



## **APPENDIX B1**

### **FINAL COST BASE**

Audit report for final submission  
(15<sup>TH</sup> April 2005)

**WICS REPORTER SERVICES  
STRATEGIC REVIEW OF CHARGES 2006  
FINAL COST BASE (15<sup>TH</sup> April 2005)**

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**RECORD OF ISSUE**

<b>Issue</b>	<b>Date</b>	<b>Description</b>	<b>Prepared</b>	<b>Checked</b>	<b>Approved</b>
0	15/2/05	Draft to SW for review	JBM	DA	DA
1	21/2/05	Report on SW Issue of 7/2/2005 to WICS	JBM	DA	DA
2	7/3/05	Submission 2 <sup>nd</sup> Draft to SW for review	JBM	DA	DA
3	8/3/05	Submission 2 <sup>nd</sup> Draft to WICS	JBM	DA	DA
4	26/4/05	Submission final draft to SW for review	JBM	DA	DA
5	1/5/05	Submission on Final Cost Base to WICS	JBM	DA	DA
6	20/06/05	Incorporated as Appendix B of Reporter's Report	JBM	DA	DA

## **B1-1. INTRODUCTION**

The Water Industry Commissioner for Scotland (WICS) has functions and duties established under the Water Industry Act 1999 and confirmed in the Water Industry (Scotland) Act 2002 for the regulation of the water industry in Scotland.

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

Scottish Water has submitted its second draft Business Plan for the Q&SIII period 2006-2014. The second draft Business Plan will include estimated costs for the capital programme to maintain existing assets, secure compliance with existing obligations, meet new obligations, address changing patterns of supply and demand, improve level of service of customers and provide the facilities necessary to manage the service. WICS will use the second draft Business Plan to develop his Strategic Review 2006 (SR06) which will include a determination of the level of funding necessary to allow Scottish Water to meet its obligations.

As part of the SR06 process Scottish Water has prepared a final Cost Base in response to WICS definitions provided under cover of the WIC56 letter issued on 20 December 2004. The Cost Base definitions are those issued by Ofwat for the 2004 Periodic Review in England & Wales (PR04). The Cost Base will be used by WICS to assist in the analysis of capital efficiencies which will be applied in SR06. Scottish Water submitted drafts of its Cost Base on 7<sup>th</sup> and 25<sup>th</sup> February 2005. The draft submissions were audited by the Reporter and reviewed by an Independent Technical Expert appointed by WICS. Scottish Water submitted its final Cost Base on 15<sup>th</sup> April 2005.

The Reporter was instructed by WICS to report on the final Cost Base submission.

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

The team reviewed the scopes of work and estimates prepared by Scottish Water for each element of the draft Cost Base. Following this initial review the team met with staff in Scottish Water and followed audit trails to the source data. The audit focused on understanding Scottish Water's response to the definitions. Particular attention was paid to consistency between the development of scope and estimates for the second draft Business Plan and the draft Cost Base.

The Reporter submitted reports on the two previous drafts of Scottish Water's Cost Base. This report builds on our previous reports on the draft Cost Base. Changes to the standard cost estimates from the draft submissions have been highlighted and commented on.

This report has been prepared by the Reporter for the use of the Water Industry Commissioner for Scotland and Scottish Water only and is written assuming the knowledge already held by these organisations and the objectives of these organisations in undertaking the work covered by the report. No responsibility is accepted by the Reporter or Black and Veatch for any reliance that may be placed by any third parties on the information contained in this report.

## **B1-2. REPORTING REQUIREMENTS**

### **B1-2.1 Role of the Reporter**

The “Role of the Reporter” is set out in the “Cost Base, Benchmarking and Efficiency Studies” information requirements which accompanied the WIC56 letter.

In this section of the report we have addressed the general issues identified in the “Role of the Reporter”. Our commentary on the standard cost estimates in Tables 1, 3, 5 and 7 is set out under the following headings:

1. Changes from the draft submission
2. Methodology and data sources.
3. Consistency with Business Plan estimates
4. Comments by line
5. Comments on Engineering Judgement Grades

We also provide commentary on tables 2, 4, 6 and 8 covering the allocation of expenditure in the Business Plan against categories of standard costs in the Cost Base.

### **B1-2.2 Methodology and Data Sources**

When auditing the Cost Base we have:

- Reviewed the scope of each estimate or group of estimates against the information requirements.
- Reviewed the scope of the cost estimates against the definitions in the information requirements and the methodology and assumptions used by Scottish Water to develop the scope of the estimates in the second draft Business Plan.
- Reviewed the sources of cost information used by Scottish Water to confirm that they are consistent with the cost information used to prepare the estimates in the second draft Business Plan.
- Reviewed the application and exclusion of on-costs, risk and contingencies against the exclusions required by the definition of the standard costs.

We believe that Scottish Water has complied with the specific direction of the information requirements and has broadly completed the checklists correctly. We have commented on any minor issues identified in the detailed commentary.

We have reviewed Scottish Water’s development of the scope included in the standard costs and commented on differences between the criteria applied to the Cost Base and the criteria being applied to the second draft Business Plan. We understand that these will be further reviewed by the independent Technical Expert appointed by WICS who will advise on whether Scottish Water’s interpretation is reasonable when compared with the Ofwat Cost Base benchmarks.

We believe that the estimates in the second draft Business Plan are broadly consistent with the standard cost estimates in the Cost Base. Based on our sample audits we have identified one remaining area where we believe that it has not been possible to demonstrate consistency between the equivalent estimates in the Business Plan and the Cost Base. This is the consistency between the unit rates used in the standard cost estimates for sewage structures (Table 7) and the estimates in the Business Plan for unsatisfactory intermittent discharges.

### **B1-2.3 Commentary on Standard Costs not completed by Scottish Water**

Scottish Water has indicated that it will not complete the following standard cost estimates:

Table 1                    *Mains rehabilitation by pipe insertion.*

We understand that Scottish Water does not undertake mains rehabilitation by pipe insertion. We understand that pipe insertion has not been used as a method of pipe rehabilitation when developing infrastructure maintenance estimates for the Business Plan. On this basis we accept that it is reasonable to omit the equivalent standard cost from the Cost Base.

Items 1.16                *New communication pipes*

Standard costs for new communication pipes were included in the draft Cost Base submission. Scottish Water's second draft Business Plan assumes that the primary infrastructure associated with new development will be provided by the developer and not by Scottish Water. Therefore there is no investment on new communication pipes in the Business Plan. On this basis we accept that it is reasonable to omit the equivalent standard cost from the Cost Base, while noting that water companies in England and Wales do undertake new development work, which is paid for by the developer. Scottish Water may choose to undertake such work in Scotland.

Items 1.18 & 1.19    *Household meters.*

Scottish Water does not have a significant number of household meters and the Business Plan does not allow for investment in household meters. Scottish Water's proposed investment in meters in the Business Plan covers the maintenance and replacement of commercial meters. Whilst accepting that it is probably reasonable to omit the equivalent standard cost from the Cost Base, we would note that opting for a meter is still possible in Scotland and that Scottish Water should have costs available. However, given that the numbers are very small any cost that Scottish Water has may not be compatible with the much larger programmes in England and Wales.

