has greatly increased.

The total Estimated Asset Replacement Cost (EARC) value for Sewage & Sludge Mains has increased significantly from that of last year, by some 54%. This is in part due to the 32% increase in the length of mains and their corresponding size band profiles and also due to the application of a consistent methodology.

H4.4-5 Sewer structures

Methodology

The dataset for Combined Sewer Overflow (CSO) condition and performance is currently limited. The former East has data gaps and data from the former North areas has no condition and performance data. The decision was taken to apply the profiles from the former West and East's known data. Performance data was sourced from the profile provided by the former West's data. The data from the former East was available with CSO condition grade, which was used to provide a profile for the condition grade of the remaining assets.

The data from the former East has a condition grade which was used to provide a profile for the condition grade of the remaining assets. The data was factored by giving a CSO with a

grading of ‘good’ a grade of 1, 2 or 3 with a split of 20%, 30% and 50% respectively. ‘Bad’ was given condition grade 5 and ‘adequate’ given condition grade 4.

Performance data was sourced from the profile provided by the former West’s data. This was done by giving a grade 5 performance to all very unsatisfactory CSOs, a grade 4 to unsatisfactory and for satisfactory CSOs and grade 1, 2 and 3 given to the data in a 20%, 30% and 50% split respectively.

Strengths of submission

The asset stock listing is believed to be more accurate. The former East and West have good condition data and performance data respectively.

Issues with data

The asset stock listing is not yet finalised. There are inconsistencies involving definitions of Emergency Overflows (EO), CSOs at Treatment Works etc. that need to be resolved. Condition and Performance data needs to be collected across the missing areas and definitions clarified. In both condition and performance, there are only three classifications at present, not the five that the Water Industry Commissioner (WIC) reporting requirements stipulate.

Comparisons with Previous Return

The total Estimated Asset Replacement Cost (EARC) value for Combined Sewer and Emergency Overflows has reduced by 14% from that reported last year. This is due to a combination of a 9% reduction in the number of assets together with the shift in size banding profile from 1 to 3.

The condition grade profile for Combined Sewer and Emergency Overflows has shown significant movement from that reported last year, with a general shift from grade 1 to grade 5. The percentage of grade 4 and 5 Combined Sewer and Emergency Overflows has greatly increased. This movement has been due to the application of a consistent methodology for grading the assets and due to some improvements in the data sets available.

Similar changes are evident for the performance grade profile for Combined Sewer and Emergency Overflows and these are attributable to the comments made above. It should be noted that the percentage of grade 5 Combined Sewer and Emergency Overflows has reduced and this is as a result of the investment in Unsatisfactory Combined Sewer Overflow (UCSO) improvements during the last year.

H4.5 - Other Sewer Structures

Methodology

As with Combined Sewer and Emergency Overflows, the available condition and performance data for Other Sewer Structures is very limited and was not sufficient for a profile to be extrapolated to represent the remaining blank data. Other sewer structures condition and performance was therefore obtained by profiling the Combined Sewer Overflow (CSO) data.

Strengths of submission

The asset stock listing has been improved.

Issues with data

Condition and performance data is unavailable.

Comparisons with Previous Return

The total Estimated Asset Replacement Cost (EARC) value for Other Sewer Structures has reduced by 18% from that reported last year. This is attributable to a combination of a 9% reduction in the number of assets together with the application of a consistent methodology for the calculation of EARC.

The condition grade profile for Other Sewer Structures has shown significant movement from that reported last year, with a general shift from grade 1 to grade 5. The percentage of grade 4 & 5 Other Sewer Structures has greatly increased.

Similar changes are evident for the performance grade profile for Other Sewer Structures.

H4.6-7 Sea outfalls

Methodology

The condition and performance dataset available for outfalls is currently very limited. A profile from the available data would not give an appropriate representation of the assets. Therefore the condition and performance data has been extracted from assets of similar circumstance. In this case we have used the condition and performance distributions of Non-critical Sewers for Short sea outfalls and Critical Sewers for Long sea outfalls.

Strengths of submission

The datasets for these assets are continuing to be improved.

Issues with data

Data on condition and performance is very limited.

To improve the above dataset would require significant asset surveys and investment. An estimated cost would be in excess of £2 million.

Comparisons with Previous Return

The total Estimated Asset Replacement Cost (EARC) value for Short Sea Outfalls has reduced by 13% from that reported last year. This is attributable to a combination of a 38% increase in the number of assets, together with the application of a consistent methodology for the calculation of EARC.

The condition grade profile for Short Sea Outfalls has shown significant movement from that reported last year, with a general shift from grade 1 to grade 5. The percentage of grade 4 and 5 Short Sea Outfalls has greatly increased from the zero values previously returned. This movement has been due to the application of a consistent methodology for grading the assets and due to some improvements in the data sets available. This year's figures are believed to be a fairer representation of the condition of these assets.

Similar changes are evident for the performance grade profile for Short Sea Outfalls and these are attributable to the comments made above.

The total EARC value for Long Sea Outfalls has reduced by 35% from that reported last year. This is attributable to a combination of a 12% increase in the number of assets together with the application of a consistent methodology for the calculation of EARC.

The condition grade profile for Long Sea Outfalls has shown significant movement from that reported last year, with a general shift from grade 1 to grade 5. The percentage of grade 4 and 5 Long Sea Outfalls has greatly increased from the zero values previously returned. This movement has been due to the application of a consistent methodology for grading the assets and due to some improvements in the data sets available. This year's figures are believed to be a fairer representation of the condition of these assets.

Similar changes are evident for the performance grade profile for Long Sea Outfalls and these are also attributable to the comments made above.

Table H5 Wastewater non-infrastructure

H5.1-2 Sewage pumping stations

Methodology

Sewage Pumping Stations data was taken directly from the legacy asset inventory systems. The systems were used by the three former authorities to store above ground Non Infrastructure data.

The total EARC value for Sewage Pumping Stations (in-line) has increased by 53% from that reported last year. This is attributable to a combination of a 13% increase in the number of assets, changes to the size banding profile for these assets, together with the application of a consistent methodology for the calculation of EARC

Strengths of submission

The total numbers of assets/asset categories and the performance and condition grades have been improved due to a limited number of recent site and desktop audits carried out by Consultants, albeit there are still significant gaps.