Item 3.3                 *New abstraction borehole treatment works with simple disinfection only, output 8Ml/d.*

We do not believe that borehole sources are likely to form part of Scottish Water's investment plan and that it is reasonable for it to omit this standard cost from the Cost Base. Scottish Water has been instructed not to include any work under the DW19 driver in its business plan. In its investment plan Scottish Water is including an amount for augmenting its resources when removing development constraints. It is conceivable that boreholes may prove to be a viable solution in one or two areas, but these would not form a significant part of Scottish Water's capital programme.

Item 3.5

*Alterations to water treatment works type SW2, output 30Mld*

This standard cost is for a membrane plant to act as a barrier to cryptosporidium. We confirm that under the Scottish Cryptosporidium Direction Scottish Water is implementing improved washwater recovery at existing filter works rather than membrane plants. Therefore it seems reasonable for Scottish Water to omit the standard cost from its Cost Base submission.

Item 3.6

*Installation of a nitrate removal plant at a borehole treatment works with simple disinfection only, output 10Mld*

We are not aware of any nitrate removal plants being included in Scottish Water's investment plan. On this basis we accept that it is reasonable to omit the equivalent standard cost from the Cost Base.

Item 3.7

*Cryptosporidium protection to an existing borehole, output 2.5Mld*

Scottish Water states that it will not have to put protection to borehole sources under the Scottish Cryptosporidium Directions, even when the risk is high. We confirm that this is the case. On the basis that this is a borehole source we believe that Scottish Water is correct in its statement that this standard cost should be omitted. We note that a significant part of Scottish Water's proposed capital programme comprises nanofiltration plants, constructed at small remote surface water sites but confirm that they do not have a cryptosporidium risk as a driver.

Items 3.8 &amp; 3.9

*New service reservoirs*

Standard costs for new service reservoirs were included in the draft Cost Base submission. Scottish Water's second draft Business Plan does not include investment in new service reservoirs outside the boundaries of water treatment works. Scottish Water has included investment in treated water storage within some smaller water treatment quality programme estimates to enhance security of supply. We believe that this serves the same function as a service reservoir. We acknowledge that these will be smaller than the examples required in the cost base.

Table 5

*Sewer laying by pipejacking or microtunnelling*

Scottish Water has not completed these entries because pipejacking or micro tunnelling does not form any significant part of its current

programme or historic cost base. Pipejacking or micro-tunnelling has not been used as a method when developing estimates for the Business Plan. On this basis we accept that it is reasonable to omit the equivalent standard cost from the Cost Base.

Item 5.15 *Construction of a self contained pumping unit to isolate a domestic property.*

This item appears to relate to sewage flood alleviation. Scottish Water has a significant sewer flood alleviation programme in its Business Plan which has been costed using an average rate per property developed from historic schemes. These will include a range of techniques and might include self contained pumping units to isolate a domestic property. On this basis, it might have been appropriate to submit a standard cost for Item 5.15. However, we believe that Scottish Water does not have the information which would allow it to separate the costs of any pumping solutions from the average scheme cost or identify the value of work in the programme associated with this type of solution. As a result any estimate of the associated proportion of work low confidence grade.

Item 7.8 & 7.9 *Upsize existing dry well in-line pumping station from 12kW to 30 kW capacity*

Scottish Water has not completed this entry because upsizing pumping stations does not form any significant part of its programme. When projects are properly defined Scottish Water may find the need to undertake some upsizing of pumping stations when planning to remove development constraints. However, any such work is likely to be small in relation to the whole programme and we accept that it is reasonable to exclude this standard cost from the Cost Base.

Item 7.13 *Installation of denitrification at existing secondary works, p.e. 40,000*

Scottish Water has not been set denitrification standards for the Q&SIII period. Work of this nature is not included in the Business Plan. On this basis we accept that it is reasonable to omit the equivalent standard cost from the Cost Base.

Item 7.20 *New enhanced sludge treatment facility, throughput 2ttds per annum.*

The Business Plan includes estimates for treating additional sludge arising from the wastewater quality programme. The scope of work is based on the extension of existing plant which includes enhanced sludge treatment facilities. The work appears to be scoped on the same basis as a new treatment facility. Therefore we conclude that the Cost Base model 7.20 is reasonably representative of a significant element of the Business Plan costs. On this basis, we believe that it would be reasonable for Scottish Water to include this standard cost in its Cost Base Submission. However, we note that Ofwat did not publish a benchmark for this item in its report of January 2005. In the absence of a comparative benchmark completing this standard

cost will not inform the comparative efficiency assessment and completing the estimate might not be worthwhile.

#### **B1-2.4 Company Specific Factors**

Scottish Water has not adjusted any standard cost estimates to reflect company specific factors which might explain part or all of the differences between its Cost Base and the Ofwat PR04 standard costs for England & Wales.

In some standard cost estimates Scottish Water has applied a “Company Specific Factor (regionality)”. This factor was developed within the Scottish Water’s costing systems to explain part of the regional variations thought to occur within tender costs across Scotland. It is intended to represent costs over and above the site specific and other items excluded from the standard costs in accordance with the Cost Base specifications. We have described the basis of this adjustment in an Appendix to our main report on the second draft Business Plan concerning costing systems. A copy of the Appendix has been included with this report on the final Cost Base submission. We have found it difficult to establish a clear audit trail between this adjustment and historic cost data. However, we have concluded that it is not unreasonable and has been applied to the Cost Base and the Business Plan estimates in a consistent way.

#### **B1-2.5 Engineering Judgement Grades**

Scottish Water generally reports engineering judgement grades of B3 for its standard costs with B2 engineering judgement grades applied to pumping stations in Tables 3 and 7 and renew communication pipes in Table 1.

In general, we believe that a reliability band of B is a reasonable representation of Scottish Water’s data. In some instances Scottish Water has relied on standard UK costing models. For its non-infrastructure quality programme estimate Scottish Water has relied on estimates based on data and costing systems from an English water and sewerage company, consistent with the equivalent Business Plan estimates. While this reduces the reliability grading of the overall estimate, we believe that the reliability band of B remains reasonable.

The accuracy banding for the estimates returned by Scottish Water does not necessarily reflect the statistical calculation of the standard errors of the data sets and cost functions on which the estimates are based. Scottish Water has undertaken a statistical analysis of its infrastructure standard cost estimate which demonstrates that a 90% confidence limit on the mean estimate can be greater than the  $\pm 20\%$  or  $\pm 30\%$  reported. As a result, a strict statistical representation of the engineering judgement grade may, in some instances be a B4.

While reaching this conclusion we would note that:

1. In most instances where the statistical analysis suggests a B4 engineering judgement grade the assessment is marginal with the grade just within the B4 band.