The application of a consistent methodology for the calculation of EARC for the whole network.

Issues with data

Data sets have not yet been completely harmonised and checked in terms of numbers and sizes. Size data gaps exist primarily at the smaller pumping stations. The split between 'in-line' and 'terminal' sites still requires further work. Action Plans exist for all the aforementioned gaps.

Comparisons with Previous Return

The % of grade 4 & 5 Sewage Pumping Stations (in-line) has increased from last year. This movement has been due to the application of a consistent methodology for grading the asset data gaps and some improvements in the data sets available.

The total EARC for pumping stations has reduced significantly from last year. This is due to revisions to the costing methodology as described above and has brought the model for sewage pumping station EARC estimation closer in line with that for water pumping stations.

H5.3-7 Sewage treatment works

A comparison has been undertaken between waste water treatment works site level performance issues and sub-asset condition and performance grading. The grades held at sub-asset level in the single asset inventory were averaged to give single works level condition and performance grades. The site level performance assessed through known

problems with regards to performance or performance risk, including works known to be failing and those where there is a development constraint. The general picture to emerge is that the sub-asset grades are not representative of the known problems.

It should be noted that, to a significant extent, septic tanks have been excluded from consideration as the majority of them are not sampled by SEPA. Scottish Water has 1379 septic tanks, 5.7% of which are recorded in condition grade 4 or 5, and 7.7% of which are recorded in performance grade 4 or 5. 200 (14.5%) are known to have performance issues and are included in the figures below. In excess of 40 or more septic tanks will be replaced with, or flows transferred to, alternative treatment facilities during Q&S2. It is anticipated that many more than the 200 would be deemed unfit for purpose if sampled by SEPA and might be so once SEPA derive Water Framework Directive needs for smaller settlements investment in Q&S3.

A total of 535 works were identified as being 'unfit for purpose' for one or more reason (including the known 200 septic tank issues), and the average condition/performance for these works was 2.3/2.5. This number is broken down in more detail below (note: the total of works listed exceeds 535, because some works appear in more than one category).

146 works are listed in the monthly 'Cyclops' report (at 31 Mar 03) on works performance as failing or at high risk of failing. The list of failing works is as agreed with SEPA. The average condition/performance of these works is 2.3/2.5. A further 75 works are identified as being 'at risk', and the average condition/performance is 2.3/2.4.

Enforcement notices have been served at 19 works: the average condition/performance for this group is 2.0/2.2.

Development constraints are in force at 162 works, which are all known to be over loaded, and the average condition/performance of this group is 2.4/2.5. A further 148 works have been identified as being potential development constraints: this means that no potential development is known at present, but the works does not have capacity to accommodate any further development, should it occur. The average condition/performance for both of these categories is 2.3/2.5.

19 works have been identified as requiring to be upgraded to comply with Bathing Water standards. These have an average condition/performance of 2.4/2.6.

Significant Health and Safety issues have been flagged at a further 9 works: the average condition performance in this case is 1.9/2.1.

In general, the condition and performance grades held in the single asset inventory and reported through Table H at sub-asset level give much too optimistic a picture of the works condition/performance as a whole. In the cases discussed above, a performance grade of 4 or 5 would be more appropriate than the level of 2 that was generally found.

Comparisons with Previous Return

The most significant change in the condition grading compared to the previous return is that the percentage of Sewage Treatment Works reported as being grades 4 & 5 has decreased. The percentage of Sewage Treatment Works reported as being in performance grade 4 & 5 has also decreased.

The net change in asset condition / performance highlighted in the H tables does not reflect the true condition and performance of Scottish Water's wastewater treatment assets. Instead it is attributed to the revised hierarchy in the single asset inventory and ERAC application methodology. Further improvements in data accuracy and consistency are

required before an accurate interpretation of Scottish Water's asset base can be demonstrated (see comment under Non-infrastructure Asset reporting above).

The total EARC for Waste Water treatment assets has also reduced significantly, which is attributable to the revised costing methodology described above.

H5.8-13 Sludge treatment facilities by disposal type

The Sludge Treatment Facilities in the previous submissions were taken directly from the three previous authority asset registers with limited verification and the data possibly being two years out of date. During 2002/03 Scottish Water has undertaken considerable strategic work to gain a greater understanding of its sludge assets and progress with a programme of operational rationalisation.

H5.8 Scottish Water has now only one Sludge treatment facility disposing liquid sludge to land (Hawick).

H5.9 Scottish Water has 19 Sludge treatment facilities disposing of cake to land.

H5.8 and H5.9 There are 8 redundant sludge treatment centres, reflected in the redundant values on line H5.8 and 5.9

H5.10 Scottish Water does not have any composting disposal facilities.

H5.13 Scottish Water does not have any other treatment disposal facilities.

The dryers on the two sites are currently being run as standby facilities. Under current negotiations with landowners, the cake disposal route is more cost effective. The dryer facilities are kept in operational order and may be used at any time during the year, either due to constraints on receiving land capacity, or due to plant failure to achieve the required log kill of pathogens for land disposal. This is common water industry practice. Future change in the use of the dryers will depend upon continued acceptance by landowners, and implementation of forthcoming sludge legislation. This matter is addressed in Scottish Water's Sludge Strategy.

Table H6 Support services

Methodology

Scottish Water is inspecting all offices and depots to determine function, suitability, condition and performance. For offices and depots, this inspection will be complete by the end of the year. There is a need to identify and establish the consequences of a number of regulatory issues - in particular there are the Asbestos at Work Regulations and the Disability Discrimination Act. It should be expected that significant changes will occur to building valuations, maintenance regimes and in some cases the use of buildings. The costs of surveys and required works is estimated at £11m over a 5 year period. Additional to this will be cases where the disposal of the building is more advantageous than essential remedial works.

We have a mixture of offices, depots with offices, depots, yards and office depot facilities at works. The office & depot inspection will identify these types and future reports may need to clarify where there is no option to reduce numbers because the facility is part of an operating asset.

Laboratory equipment on the whole is quite aged and we have highlighted a programme to replace this equipment (£400k per annum over the next 3 years). Also, pending laboratory rationalisation, we will be in a better position to assess our equipment needs.

Strengths of submission

The base data on all Laboratory equipment is held on an Asset Register which lists all the relevant information concerning each piece of equipment including age, initial cost, maintenance costs and current status.

This information was collected from operational staff who offered technical advice on the state of each piece of equipment.

Issues with data

Current and future restructuring may result in changes in strategy and therefore investment. The figures are compiled from available existing information and therefore have a low quality level. Only one of the 3 predecessor authorities performed an asset revaluation exercise and this was done by limited type sampling. Prudent accounting practice of publicly listed companies would require regular asset revaluation's. The cost for such a valuation has not been built into existing budgets.

H6.3 Control Centres

None

H6.4 Vehicles and Plant

None

H6.5 Telemetry Systems

Methodology

A Scottish Water Telemetry Strategy is at the planning stage and the expansion of telemetry outstation assets will be prioritised according to Legislative Requirements, Efficiency/Performance and Spend-to-Save based on risk assessment.

The top-end telemetry system currently being used in the former East area will be rolled out to the former North and West areas over the next two years.

There are up to 450 outstations that may be replaced during 2003/04 as part of the roll-out of the new Scottish Water telemetry system. These outstations may not be compatible with the system. They have not been identified in the return.

There are approximately 140 sites in the former Highland area which have multiple outstations. This was a technical method used to provide for larger input/output counts at particular sites. The maximum number at any one site is 5 outstations. The figures used have counted these sites with multiple outstations as one outstation site. If the sites were upgraded, they would certainly have the multiple outstations replaced with a single (larger) outstation.

A financial impact analysis was undertaken, which formed the basis of a single Equivalent Asset Replacement Cost (EARC) of £5K to replace any outstation. In practice this would increase significantly for larger sites. The figures also do not take into account costs for instrumentation upgrading and allowing for increased i/o to take into account new telemetry i/o standards.

The figures input for asset life appear to be pessimistically low. Line H6.5 shows it to be in the 'short' range. Without putting accurate numbers into Life this figure will not reflect the true nature of the replacement needs

No indication is given for outstations listed/not listed in the return which are installed on site but not yet commissioned.

Strengths of submission

This submission has taken information from the existing eight legacy systems and collated the outstation base into the four geographical areas of the business. This information has been data-based so that it will assist in future asset planning. It is intended to cleanse and add a structure to this data so that it is more accurate and valuable.

Issues with data

There is data missing from outstation sites in Scottish Water's North West and North East areas. It is hoped to rectify this before next year's submission.

This is the first year that the submission has separate outstations in terms of the new geographical areas.

Comparisons with Previous Return

Much of the information used for this return is the same as last year's but with new outstations added. No attempt has been made to cleanse historical data.

H6.6 Information Systems

Methodology

Scottish Water IT has a centralised Asset Database for all IT Assets. The required information was extracted from this database and an estimate of the replacement value was calculated.

The condition of PCs within Scottish Water is poor, with half of the stock now over 3 years old. This is due to previous regional replacement programmes being put on hold during the transition to Scottish Water. However, these have now been replaced by several Scottish Water IT Infrastructure Rationalisation Projects being run within the framework of the overall IT Rationalisation Programme. These projects, being implemented over the next 2 years, cover Server Environment Development, Desktop Environment Development, Network Services Development and Security & Systems Management Development.

Strengths of submission

The current hardware inventory has been gathered in a methodical manner and is held on a centralised database. The replacement programme is based on an industry standard lifecycle policy.

Issues with data

For the WIC Report, it is difficult to class equipment under the categories PCs, Workstations, and Mainframes. For future, it would be more meaningful to be able to use Desktops, Laptops & Servers.

H6.7 Other Non-Operational Assets, Land and Forestry

Methodology

It has been assumed that the number of assets will remain similar in the foreseeable future, though they could be affected by a future strategy. Capital investment for Land and Forestry will be limited to maintaining existing assets and amounts to less than £100,000 over the investment period. Scottish Water is reducing the number of surplus houses the authority owned resulting in the disposal of significant numbers of houses through tenants 'right to buy' legislation and open market sales. Expenditure on Tenanted Farms will be limited to maintenance costs as required under the terms of the relevant leases, as the numbers of such farms are falling as the reasoning for owning them to protect the catchment area is now less important with improved water treatment facilities.

Strengths of submission

Scottish Water has a relatively high level of knowledge of the asset inventory and these details are held on a number of corporate databases.

Weaknesses of submission

Any future investment cannot be determined until Scottish Water develops or implements a new strategy for Other Non-Operational assets.

Table H11-H16 Future Asset Inventory

Introduction

The principal aim for the future "Asset Inventory" tables is to see a reduction in the value of "red" risk sub-assets. However, much of the capital investment programme is aligned to quality and growth, and therefore the reduction in red 'risk' assets is reduced.

Methodology

The source for non-infrastructure data originates from Ellipse and has one consistent terminology set, has one consistent asset hierarchy structure, and works on the single level of granularity required by the WIC's guidelines.

Issues with data

It is difficult to align future projects to specific sub-assets since detailed project study work has not yet been undertaken at that level. This is particularly problematic when the project is Quality, rather than asset maintenance driven.

General

The future Table H11-16 is directly related to Table G. This involved obtaining the projects and total costs from Table G and applying the costs in Table H11-16 to either new assets or by modifying existing assets.

On completion of the future data-entry the following differences were identified between Table H11 and Table G.

- Rolling Budgets in Table G are entered in the Asset Inventory section on Table G as years 2002-03 only, to allow compliance with Table D1-3, whereas Table H11-16 includes totals from 03/04 onwards.

- Recreational Fisheries were not included in the Tables H11-16, as there is not an asset to assign this cost to.
- Two wastewater treatment works (Livingston and Dunfermline) were entered in the future Tables H11-16 with spend for 03-04 onwards, as the majority of the total spend for these projects has already been included in the current asset inventory.