2. The calculated accuracy grade represents the selection of a single estimate from a single cost function. The accuracy band for a number of estimates in a programme of work will be much narrower than the B4 engineering judgement grade of a single estimate would imply.
3. The assessment for sewerage particularly is affected by the use of data from a number of term contracts each of which create a relatively tightly grouped set of estimates. For this type of data a normal distribution may not be representative of the distribution of the underlying data and is likely to overestimate the spread of the data.
4. The standard cost estimates appear to be broadly representative of the data used to prepare the estimates in the Business Plan.

Taking account of these issues, we believe that a B3 engineering judgement grade is a reasonable representation of the accuracy of the infrastructure standard costs despite the results of the strict statistical analysis.

Scottish Water has reported a confidence grade of C4 for Items 1.12a and 1.13a (sliplining) on the basis that the rates have been extrapolated from standard cost estimates for lower diameters. We consider this to be reasonable.

Scottish Water has demonstrated that the rates used to estimate the Business Plan are broadly consistent with those used to prepare the standard cost estimates. On this basis, we see no reason why the relevant standard cost estimates should be excluded from the analysis of comparative efficiency on the basis of confidence grade. Scottish Water disagrees with this conclusion and believes that any item with a confidence grade of C4 should be excluded from the comparative efficiency analysis whether or not the relevant rates have been used to cost the Business Plan.

Scottish Water has not reported any statistical analysis of the Scottish Water Solutions' quality programme costing systems which would allow the accuracy of cost base items prepared using that system to be assessed.

We have reviewed the engineering judgement grades provided by Scottish Water. We have commented on individual engineering judgement grades in our detailed commentary on each table.

### **B1-2.6 Independence of Company Estimates**

Scottish Water delivers most of its Q&SII investment through Scottish Water Solutions which includes two English Water and Sewerage Companies (WASC). We understand that Scottish Water has taken advice from these partner companies on the interpretation of the Cost Base specifications, drawing on their experience of the PR04 Cost Base submissions in England & Wales.

In our detailed commentary we have drawn attention to areas where we consider Scottish Water's interpretation of the Cost Base scope to be significantly different from its methodology used to scope solutions for the second draft Business Plan. WICS has appointed a Technical Expert to compare Scottish Water's interpretation of the standard cost specifications with the Ofwat benchmarks for England & Wales which will form the basis of the capital efficiency assessment.

Scottish Water has used a costing system provided by Scottish Water Solutions to cost the standard costs which align with the quality programme. This costing system is predominately based on projects carried out by one WASC in England and may have been used in part to prepare the PR04 standard cost estimates submitted to Ofwat by the partner company.

Scottish Water Solutions' costing system includes a nanofiltration cost function developed from data provided by Scottish Water. This cost function has not been used in the Cost Base estimates.

#### **B1-2.7 Difference in Standard Costs Compared with Previous Submissions**

Comments on changes between the draft and final Cost Base submissions are included in our commentary on individual estimates.

We note that the Cost Base submission for the Business Plan is not directly comparable with previous Cost Bases submitted by Scottish Water in its Annual Returns. In particular, we do not believe that it should be used to draw conclusions about movements in Scottish Water's investment efficiency from previous years.

#### **B1-2.8 Standard Cost Estimates Base Date**

The standard cost estimates have been prepared at a common base date of Q3 2002-03 using COPI. The estimates are presented at a COPI index of 128.

## **B1-3. WATER INFRASTRUCTURE STANDARD COSTS**

### **B1-3.1 Table 1: Water infrastructure standard costs**

#### **Changes from the draft Cost Base submission**

Scottish Water has revised the standard cost estimates for Table 1 from the draft submission by:

1. Including the same corporate on-cost of 3.00% which was applied to the AR04. The draft submission included a corporate on-cost of 3.15%.
2. Including the tender to out-turn adjustment of 2.82% which was included in the AR04 estimates. The draft submission excluded this tender to out-turn adjustment.
3. Including a Company Specific Factor (regionality) of 1.61% of the total estimate (equivalent to 2.1% applied to construction costs only). We have described this factor in the Appendix to our report on the second draft Business Plan concerning costing systems.
4. Omitting the standard costs for new communication pipes (Items 1.16) for reasons described in Section 2.3 above.
5. Re-calculated the rates for Item 1.17 – new communication pipes to take account of the specific lengths in the Cost Base definitions as revised by Ofwat for PR04.

As a result of points 1 to 3 above, the final standard costs have generally increased by approximately 4.6% over the draft standard costs previously submitted.

#### **Introduction**

Scottish Water made a complete return of water infrastructure standard costs in Table 1 with the exceptions of “mains rehabilitation by pipe insertion”, “new communication pipes” and “household meters” (see Section 2.3 above).

The rates submitted are based on the cost data and rates analysis used to generate the water infrastructure standard costs in AR04 Table J1. Our comments on the standard costs are based on our audit of the AR04 Cost Base.

A standard adjustment has been applied to the AR04 standard cost estimates for infrastructure to produce the Cost Base as follows:

1. Divide by 134 and multiply by 128 to adjust by COPI from Q3 2003 to Q3 2002.
2. Add a Company Specific Factor of 1.61% of the total estimate (equivalent to 2.1% to the construction cost only). We have described this factor in the Appendix to our main report on the second draft Business Plan to our report on the second draft Business Plan concerning costing systems.

## Methodology and data sources

We believe that Scottish Water has made a robust assessment of the standard costs which reflect current technical standards and its current cost base.

The cost data used to prepare the infrastructure standard costs are Scottish Water's own data from April 2003 onwards.

The standard costs have been prepared using the following data sources:

- Historic term contracts in use in 2003-04.
- Analysis of individual historic projects.
- Target cost estimates by Scottish Water Solutions based on the standard cost estimates which form part of the contract between Scottish Water and Scottish Water Solutions.
- Individual contracted rates, equivalent to the standard cost estimates, written into the service agreement between Scottish Water and Scottish Water Solutions.

The cost data was used to develop a range of estimates consistent with the WICS definitions for standard costs. Where appropriate these estimates are subject to statistical analysis to develop a cost function for different types of main and surface type or method of rehabilitation. The rates are inclusive of appropriate on costs but exclude site specific items as indicated in the item definitions. Diameter is used as a descriptor in the cost functions.

The standard costs include percentage additions of:

- 3.00% to cover Scottish Water's internal management costs.
- 2.82% to cover changes between tender and outturn.

During our detailed audit of the AR04 submission we identified a number of minor concerns about the standard cost estimates and we recommended that these be addressed in future standard cost submissions. These have not been addressed for the current submission. While the issues raised may affect the accuracy of the standard costs we believe that they do not affect consistency between the standard cost estimates and the Business Plan. The issues identified were:

1. No assessment has been made of whether the balance of term contract rates specific project rates and Scottish Water Solutions estimates reflects the balance of work carried out by Scottish Water. We would expect term contracts to include lower unit rates and that a majority of work on mains laying would be undertaken through term contracts. If this balance of work was assessed and included in the analysis, it might result in lower standard cost estimates.
2. At times we found it difficult to establish a clear audit trail to the source data and were unable to reconcile the estimates provided with the original contract documentation. It was not clear what level of checks and reviews was applied when developing the individual data points. We recommended that Scottish Water review and formalise its procedures for checking and reviewing the estimates. We recognise that there is a need to strike a balance

between the large quantity of data which must be processed to maintain a substantive cost base and maintaining absolute audit trails and accuracy. We do not believe that the issues raised on individual estimates are systematic or bias the estimates in a particular direction.