In the cases where there are named projects which have detailed design or feasibility reports, the future data entered in to Tables H11-16 is generally accurate. However, in rolling projects and future strategies where the design has not been completed, the change to the future asset stock can only be estimated. Therefore, it is not anticipated that the actual future asset stock will reflect what has been predicted in Table H11-16.

The confidence grades were generally reduced to a reliability grade B, with the exception of water pumping stations, water mains, sewers and sewer structures which are reliability grade C.

Table H12 Water non-infrastructure

H12.1-8 Water Treatment Works

Future Data

The number of WWTWs is expected to increase from its current figure of 587, to a total of 629 treatment works, reported in H12. The largest increase in type of TWs is SW2, in which there is an additional 54, while SW0 and SW1 have reduced, indicating that more works are being upgraded during this period. The majority of assets have moved from Red to Green or amber status.

H12-9-10 Water Storage

The total number of water storage units will increase in the future from 1989 to 2042. The majority of this increase will be in Service reservoirs, where there will be an increase of 53.

The investment in water storage appears to only convert 50% of the red assets. The service reservoir projects in the investment programme are mostly in rolling budget or future strategies. Therefore, it is possible that the actual investment in the future for new and base may differ slightly and that the red assets may reduce.

H12.11-13 Water Pumping Stations

The total number of water pumping stations will increase in the future from 672 to 707. The majority of this increase will be in Booster pumping stations, where there will be an increase of 26.

Table H13 Water infrastructure

H13.1-3 Water Resources

Assets in this banding in the future will increase from 1296 to 1315, (specifically for DIRs and Raw Water Intakes (Lochs and Burns)

H13.4-8 Water Mains

In the future, the investment in mains potable (H3.4) has increased the length of mains by only 1244km. The future base investment for water mains has been applied to only red assets. This may not actually occur and some of the amber assets may be replaced or rehabilitated.

The water meters future data includes 3400.

Table H14 Wastewater infrastructure

H14.1-5 Sewers and Sewer Structures

The total length of sewers will increase to 40593km (from the current figure of 39346km). The proportion of assets allocated to risk grade Green will also increase. There will be a significant increase in the number of Sewer structures, (particularly in the number of CSOs), from 4358 to 5112. Base expenditure is not included here, as it does not increase the value of the assets stock, it only improves the condition performance, or lowers the risk gradings.

H14.6-7 Sea Outfalls

The sea outfall future data includes 65 new assets.

Table H15 Wastewater Non-infrastructure

H15.1-2 Sewage Pumping Stations

In the future asset inventory, the number of sewage pumping stations will increase from 1879 to 2018.

H15.307 Sewage Treatment Works

The number of Sewage Treatment Works will increase from 2047 to 2110 and the majority of red assets have been converted to either amber or green.

In general the future data for the wastewater treatment works is fairly accurate as detailed feasibility studies were used to modify and create new assets or sub assets.

H15.8-13 Sludge Disposal Facilities

The number of sludge disposal facilities will increase from 28 to 36.

In general the future data for the sludge disposal facilities is fairly accurate as detailed feasibility studies were used to modify and create new assets or sub assets.

Table H16 Support Services

In the future asset inventory, the most significant investment is shown to be in telemetry and information systems, indicating capital expenditure of £20.8m and £11.19m respectively. The risk red status of assets has not changed significantly, although more assets have moved to risk status green.

General

The capital investment section, which is brought forward from Table G into Table H 11-16, indicates a different investment profile to the investment profile in the Risk, Condition/Performance and Financial Impact section. This is because the need for investment may be different from actual timing of the investment, i.e. as asset may require investment in H1-6 in Period 0 (1-2yrs), however, the investment may not be available until Period 1 (3-5yrs) if there is a limited budget. Not all sub assets will require investment at the same time but it is more cost effective to upgrade a works in one contract.

Section J - Commentary

General Comments

In summary, the Cost Base exercise was undertaken in the following manner:

- SW has completed all the tables (J1, J2, J3, J4, J5, J6, J7 and J8) as part of this submission. Tables, J2, J4, J7 and J8 ask for the projected expenditures on a percentage basis, for each of the elements of the Cost Base: this has been completed based on the June 2002 capital programme. Tables J1, J3, J5 and J6 are the unit costs at which SW constructs the WIC-specified models noted.
- An auditable and fully documented process was used to extract data from projects completed over the last seven years for non-infrastructure assets and infrastructure work (both projects and term contracts).
- The professional statistician engaged last year by the predecessor authorities in their individual submissions to verify the statistical integrity of the process component level cost curves, which underlie the standard cost models, was retained this year.
- The methodology of inflating older data to a common base date to permit equal weighting (as specified by the Reporting Requirements) utilises COPI (the Construction Output Price Index). The date is mid-point of the financial year ie Q3 2002.
- In addition to the benchmarks specified by WIC, the remainder of the capital programme is benchmarked using models either extended from the WIC sizes or in a consistent manner from other treatment processes. These are used as the basis of costing Table G and establishing EARCs (Equivalent Asset Replacement Costs) for Table H (as specified by the Reporting Requirements).
- For pricing the above ground assets, the process was to break down actual projects into their constituent components, costed by itemisation of the successful tender or, increasingly, from the ATC (Agreed Target Cost) in partnered contracts.
- The process component costs are uplifted by pro-rated general project costs, design and supervision, project and programme management, tender to out-turn variation and allowable Scottish Water (client) costs to arrive at the Standard Cost for each model.
- Non-infrastructure models are based on designs to the WIC specification and the process components are priced on actual Scottish water projects.
- Where possible, data from a wide geographical spread of projects has been used. The Cost Base can therefore be said to be representative of Scottish Water's construction conditions. A very small amount of the less common process component models have small datasets. Where this has occurred, the opinion of the professional statistician has been sought as to the integrity of the cost curve.
- For the infrastructure assets, all the data analysed is Scottish Water's, normalised to the precise WIC specification checklists and is representative of the whole region.
- The advice of the professional statistician was extended to develop a quantitative approach to the application of Engineering Judgement Grades to the models. This is considered a major data quality advance over the previous subjective assessment.
- The efficiency improvements of recent years have been diluted by the need to continue to include older data to ensure there are enough data points to verify the statistical validity of the models. This older data will persist in masking efficiency gains in future returns until the datasets are sufficiently up to date.
- We have undertaken extensive analysis of the efficiency gains achieved so far in the first year of the Q&S 2 period and are confident we have matched the targets set out in the 'Strategic Review of Charges 2002-06' document.