3. We recommended that Scottish Water developed a consistent approach to the use of Scottish Water Solutions estimates including issues such as:
  - Application of inflation.
  - Application of management fees.
  - Application of tender to outturn costs.
  - Source of insurance costs.

The estimates have been developed from historic or current projects and reflect the choice of pipe material, pressure rating, bedding and depth of pipes laid by Scottish Water.

Scottish Water has followed the fittings frequency stated in the Information Requirements.

Scottish Water notes in the standard cost check list that the costs do not include “minor service diversions”. We understand that Scottish Water does not pay easement costs or wayleave costs as they are entitled to serve notice to obtain access.

The estimates include an allowance for tender to out-turn adjustment which should cover contractual claims, contingencies and any other general adjustments. We have not audited this percentage adjustment. It has been applied to the Cost Base estimates and the Business Plan estimates in a consistent way.

The estimates are based, in part, on rates from the contract between Scottish Water and Scottish Water Solutions which allows for pain-gain incentive payments. No allowance for pain-gain payments has been included in the standard cost estimates. At the time the standard cost estimates were prepared for AR04 Scottish Water noted that no pain-gain payments had been made under the contract and there was not enough experience of the contract to make an assessment of future pain-gain payments.

The estimates are also based, in part, on a range of historic projects across Scotland. These include any company specific factors to the extent that they were included in the source projects. It is not clear to us whether or to what extent this might duplicate the Company Specific Factor (regionality) added to the rates. The impact of any possible duplication would effect the Business Plan estimates as well as the standard cost estimates.

### **Consistency with the Investment Plan Estimates.**

We confirm that the most significant Investment Plan estimates are consistent with the Cost Base. Some rates for more minor work are based on historic spend or DLO rates.

**Comments by Line**

- Lines 1 to 4      The standard cost estimates are based on statistically derived cost functions which use a common data set from a range of term contracts, specific projects and Scottish Water Solutions target cost estimates.
- Lines 5 & 6      The standard cost estimates are the estimates used in the 2002-03 return inflated using COPI. We understand that they were originally derived from project and term contract data in 2001. Scottish Water has continued to use these historic estimates because they have not undertaken any significant work on mains laying in these larger size bands to provide updated information.
- We found that it was difficult to establish an audit trail to this data. We recommend that Scottish Water formalise its internal records and audit trails to standard cost estimates to ensure that figures carried from one return to another can be supported by the detailed analysis originally used to prepare them.
- Lines 7 to 9      Standard cost estimates for mains laying by directional drilling have been taken from a single term contract.
- Lines 10 to 15      *Surface applied internal coating*
- The standard cost estimates for surface applied internal coatings are based on one project for which Scottish Water Solutions has prepared a standard cost. The project data covers 100 mm and 150 mm nominal bore pipes only. The standard cost estimates for 200 mm and 300 mm are a linear projection of the two lower rates and not supported by project data. Scottish Water has reduced the confidence grade for the larger nominal diameters to reflect the extrapolation.
- Lines 10 to 12      *Sliplining*
- The standard cost estimates for slip lining are derived from a combination of a term contract and Scottish Water Solutions target cost estimates but are dominated by Scottish Water Solutions target cost estimates.
- Lines 10 to 15      *Pipe insertion*
- Scottish Water has not provided a standard cost estimate for this category of work.
- Lines 10 to 12      *Pipe bursting*
- The standard cost estimates for pipe bursting have been derived from a combination of a term contract and Scottish Water Solutions target cost estimates. The statistical model produced covers the full range of nominal pipe diameters in the return.
- Lines 16          *New communication pipes*

Scottish Water has not prepared estimates for new communication pipes. Scottish Water expects any new communication pipes in to be installed by developers as part of the primary infrastructure. As a result the Business Plan estimates do not include new communication pipes. We have commented on this further in Section 2.3.

Line 17 *Renew Communication pipes*

The standard cost estimates for communication pipes reflect the standard costs in the contract between Scottish Water and Scottish Water Solutions. The estimates have been adjusted to reflect the communication pipe lengths set out in the standard cost specifications.

We note that this cost reflect the costs of major programmes of replacement associated with the mains renewals programme. It is not consistent with the cost of customer requested lead communications pipe renewals that Scottish Water is putting forward in its investment plan. We believe that this approach is likely to be consistent with those stated in the benchmark but WICS may like to confirm this with Ofwat.

Lines 18 to 19 *Household meters*

Scottish Water has not prepared estimates for household meters. Scottish Water does not have a significant number of household meters and the Business Plan does not allow for investment in household meters. Scottish Water's proposed investment in meters covers the maintenance and replacement of commercial meters. We have commented on this further in Section 2.3.

### Comments on Engineering Judgement Grade

We have commented on Scottish Water's overall approach to and assessment of engineering judgement grade in Section 2 and noted that the accuracy assessment included in the engineering judgement grades is not based on a statistical analysis of the cost data and cost functions. However, we believe that the engineering judgement grades attributed by Scottish Water are broadly reasonable subject to any individual differences of opinion noted below. We note that there is broad consistency between the Business Plan estimates and the standard cost estimates. We do not believe that any of the standard costs submitted by Scottish Water should be excluded from the comparison with the Ofwat benchmarks on the basis of their engineering judgement grade.

Lines	Description	Eng. Judgement Grade	
		SW Return	Reporter
1.1 to 1.4	Mains laying – nominal bore 100 to 300 mm	B3	B3
1.1 to 1.6	Mains laying – nominal bore 450 to 600 mm	B3	B3
1.7 to 1.9	Mains laying by directional drilling	B2	B2

Lines	Description	Eng. Judgement Grade	
		SW Return	Reporter
1.10a to 1.11a	Mains rehabilitation – surface applied internal coating (100mm and 150mm nominal bore)	B2	B2
1.12a to 1.13a	Mains rehabilitation – surface applied internal coating (200mm and 300mm nominal bore)	C4	C4
1.10b to 1.12b	Mains rehabilitation – sliplining	B2	B2
1.10d to 1.12d	Mains rehabilitation – pipe bursting	B3	B3
1.16	New communication pipes	Not submitted	
1.16 to J1.17	Renew communication pipes	B2	B2
1.18 to 1.19	Household meters	Not submitted	

### B1-3.2 Table 2: Water mains projected expenditure

In Section 3.2 of its narrative Scottish Water presents a table showing the changes from its 1<sup>st</sup> cost base submission. The changes arise from two causes:

1. The mains rehabilitation for quality (iron and manganese) was initially based on the proposals in the 1<sup>st</sup> draft business plan. In this plan this work was estimated at £50M and was based on epoxy lining all the mains. This work was re-examined for the 2<sup>nd</sup> draft business plan in more detail and the cost was reduced to £41M, based on cleaning and air scouring without epoxy lining where there were manganese failures only. Epoxy lining was still considered to be necessary where there were iron failures. This has significantly reduced the proportion of spend on surface applied internal coating in Line 2.7.
2. The split between grassland, rural/suburban highway and urban highway has changed for mains laying or replacement in lines 2.1 to 2.3. The revised figures have been obtained from the latest figures for this year's programme of works undertaken by SWS. The proportion comes from site returns made by SWS project managers and are based on latest best estimates for the work where the work has not yet been completed. SWS does not record work done in the WIC categories and the following assumptions were used:
  - o main road was taken as urban;
  - o side road and footpath was taken as suburban; and
  - o unmade was taken as grassland.

The assumed split between replacement and sliplining is shown below and has not changed from the first cost base submission for distribution mains:

#### *Distribution Mains*

- 29% of pipes less than 150mm are in open cut.
- 71% of pipes less than 150mm are slip-lined or pipe burst.

- 10% of pipes 150mm and greater are open cut.
- 90% of pipes 150mm and greater are slip-lined or pipe burst.

#### *Trunk Mains*

For the first submission all capital maintenance was assumed to be in open cut and in grassland. For this submission, trunk mains costs comprise approximately 50% for the Invercarnie aqueduct and approximately 50% for other trunk mains. The former is assumed to be sliplined and the latter is assumed to be split as per the distribution mains.

During our audit we noted that reactive maintenance, which had been substantially increased in the 2<sup>nd</sup> draft business plan, had not been included in the analysis. At the same time Scottish Water noted an error in its calculation. Scottish Water has now amended its submission of Table 2. This has resulted in a significant change to the amount of costs allocated to the surface types in Table 2. We assume that Scottish Water will be resubmitting this table.

For the 1<sup>st</sup> cost base submission we concluded that “*while the allocation to road types may be reasonable we are unable to audit the derivation of the figures. We suggest that SW ask SWS to analyse its recent work to see what the current situation is prior to the final submission. In discussion with Scottish Water we noted that they have already commenced to plan the first two years’ work for Q&SIII. This analysis provides detailed maps of the work and Scottish Water has stated that this will also enable it to provide a much improved split for the next submission*”.

For this submission we conclude that the reported figures are generally representative of its Q&SIII programme subject to the following comments:

1. The errors found in Table 2 of Scottish Water’s original submission means that the revised submission should be used in any comparison undertaken by WICS.
2. The new figures by surface type show a large percentage allocated to grassland. This is based on the 2003/4 programme of Q&SII as recorded from contractor’s returns. We accept that this is reflective of that programme. We have queried the percentage allocated to grassland. We are informed that the percentage can partially be explained by the fact that much of the reporting year’s programme is in the predominately rural areas of Black Isle and the islands. While SWS always tries to site mains in unmade ground and verges as the cheapest alternative, this cannot be done to the same extent in urban areas. This means that the reported figures may not adequately represent the Q&SIII programme if the nature of the work changes.

While Scottish Water could have estimated these percentages from the Q&SIII work for the first two years that it is currently developing we acknowledge that this may not be representative of the whole programme and would entail Scottish Water in site surveys if an accurate answer was required.

## **B1-4. WATER NON-INFRASTRUCTURE STANDARD COSTS**

### **B1-4.1 Table 3: Water non-infrastructure standard costs**

#### ***B1-4.1.1 Introduction***

##### **Overview**

Scottish Water has substantially updated Table 3: Water non-infrastructure standard costs for the final Cost Base submission of 15th April. This section of our report expands on our report on the draft submission of 25<sup>th</sup> February.

In this final submission Scottish Water has provided standard cost estimates for:

Item 3.1	New water treatment works type SW2, output 30MI/d
Item 3.2	Replacement filtration system at an existing water treatment works, type SW2, output 30Mld.
Item 3.4	Fitting new plumbosolvency control to an existing abstraction borehole treatment works with simple disinfection only, output 8Mld
Item 3.10	Refurbishment of service reservoir, capacity 6 MI.
Items 3.11 – 3.18	Pumping stations

Scottish Water has withdrawn the standard cost estimates for Items 3.8 and 3.9 – New service reservoirs as it does not believe that the specification is representative of work included in the second draft Business Plan (see Section 2.3 above).

##### **Methodology and data sources**

The standard costs estimates for water non-infrastructure have been prepared using three different sources of cost information:

System A	Scottish Water's costing system, based on WATCOST and populated with data from tendered projects in Scotland, supplemented by cost functions from TR61.
System B	Framework contracts between Scottish Water Solutions and its Q&SII supply chain.
System C	Scottish Water Solutions costing system based mainly on projects undertaken in England over the last 10 years, used to develop Q&SIII estimates for the quality programme.

These systems are described in detail in the Appendix to our main report on the second draft Business Plan concerning costing systems.

## Consistency with the Business Plan

### *Costing System A - Scottish Water's WATCOST System*

Scottish Water's WATCOST costing system has been applied to develop non-infrastructure maintenance estimates for the Business Plan. It has not been used to produce any standard cost estimates.

In our report on the Costing Systems we noted a concern that Scottish Water's capital investment costing systems for non-infrastructure maintenance was developed from historic projects which consisted of new works or major extensions to existing works. Business Plan interventions for non-infrastructure maintenance can include part replacement of plant and this is estimated by applying a percentage to a relevant cost function. The percentage applied is a matter of judgement. During the audits of the first draft Business Plan we noted cases where the resulting cost estimate appeared to be high relative to the scope of work required. We believe that this is an area where the standard cost estimates being developed for plant replacement using Scottish Water Solutions Framework contracts (Costing System B) may be more representative of the true cost of partial plant replacement.

Costing System A was used by Scottish Water to develop pumping station estimates. These are broadly equivalent to the standard cost estimates for pumping stations in the Cost Base produced using Costing System B described below.

### *Costing System B - Scottish Water Solutions Framework Contracts*

A number of standard cost estimates (particularly those for the pumping stations) have been built up using Scottish Water Solutions framework contract rates. Two rates have been used: the Schedule A rates for labour and small plant and current supplier framework prices for the supply of mechanical and electrical equipment. We believe that the Cost Base standard costs estimated in this way are a reasonable reflection of current costs. However, this method has not been applied to the investment plan, where the costs are derived from cost curves for a complete installation, applying a factor to allow for refurbishment where applicable (see also our comments on Costing System A above).

Since our audits of the draft Cost Base, Scottish Water has demonstrated that the Business Plan estimates for major refurbishment of pumping stations (which Scottish Water assumes are 65% of the cost of a complete installation) are broadly consistent with the standard cost estimates subject to exclusions of items of scope in line with the standard cost definitions. On this basis we have concluded that the standard cost estimates are broadly consistent with the equivalent major refurbishment estimates in the Business Plan.