Methodology

Data Collection

Infrastructure Assets

The return was based on a detailed analysis of term contracts and projects. Term contracts for both sewers and water mains rehabilitation in the three regions, East, West and North were analysed, as were individual contracts. Generally, individual contracts are let to undertake water mains only at the larger diameters. Sewer replacement is more generally let on a project-by-project basis at all pipe sizes.

Contracts were carefully broken down to cost elements and the frequency of occurrences of fittings (water mains) and junctions/manholes (sewers) applied in accordance with the specification. Gravity sewers data were normalised to the WIC specification of 2m to crown of pipe (ie increases for greater depth were eliminated). As water mains and pumped sewer mains follow the contours of the land at the WIC specified depths, no adjustment is required. General and overhead costs were applied strictly in accordance with the standard cost assumption checklists.

For sewers in general, materials are all contractor supplied. For water mains, the supply of materials varies between operational regions. As previously agreed term contracts have continued in all regions (though some rates have changed), SW generally supplies the pipes, pipe fittings, ancillaries and temporary works materials and the contractor supplies concrete and builder's materials in the former North area, but the contractor supplies all materials in the former East area. In the former West area, contractors source materials through Scottish Water's supply contracts. In all instances, the standard costs include for materials, whether contractor supplied or free issue from SW's warehouse stocks. Site specific costs are excluded from WIC Cost Base comparators.

Data were collected on the following standard costs:

Water infrastructure

- Mains laying:
  - Nominal bore - 100mm - Grassland
  - Nominal bore - 100mm - Rural / suburban highway
  - Nominal bore - 100mm - Urban highway
  - Nominal bore - 150mm - Grassland
  - Nominal bore - 150mm - Rural / suburban highway
  - Nominal bore - 150mm - Urban highway
  - Nominal bore - 200mm - Grassland
  - Nominal bore - 200mm - Rural / suburban highway
  - Nominal bore - 200mm - Urban highway
  - Nominal bore - 300mm - Grassland
  - Nominal bore - 300mm - Rural / suburban highway
  - Nominal bore - 300mm - Urban highway

- Mains rehabilitation:
  - Nominal bore - 100mm - Epoxy resin
  - Nominal bore - 100mm - Pipe bursting
  - Nominal bore - 100mm - Sliplining
  - Nominal bore - 150mm - Epoxy resin
  - Nominal bore - 150mm - Pipe bursting
  - Nominal bore - 150mm - Sliplining
  - Nominal bore - 200mm - Epoxy resin
  - Nominal bore - 200mm - Pipe bursting
  - Nominal bore - 200mm - Sliplining
  - Nominal bore - 300mm - Epoxy resin

Communication pipes:
- New - Long side
- New - Short side
- Renew - Long side
- Renew - Short side

Sewerage infrastructure

Sewer laying:
- 150mm Diameter - Grassland
- 150mm Diameter - Rural / suburban highway
- 150mm Diameter - Urban highway
- 225mm Diameter - Grassland
- 225mm Diameter - Rural / suburban highway
- 225mm Diameter - Urban highway
- 300mm Diameter - Grassland
- 300mm Diameter - Rural / suburban highway
- 300mm Diameter - Urban highway
- 450mm Diameter - Grassland
- 450mm Diameter - Rural / suburban highway
- 450mm Diameter - Urban highway
- 600mm Diameter - Grassland
- 600mm Diameter - Rural / suburban highway
- 600mm Diameter - Urban highway
- 900mm Diameter - Grassland
- 900mm Diameter - Rural / suburban highway
- 900mm Diameter - Urban highway

Sewer rehabilitation:
- 150mm Diameter – In-situ form
- 225mm Diameter – In-situ form
- 300mm Diameter – In-situ form
- 450mm Diameter – In-situ form
- 600mm Diameter – In-situ form
- 900mm Diameter – In-situ form
- 900mm Diameter - Man Entry

Non-Infrastructure Data

On the evaluation of the models for water treatment works, the water source was specified as SW1, requiring only coagulation, filtration and disinfection. Even for a good upland source, Scottish Water would generally include a DAF process and a clarifier, but as these are specifically excluded, for the sake of comparability the model excludes them.

Replacement of pumps and pumpsets at water pumping stations have been omitted from the return, as in previous years. However, Scottish Water has submitted a return for the replacement of sewage pumping station pumps and motors, which is an improvement over previous returns by the predecessor authorities.

Data were collected on the following standard costs:

Water above ground

Water treatment works:

J5.1 New Treatment Works Type SW1 – 12 Ml/d
J5.2 New Treatment Works Type SW1 – 5 Ml/d
J5.3 New Treatment Works Type SW2 – 30 Ml/d
J5.4 New Filtration System at Treatment Works Type SW2 – 10 Ml/d
J5.5 New Filtration System at Treatment Works Type SW2 – 30 Ml/d

Storage:

J5.6 New Service Reservoir – 1 Ml
J5.7 New Service Reservoir – 4 Ml
J5.8 Refurbishment of Service Reservoir – 6 Ml

Sewerage above ground

Sewage structures:

J6.1 Storage Tank to Combined Sewer Overflow – 750 m^3

Sewage pumping stations:

J6.2 Replacement pumps and motors – 12 kW
J6.3 Replacement pumps and motors – 30 kW
J6.4 Replacement pumps and motors – 100 kW

Treatment works:

J6.5 Primary Treatment Works p.e. 10,000
J6.6 Additional Secondary Treatment Works p.e. 5,000
J6.7 Additional Secondary Treatment Works p.e. 60,000
J6.8 New Secondary Treatment Works p.e. 5,000
J6.9 New Secondary Treatment Works p.e. 70,000
J6.10 Reconstruction of Preliminary Treatment Works p.e. 25,000
J6.11 First Time Rural Sewage Treatment Works p.e. 200
J6.12 Additional Nutrient Removal p.e. 12,000
J6.13 Additional Nutrient Removal p.e. 40,000
J6.14 Additional Ammonia Removal p.e. 2,000

Data Analysis

Infrastructure Assets

Using the process of analysis to determine a specific Standard Cost for an underground asset, the contract sums are tabulated by pipe diameter. Fittings, crossings and branches, etc are costed per occurrence and the evaluated amount for each occurrence at each size is added back to the cost for that size, based on the stipulated frequency as noted in the Table of Frequencies.