### *Costing System C – Scottish Water Solutions quality programme estimating system*

From detail audit checks we were able to confirm that the Scottish Water Solutions cost functions applied to Cost Base are those being applied to the second draft Business Plan estimates for water and wastewater treatment.

## **B1-4.1.2 Water Treatment Works(Lines 3.1 to 3.7)**

### **Comment by Line**

Line 3.1                      *New treatment works type SW2, output 30Ml/d*

Revisions	<p>Scottish Water has revised the standard cost estimate from the draft submission by:</p> <ol style="list-style-type: none"><li>1. Adjusting the allowance in the design flow rate for losses.</li><li>2. Adjusting chemical storage volumes to align with the assumptions of the Business Plan.</li><li>3. Adjusting the rates for static mixers to align with changes to the estimating system applied to the Business Plan.</li></ol>
Process design	<p>We note that these changes meet a number of our concerns but we repeat below a number of our previous comments that we still believe are relevant.</p> <p>Scottish Water's design is based on an assumed raw water quality for a lowland river with a maximum colour (true) of 10°Hazen and maximum turbidity of 5 NTU.</p> <p>Based on the raw water assumptions SW has assumed that clarification is not necessary and proposed direct filtration. If the assumed turbidity and colour values are deemed appropriate and the proposed aluminium sulphate doses are acceptable the use of direct filtration is suitable.</p> <p>Scottish Water's assumption has significant cost implications as it allows Scottish Water to exclude a clarification stage. As well as the direct impact, this omission will reduce the water wastage, which influences the works input and allows operating at lower aluminium sulphate doses with a consequent reduction in the size of chemical facilities. Others may have included a clarification stage.</p> <p>Ofwat's definition of a W2 works is a single stage complex physical or chemical treatment. Scottish Water indicates that this is why it is reasonable to choose simple filtration as the basis for the standard cost estimate.</p> <p>Scottish Water has assumed that flocculation will not be required. We would always include flocculation before direct filtration including on surface waters for the turbidity and colour values assumed. We suggest that this assumption is checked against the benchmark.</p> <p>Flow and solids balance depends on the water quality assumptions and hence treatment process. The proposed balance is generally appropriate for the proposed treatment; although maximum flow for the design of chemical dosing plant does not take account of the washwater recycle flow. We believe that this results in a chemical plant that is slightly undersized.</p> <p>Below we give some additional information against the units provided in the Cost Base:</p>

*Filtration system*

The proposed number of filters, filter dimensions, filtration rate, nozzle density and valve/penstock sizing are considered to be adequate, irrespective of the quality of raw water treated. We note that the filter costs are based on a simple throughput criterion that reflects the designs of the projects making up the curve, and therefore the sophistication of the design is not needed.

The design solids loading is adequate for a direct filtration application.

*Dirty washwater storage system*

The Scheme Definition does not require filter backwash water treatment.

Only one storage tank of capacity equivalent to one wash volume is proposed. Scottish Water argues that the non variable raw water quality assumed will allow regular timed backwashes, allowing the single backwash volume to be acceptable. Normal plants, where quality varies, would normally have backwash tank volumes for several filter washes (at least two wash volumes or two tanks each of capacity equivalent to one wash volume).

We recommend that these assumptions are checked against those of the benchmark.

*Chemical dosing system*

The aluminium sulphate dose appears to be low and the basis should be justified. An acid (or further aluminium sulphate) or lime would be needed for coagulation pH correction but has not been included by Scottish Water. Inclusion of coagulation pH correction will also make it consistent with the programme process design. Scottish water argues that the standard cost definition excludes the need for pH correction although we note that the statement includes the words “...except where such a dose is an integral part of the treatment process proposed.” We believe this to be the case.

We consider the chlorine doses to be high, although the maximum dose is consistent with the programme process design. Average chlorine dose and sulphur dioxide doses are inconsistent with the programme process design.

## Costs

The standard cost estimate was prepared using Scottish Water Solutions’ costing system (System C above). We were able to confirm that the cost functions applied to the standard cost estimate are the same functions applied to the Business Plan estimates.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and

management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

A denominator of 30 Mld has been used.

Line 3.2	<i>Replacement filtration system at an existing water treatment works, type SW2, output 30Ml/d</i>
Revisions	Scottish Water has revised the standard cost estimates from the draft submission by adjusting downwards the allowance in the design flow rate for losses.
Process Design	As for Item 3.1 the design is based on an assumed raw water quality for a lowland river with a maximum colour (true) of 10° Hazen and maximum turbidity of 5 NTU. The design uses similar criteria to Line 3.1 and our comments above apply.
Costs	<p>The standard cost estimate was prepared using Scottish Water Solutions' costing system (System C above). We were able to confirm that the cost functions applied to the standard cost estimate are the same functions applied to the Business Plan estimates.</p> <p>Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.</p> <p>The standard cost estimate is presented at a COPI index of 128.</p> <p>A denominator of 30 Mld has been used.</p>
Line 3.3	<i>New abstraction borehole treatment works with simple disinfection only, output 8Ml/d</i>
	Scottish Water has not included for this standard cost. See our comments in Section 2.3 above.
Line 3.4	<i>Fitting new plumbosolvency control to existing abstraction borehole treatment works with simple disinfection only, output 8Ml/d</i>
Revisions	Scottish Water has revised the standard cost estimates from the draft submission by adjusting chemical storage volumes to align with the assumptions of the Business Plan.

**Process Design**      The standard cost specification is based phosphate dosing and phosphate storage. It is assumed that other site facilities including any flow measurement required to control the dose rate is available on site.

No allowance has been made for a static mixer at the dosing point which is normally included in estimates for chemical dosing in the Business Plan.

**Costs**                      The standard cost estimate was prepared using Scottish Water Solutions' costing system (System C above). We were able to confirm that the cost functions applied to the standard cost estimate are the same functions applied to the Business Plan estimates.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

A denominator of 8 Mld has been used.

**Line 3.5**                      *Alterations to water treatment works type SW2, output 30M/d*

Scottish Water has not included for this standard cost. See our comments in Section 2.3 above.

**Line 3.6**                      *Installation of a nitrate removal plant at a borehole treatment works with simple disinfection only, output 10M/d*

Scottish Water has not included for this standard cost. See our comments in Section 2.3 above.

**Line 3.7**                      *Cryptosporidium protection to an existing borehole treatment works with simple disinfection only, output 2.5M/d*

Scottish Water has not included for this standard cost. See our comments in Section 2.3 above.

### ***B1-4.1.3 Storage (Lines 3.8 to 3.10)***

#### **Comments by line**

**Line 3.8 and 3.9**      *New service reservoirs, capacity 4Ml and 15 Ml*

Scottish Water has not included for this standard cost. See our comments in Section 2.3 above.

Line 3.10	<i>Refurbishment of service reservoir, capacity 6Ml</i>
Revisions	<p>Scottish Water has revised the standard cost estimates from the draft submission by:</p> <ol style="list-style-type: none"> <li>1. Reviewing the quantities of work against the standard cost specification.</li> <li>2. Correcting for an inflation adjustment included in the draft estimate.</li> <li>3. Excluding design costs on the basis that the estimate is scoped and no further design is required.</li> </ol>
Scope of Work	<p>The scope of work in the standard cost estimate covers cleaning, repairs to cracks and construction joints, render to the internal walls, new membrane to the roof, and the replacement of existing metalwork and access covers. The quantities derived by Scottish Water appear to comply with the specification. The quantity for preparation and rendering to internal surfaces assumes that there is no freeboard in the reservoir.</p>
Costs	<p>Scottish Water has derived standard costs from a number of completed projects from the Reservoir Improvements Term Contract in 2000/01. We have had access to summary rates from these contracts but not the tender documents from which the rates are derived.</p> <p>Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. This includes the company specific factor adjustment. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.</p> <p>It has been assumed that no design will be required for work already specified in detail.</p> <p>The standard cost estimate is presented at a COPI index of 128.</p> <p>A denominator of 6 Mld has been used.</p>

#### ***B1-4.1.4 Pumping Stations (Lines 3.11 to 3.18)***

##### **Comments by line**

Lines 3.11 to 3.18 *Pumping stations*

In our previous report we noted that: *the standard costs for these lines have been built up using suppliers' budget prices together with labour and plant rates. The rates come from Scottish Water's framework suppliers and contractors and so we believe that the resulting standard costs are representative of Scottish Water's actual costs. However, the estimates used for the investment plan are based on the cost of a new pumping station multiplied by percentages assessed as representing the amount of work when compared to the new facility. While the two methods should give consistent results if carried out perfectly it is difficult to say categorically that the cost base and investment plan are consistent, given the different ways of preparing the estimates.*

This conclusion remains as the costs in the current submission generally remain as before, subject to a number of changes, most of which are to address our concerns: The changes are as follows:

- A small amount is now included for lorry hire to remove redundant items from site.
- The costs of MCCs and PLC hardware are now supported by current framework prices from one of Scottish Water's framework suppliers.
- The issue of average costs for Scotland has been addressed by the inclusion of a company specific factor of 2.1% of construction costs.
- The percentage for general items has been increased to 24.13%, in line with the percentage generally applied to the investment programme.
- The percentage for design has been reduced from 8.5% to 2.5% to reflect the low amount of design needed for this type of work.

The overall effect of these changes is to reduce the standard costs. The reduction generally comes from a reduction in cost of the electrical plant as a result of obtaining accurate budget prices from Scottish Water's framework suppliers.

Generally we conclude that Scottish Water has addressed our concerns subject to the following two comments:

1. We noted that a PLC and RTU had not been included in MCC standard costs in lines 3.17, 3.18, 7.10 and 7.11. While not altogether clear, the specification implied that they should be included. We would like confirmation from WICS that the benchmark does include for a PLC and RTU.

Should it be confirmed that the PLC and RTU should be included, then Scottish Water should revise its standard cost estimate.

2. The costs of pumps were properly supported by a letter from KSB giving prices and stating that they were as the framework agreement. However, when we audited the schedules in the agreement we noted that the prices stated in the letter were significantly lower than those in the schedule. Scottish Water is trying to reconcile the differences with KSB, but at the time of writing this report no response was available.

#### ***B1-4.1.5 Comments on Engineering Judgement Grade***

We commented on Scottish Water’s overall approach to and assessment of engineering judgement grade in Section 2.5 and noted that the accuracy assessment included in the engineering judgement grades is not based on a statistical analysis of the cost data and cost functions. On the basis of the statistical assessment carried out by Scottish Water and our opinion of the data observed in the audit, we believe that a more reasonable assessment of the engineering judgment grades is set out on the table below.

Lines	Description	Eng. Judgement Grade	
		SW Return	Reporter
3.1 to 3.4	Water treatment works	B3	B3
3.5 to 3.7	No standard cost submitted		
3.8 to 3.10	Water storage	B2	B3
3.11 to 3.16	Pumping stations	B2	B2*
3.17 & 3.18	Pumping stations	B3	B3

Notes: \* Subject to comfort that KSB’s costs are consistent with its contract.

#### **B1-4.2 Table 4: Water service – composition of expenditure by asset type**

Scottish Water has completely re-worked the standard cost estimates for Table 4: Water service – composition of expenditure by asset type.

Scottish Water describes the basis of its Table 4 submission in Section 3.4 of its narrative. We have examined the basis of the calculation and generally confirm Scottish Water’s statements. We have the following comments on the table.

1. Scottish Water’s second draft Business Plan database was used to allocate costs. The database is used to generate Table C information for the business plan and contains many projects by site. It therefore gives an accurate split of costs for tables 4 and 8, subject to our further comments below. We confirm that the expenditure over the 4 years of the business plan was used for the allocation.

2. While the vast majority of the costs have been mapped directly from the database some costs have been mapped either from other databases or pro-rata to other costs. These other items are:
  - £50M of overlap between capital maintenance and quality spend at WTW were mapped in proportion to the main database mapping.
  - Capital maintenance of non infrastructure assets calculated using the SARRAS generic model was mapped from information in that model.
  - Security costs at WTW were distributed pro-rata to capital maintenance costs. Most security costs were for storage and were directly allocated to Line 4.4b.
  - Development constraints costs were mapped from individual lines in the development constraints database.
  - Infrastructure capital maintenance costs were mapped to lines 4.6 and 4.7 based on information from the WILCO model.
3. Again during this audit we noted that some money had been allocated to new WTW. As stated in our previous report we noted that we were not aware of any completely new WTW being planned.
  - WTW under 10Mld (Line 4.2a): Scottish Water has again allocated all nano-filtration plants to “new” on the basis that they were likely to be virtually a new plant. Whilst accepting that many of the plants might currently only have disinfection, those from river sources may have other forms of treatment. It could be argued that under a strict definition at least some of these should be allocated to refurbishment.
  - WTW over 10Mld (Line 4.2b): As for its previous submission Scottish Water has allocated 5 WTW to the new category. This is on the basis that the refurbishment was so extensive that a new plant might be built. While we understand Scottish Water’s reasoning, again it could be argued that under a strict definition these again should be allocated to refurbishment.

In its narrative Scottish Water notes that it has allocated all storage to refurbishment, although there might be some new build. We agree with Scottish Water’s comment and accept that the new build is likely to be small compared to refurbishment. We note that a number of clearwater tanks at small works are sized for approximately 6 hours detention. We believe that tanks of this retention capacity are effectively service reservoirs rather than contact tanks and should possibly be re-allocated to storage rather than the current allocation to treatment. Scottish Water disagrees with this view.

For this submission Scottish Water has reviewed each item of its projected M&G costs and allocated them to either the water service or sewerage service as appropriate. Where this has not been possible costs have been allocated 50% to water and 50% to wastewater. Overall the splits remain very close to the 50/50 split previously assumed.