There is no allowance made for some of the more commonly occurring frequencies such as wall and hedge crossings in grassland and service crossings and minor burn crossings in all ground types, within the Reporting Requirements. We have included these additional costs to give a more accurate assessment of the unit cost and retain consistency with previous years.

As per the predecessor authorities, Scottish Water analysed several projects to determine an empirical average which was then applied to the data. Major river and rail crossings were excluded. The general items are listed and distributed pro rata to the different sizes, taking into consideration the relative lengths at each size and the weighted value apportioned to each.

The general items to which this applies are activities such as traffic management, cleaning and testing, materials handling and fencing. Care is taken to exclude those items not permitted by WIC for inclusion in the comparitors (eg overpumping and customer relations). Preliminary sums, contingencies and tender to out-turn amounts are similarly proportioned across all pipe sizes in the contract, weighted by size and length at each size. An adjustment for COPI (the Construction Output Price Index) is made and a percentage added for allowable Scottish Water overhead. The COPI adjustment is used to inflate the costs for earlier contracts to the value of money at a purchasing power equivalent to the third quarter of the year 2002, as specified in the Reporting Requirements and Definitions.

Non-Infrastructure Data

The process to evaluate above ground unit costs was to break down completed projects into component parts. Data from the predecessor authorities databases were amalgamated into a single database. Components such as pumping stations, inlet works, sludge mixers, different types of tanks and buildings were categorised into defined cost models. Most components were split into a civil and buildings element and a mechanical and electrical element. The tender costs of these elements were plotted against the most appropriate size descriptor and the date of construction was noted. For consistency, the tender date rather than beneficial use date is used – this eliminates problems associated with delays in commissioning or putting the plant into service.

Scottish Water engineering staff designed generic process models to the WIC stylised specifications and sized the process components accordingly. Actual projects constructed were broken down in a similar manner to these designs. The cost of the process model components was taken from cost curves generated by the (base-dated) project-derived components. As in previous years, Scottish Water was assisted by the expertise of specialist cost consultants and the statistical validity of the cost curves was verified by a professional statistician who provided a considered judgement as to the acceptability of the data.

Standard Cost estimates are the result of combining all the costs generated by the appropriate point on the cost curves for all the components of an individual model. Additional costs for interconnecting pipework, chambers and manholes and telemetry, derived from the analysis of a number of contracts, are added as a percentage of component costs. This construction cost is then increased by further percentages for fixed and time related charges, method related charges and provisional sums.

The total contract cost is then uplifted for corporate overhead, design and supervision costs etc. (as described in the overheads section) to arrive at a value corresponding to the checklist assumptions. All the ‘on-costs’ were generated by analysis of actual Scottish Water contracts and financial cost data and the process and principles are consistent with the methodology adopted in previous years by the predecessor authorities.

Data is only selected from projects which have been either completed or are in implementation, Data is sourced from the contract documentation. Priced tenders and out-turn costs are tabulated and project particulars noted.

The projects are assessed for suitability. Reasons for rejection could be for example the form of contract (may be insufficient detail to permit analysis) or that site specific costs cause the project costs to be unrepresentative.

The project is broken down into its component parts. The analysis of general items – preliminary work, provisional sums, contingencies etc – was pulled out from several individual tender schedules across the programme and pro rated back to project components as an add-on. Other items of a similar nature, such as roads/paving, telemetry, fencing and security also generate uplift percentages. Data from projects analysed this year in the manner described above are added to data already in the database which have been derived from projects broken down similarly in previous years.

The physical components are assessed at the sub-asset level eg tanks, sludge mixers, buildings etc. WIC specifications are then applied, the source water (for water treatment works) or effluent quality to be achieved (for sewage treatment) noted and adjustments to the components of the design noted. In addition to the civils elements of the design, generally sized by capacity, list schedules are compiled of the mechanical and electrical components, usually sized by their rating (eg pumps in kw). These form the building blocks against which the cost is allocated.

Project particulars were comprehensively documented (including design sizes of the overall plant and the individual components) and an audit trail established.

Each of the components was assigned to a particular category and for each category, data points of the cost and size of each component built up to form cost curves. An adjustment for COPI is made so that the costs are base dated. The COPI adjustment is used to inflate the costs for earlier contracts to the value of money at a purchasing power equivalent to the third quarter of the year 2002, as specified in the Reporting Requirements and Definitions. For statistical veracity, a minimum of 6 (preferably 8) points evenly spaced across the data range are preferable for each graph. The variation of the data points from the line of best fit is also a factor (the standard deviation). Where there is uncertainty, the recommendation of the statistician is taken.

Engineering Judgement Grades

This year we have employed a quantitative statistical methodology which we believe gives a significant improvement in data quality and in defining the robustness of our Standard Costs. This methodology is outlined below:

Scottish Water is required by the WIC to assess the confidence with which any models are representative of the actual assets contained within the company. This is performed using a banding process where

- Band 1 relates to models for which Scottish Water have confidence that actual figures lie within +/- 10% of the true value.
- Band 2 relates to models for which Scottish Water have confidence that actual figures lie within +/- 20% of the true value

The process, as previously implemented, relied upon qualitative assessments to place each model into its relative band.

The modelling process, whereby statistical models are produced for elements within a project, allows some quantification of the judgement process.

As an example, for a primary sewage treatment works containing the elements:

	Element	Est Cost	Standard Deviation
1.	STW Inlet Works Civils	125,000	25,000
2.	STW Inlet works M&E	108,000	21,600
3.	3 X sedimentation Tanks civils	84,000	16,800
4.	3 X sedimentation Tanks M&E	47,000	9,400

5.	Interstage Pumping Station	57,000	11,400
6.	2 X pump	32,000	6,400
7.	A general Building	22,000	4,400

Then the estimated cost of the works will be £475,000 (the sum of the independently estimated values) and the sum of the Standard Deviations will be £95,000 assuming there is an estimated 20% uncertainty in the confidence of the individual values. However, this will reduce to 8.5% (£40,650) for the combined works because not all the errors are likely to be cumulative in the same direction. In fact, the statistical calculation for the overall Standard Deviation is the mean divided by the square root of the sum of the number of elements (note there are multiple instances of some elements).

The above example is for illustrative purposes only and tries to demonstrate the quantitative approach used to assess EJGs.

A general spreadsheet can be constructed which, using the element models and the required works, can produce engineering judgement grades for that works. While such a model will be subject to some uncertainty, the methodology will be robust and will add credence to any judgement grade adopted for the model.

We have adopted this methodology. The elements comprising each project have been identified and costs provided using the statistical models. The statistical information has been further used to provide standard errors for the expected cost and 90% and 95% bands produced based on these estimates.

Overheads

The Scottish Water overhead was calculated by taking the costs charged to the capital accounts in the financial system of the three regions (North, West and East) for the year and distributing them pro rata to each project in that region. This overhead cost is then translated into a percentage by dividing it by the total cost of capital work undertaken in the year in each region. They are then consolidated to arrive at an overall percentage. As some costs are not allowable, such as scheme promotion, public meetings, compensation etc, these costs were excluded. In all cases, the inclusion or otherwise of costs was in line with the Standard Cost Assumptions, which have been completed and are included with this submission.

For all construction costs, both above ground and infrastructure, an adjustment for COPI is made to the direct costs and the percentage calculated above added for allowable Scottish Water overhead.

Conclusions of the Data Analysis

Last year, the Section J Standard Costs in the consolidated SW return was a straight average of the three previous water authorities. This year the data have been derived from an integrated database: nevertheless, the data collection and the methodology for analysis have not significantly changed this year from last, so it is relevant to examine the individual Standard Costs as presented.

Analysis against last year's submission

Using COPI to inflate the 2002 submission, the following tables can be constructed:

Water Infrastructure

		Consolidated 3 former WAs 2002 Table J submission	Consolidated 3 former WAs 2002 Table J submission	SW 2003 Table J submission	%age reduction from 2002 to 2003
Description	**Unit**	**At 3Q01 prices**	**At 3Q02 prices**	**At 3Q02 prices**	**At 3Q02 prices**
Grassland					
Nominal bore 100mm	£/m	52.1	53.4	47.4	11.13%
Nominal bore 150mm	£/m	61.4	62.9	56.5	10.20%
Nominal bore 200mm	£/m	67.2	68.8	59.9	13.02%
Nominal bore 300mm	£/m	95.4	97.7	90.8	7.03%
Nominal bore 450mm	£/m	145.9	149.4	145.9	2.34%
Nominal bore 600mm	£/m	207.3	212.3	207.3	2.34%
Suburban roads					
Nominal bore 100mm	£/m	88.2	90.3	88.2	2.30%
Nominal bore 150mm	£/m	100.2	102.6	103.3	-0.70%
Nominal bore 200mm	£/m	107.8	110.4	106.8	3.28%
Nominal bore 300mm	£/m	133.8	137.0	134.0	2.17%
Nominal bore 450mm	£/m	246.2	252.1	246.2	2.36%
Nominal bore 600mm	£/m	321.1	328.8	321.1	2.34%
Urban Streets					
Nominal bore 100mm	£/m	100.6	103.0	100.8	2.17%
Nominal bore 150mm	£/m	112.2	114.9	112.4	2.17%
Nominal bore 200mm	£/m	122.9	125.8	123.1	2.20%
Nominal bore 300mm	£/m	148.6	152.2	148.9	2.18%
Nominal bore 450mm	£/m	299.9	307.1	299.9	2.34%
Nominal bore 600mm	£/m	371.2	380.1	371.2	2.34%
Rehab epoxy resin lining					
Nominal bore 100mm	£/m	46.4	47.5	46.9	1.23%
Nominal bore 150mm	£/m	48.8	50.0	49.3	1.30%
Nominal bore 200mm	£/m	51.1	52.3	51.7	1.16%
Nominal bore 300mm	£/m	57.0	58.4	57.7	1.20%
Rehab sliplining					

Nominal bore 100mm	£/m	49.8	51.0	49.8	2.34%
Nominal bore 150mm	£/m	61.7	63.2	61.7	2.34%
Nominal bore 200mm	£/m	62.4	63.9	62.4	2.34%
Rehab pipe bursting					
Nominal bore 100mm	£/m	58.9	60.3	59.1	1.98%
Nominal bore 150mm	£/m	69.0	70.7	69.1	2.15%
Nominal bore 200mm	£/m	81.6	83.6	82.1	1.79%
Communication pipes					
New long side	£/m	363.8	372.5	363.8	2.34%
New short side	£/m	198.9	203.7	198.9	2.34%
Renew long side	£/m	425.1	435.3	425.1	2.36%
Renew short side	£/m	392.5	401.9	392.5	2.36%

Sewerage infrastructure

		Consolidated 3 former WAs 2002 Table J submission	**Consolidated 3 former WAs 2002 Table J submission**	**SW 2003 Table J submission**	**%age reduction from 2002 to 2003**
Description	**Unit**	**At 3Q01 prices**	**At 3Q02 prices**	**At 3Q02 prices**	**At 3Q02 prices**
Grassland					
Nominal bore 150mm	£/m	138.3	141.6	125.3	11.51%
Nominal bore 225mm	£/m	168.3	172.3	151.6	12.01%
Nominal bore 300mm	£/m	196.5	201.2	164.5	18.26%
Nominal bore 450mm	£/m	234.9	240.5	202.3	15.89%
Nominal bore 600mm	£/m	292.8	299.8	249.0	16.95%
Nominal bore 900mm	£/m	509.5	521.7	398.9	23.55%
Suburban Roads					
Nominal bore 150mm	£/m	203.0	207.9	189.0	9.07%
Nominal bore 225mm	£/m	235.0	240.6	228.3	5.15%
Nominal bore 300mm	£/m	265.6	272.0	272.2	-0.09%
Nominal bore 450mm	£/m	333.5	341.5	323.4	5.30%
Nominal bore 600mm	£/m	402.0	411.6	387.8	5.79%
Nominal bore 900mm	£/m	674.3	690.5	630.9	8.63%
Urban Streets					
Nominal bore 150mm	£/m	238.9	244.6	236.8	3.19%
Nominal bore 225mm	£/m	272.3	278.8	275.0	1.38%
Nominal bore 300mm	£/m	320.6	328.3	309.1	5.83%
Nominal bore 450mm	£/m	395.8	405.3	383.8	5.31%
Nominal bore 600mm	£/m	486.5	498.2	468.5	5.96%
Nominal bore 900mm	£/m	759.2	777.4	731.4	5.92%
Rehab Insitu-form lining					
Nominal bore 150mm	£/m	122.5	125.4	122.5	2.38%
Nominal bore 225mm	£/m	137.6	140.9	137.6	2.36%
Nominal bore 300mm	£/m	160.8	164.7	160.8	2.37%
Nominal bore 450mm	£/m	219.1	224.4	219.1	2.37%
Nominal bore 600mm	£/m	284.1	290.9	284.1	2.33%
Rehab man-entry					
Nominal bore 900mm	£/m	410.4	420.2	410.4	2.33%

Analysis of the standard costs of infrastructure data points shows, in general, an improvement in efficiency of the COPI rate of inflation or better. Where the efficiency gain is the rate of inflation, this is because the same Term Contracts apply, and the rates agreed last year are still current. Where the rates show a greater gain (eg water mains lay in grassland, sewer lay in grassland) better rates have been negotiated or more competitive contracts have been let in an area where SW was less competitive than other water companies.

Water non-infrastructure

Description	Unit	Consolidated 3 former WAs 2002 Table J submission At 3Q01 prices	Consolidated 3 former WAs 2002 Table J submission At 3Q02 prices	SW 2003 Table J submission At 3Q02 prices	%age reduction from 2002 to 2003 At 3Q02 prices
Water Treatment					
New WTW type SW1, 12 MLD	£/ML/d	247220	253153	234201	7.49%
New WTW type SW1, 5 MLD	£/ML/d	444608	455279	410921	9.74%
New WTW type SW2, 30 MLD	£/ML/d	168360	172401	173485	-0.63%
New filtration system at WTW, type SW2, 10 MLD	£/ML/d	110384	113033	98990	12.42%
New filtration system at WTW, type SW2, 30 MLD	£/ML/d	67407	69025	82304	-19.24%
Water Storage					
New service reservoir, 1 ML	£/ML	290982	297966	301735	-1.27%
New service reservoir, 4 ML	£/ML	171157	175265	174865	0.23%
Refurb service reservoir, 6 ML	£/ML	28964	29659	28964	2.34%

Sewerage non-infrastructure

Description	Unit	Consolidated 3 former WAs 2002 Table J submission At 3Q01 prices	Consolidated 3 former WAs 2002 Table J submission At 3Q02 prices	SW 2003 Table J submission At 3Q02 prices	%age reduction from 2002 to 2003 At 3Q02 prices
Storm detention					
Storage tank to CSO at 750 m3	£/unit	380862	390003	386577	0.88%
Pumping stations					
Replacem't pumps & motors 12kW	£/kW			1671	
Replacem't pumps & motors 30kW	£/kW			795	
Replacem't pumps & motors 100kW	£/kW			387	
Sewage treatment					
Primary treatment works PE 10000	£/kgBOD/d	1607	1646	1483	9.88%
Addit secondary treatment PE 5000	£/kgBOD/d	2897	2967	3033	-2.24%
Addit secondary treatment PE60000	£/kgBOD/d	917	939	956	-1.81%
New secondary treat STW PE 5000	£/kgBOD/d	5879	6020	5874	2.43%
New secondary treat STW PE70000	£/kgBOD/d	1699	1740	1705	2.00%
Reconstruct prelim treat PE 25000	£/kgBOD/d	664	680	396	41.76%
First time rural STW PE 200	£/kgBOD/d	21585	22103	19047	13.83%
Addit nutrient removal PE 12000	£/kgBOD/d	567	581	557	4.07%
Addit nutrient removal PE 40000	£/kgBOD/d	251	257	216	15.96%
Addit ammonia removal PE 2000	£/kgBOD/d	2367	2424	2193	9.52%

In water and sewerage non-infrastructure, all standard costs are built up from process components. New data points are added to these data sets for each annual return. A general efficiency gain is reported in most standard costs, but for J5.5, New filtration works at 30 MLD for SW2 raw water, and J5.3, New WTW at 30 MLD for SW2 raw water, in previous years the model erroneously omitted a building structure over the filtration unit. This process component model has been added to complete the process units which comprise these standard costs. This has caused an increase of almost 20% in J5.5 and a slight increase in J5.3. (The building component forms a smaller proportion of the whole WTW than the construction of a new filter only, hence has less impact on the overall standard cost.)

Similarly, an error in transcribing the formula for the inlet works m&e model last year has resulted in a major reduction in the cost of J 6.10, Reconstructing a preliminary stage of a STW at 25000 PE, (where it forms a very large part of the works) and to a lesser extent (because it constitutes a smaller proportion) of models J6.5. J 6.9 and J6.11.

With reference to J6.13 and J6.14, over the past 12 months Scottish Water has improved its cost data for each of the small number of sub asset models included in each of these standard costs. These improved data demonstrate lower unit costs for both.

A statistical analysis of the movement of costs of process components procured by SW over several years compared with inflation has been undertaken by Professor R Mattheys and his findings are reproduced below. They show conclusively that SW is constructing its assets more efficiently than previously, and that the trend is accelerating.