During our audit we noted a very minor error in the allocation of resources to lines 4.1 and 4.6. The correct allocation would increase Line 4.1 to 8.7% and reduce line 4.6 to 20.9%.

Overall we conclude that the allocation is based on detailed information and is a good representation of the likely allocation of Scottish Water's expenditure in the strategic business plan period. As before, our main concern remains the allocation to new water treatment works in lines 4.2a and 4.2b. These have been accurately calculated but the allocation is based on an assumption. This is considered reasonable but may not be consistent with assumptions made by other water companies.

## **B1-5. SEWERAGE INFRASTRUCTURE STANDARD COSTS**

### **B1-5.1 Table 5: Sewerage infrastructure standard costs**

#### **Changes from the draft Cost Base submission**

Scottish Water has revised the standard cost estimates in Table 5 from the draft submission by:

1. Including the same corporate on-cost of 3.00% which was applied to the AR04. The draft submission included a corporate on-cost of 3.15%.
2. Including the tender to out-turn adjustment of 2.82% which was included in the AR04 estimates. The draft submission excluded this tender to out-turn adjustment.
3. Including a Company Specific Factor (regionality) of 1.61% (equivalent to 2.1% applied to construction costs only). We have described this factor in the Appendix to our report on the second draft Business Plan concerning costing systems.

As a result of points 1 to 3 above, the final standard costs have generally increased by approximately 4.6% over the draft standard costs previously submitted.

#### **Introduction**

Scottish Water has made a complete return of sewerage infrastructure standard costs in Table 5 with the exceptions of “sewer laying by pipejacking or micro-tunnelling” and “construction of a self contained pumping station to isolate a domestic property” (see Section 2.3 above).

The standard costs submitted are based on the cost data and analysis used to generate the sewerage infrastructure standard costs in AR04 Table J3. Our comments on the standard costs are based on our audit of the AR04 Cost Base.

A standard adjustment has been applied to the AR04 standard cost estimates for infrastructure to produce the Cost Base as follows:

1. Divide by 134 and multiply by 128 to adjust by COPI from Q3 2003 to Q3 2002.
2. Add a Company Specific Factor of 1.61% of the total estimate (equivalent to 2.1% to the construction cost). We have described this factor in the Appendix to our report on the second draft Business Plan concerning costing systems.

#### **Methodology and sources of cost data.**

We believe that Scottish Water has made a robust assessment of the sewerage infrastructure standard costs which reflects current technical standards and Scottish Water’s cost base at AR04.

The cost data used to prepare the infrastructure standard costs is Scottish Water's own data from 2000 onwards. It includes data from term contracts and Scottish Water Solutions from 2003 onwards.

Scottish Water has prepared the standard cost estimates from the following data sources:

- Historic term contracts in use in 2003-04.
- Analysis of individual historic single contracts going back to 2000.
- Target cost estimates by Scottish Water Solutions based on the standard cost estimates which form part of the contract between Scottish Water and Scottish Water Solutions.
- Individual Contracted Rates, equivalent to the standard cost estimates, written into the Service Agreement between Scottish Water and Scottish Water Solutions.

The cost data was used to develop a range of estimates consistent with the WICS definitions for standard costs. Where appropriate these estimates are subject to statistical analysis to develop a cost function for different types of main and surface or rehabilitation. The rates are inclusive of appropriate project on-costs but exclude site specific items are indicated by the item definitions. Diameter is used as a descriptor in the cost function.

The standard cost estimates submitted in AR04 included percentage additions of:

- 3% to cover Scottish Water internal management costs.
- 2.82% to cover changes between tender and out-turn.

During our detailed audit of the AR04 submission we identified a number of minor general concerns about the underlying cost estimates which are covered in our report on Table 1.

The estimates have been developed from historic or current costs and reflect the choice of pipe material used by Scottish Water. In the estimates we have noted adjustments for bedding, backfill and reinstatement consistent with the standard cost definitions.

Scottish Water's estimates are based on the standard lengths and manhole frequency set out in the standard cost definitions. Where possible, the frequency of laterals has been accounted for in the rates. This has not always been possible where specific projects and term contracts do not identify laterals separately. In these circumstances laterals are reflected in the rates at the average frequency of the projects used to develop the cost functions. We note that based on Scottish Water's asset inventory, the average frequency of lateral connections in Scotland is of the order of one per 15m of main sewer.

Scottish Water has completed the standard cost check lists. During audit we were unable to confirm that the Scottish Water's standard costs include minor service diversions. We understand that Scottish Water does not pay easement costs or wayleave costs as they are entitled to serve notice to obtain access.

The estimates include an allowance for tender to out-turn margin which should account for contractual claims or contingencies or general adjustment. We have not audited this percentage adjustment. It has been applied to the Cost Base estimates and the Business Plan estimates in a consistent way.

The estimates are based in part on rates from the contract between Scottish Water and Scottish Water Solutions which allows for pain-gain incentive payments. No allowance for pain-gain payments has been included in the standard cost estimates. At the time the standard cost estimates were prepared for AR04 Scottish Water noted that no pain-gain payments had been made under the contract and there was not enough experience of the contract to make an assessment of future pain-gain payments.

The estimates are based on a range of historic projects across Scotland and therefore include any company specific factors to extent that they were included in the source projects. It is not clear to us whether or to what extent this might duplicate the “company specific factor” added to the rates.

### **Consistency with the Investment Plan Estimates**

Scottish Water’s infrastructure maintenance estimates for sewerage are based on rates which are broadly consistent with the rates in the Cost Base. The rates are based on cost functions derived from the same data set used to develop the standard cost estimates with the following adjustments:

- The rates estimated from individual projects have been reviewed to include site specific costs which are excluded from the standard cost estimates in accordance with the Information Requirements.
- The Business Plan cost functions are based on a smaller sample of projects data than the standard cost estimates.
- The rates used in the Business Plan estimates have been regionalised to allow for Scottish Water’s assessment of regional variation of costs across Scotland.
- The rates are based on depth bands. Rates selected for the Business Plan estimates assume that each sewer diameter can be represented by a single depth band reflective of the asset inventory. Relay rates for sewer laterals are assumed to be in the 0-2m depth band.
- The rates have been adjusted to reflect the frequency of manholes on Scottish Water’s sewerage system as opposed to the 50m spacing of the standard cost estimates.
- The overall rates are based on project costs which include company specific factors to the same extent as they are represented in the project data used to develop the cost functions.

The rates used to develop estimates for first time provision of sewerage and interconnecting pipework for the uID programme are based on term contract rates from for one of the partner organisations in Scottish Water Solutions. The rates applied in the Business Plan appear to be greater than the standard cost estimates taking account of the qualifications of the standard cost estimates. Scottish Water has noted that they have undertaken an analysis of the rates used for the UID pipework estimates and found that for some depth bands and surface types they are lower than the equivalent rates used in the Capital Maintenance estimates in the Business Plan. In other cases they are higher. We have yet to complete an audit of this analysis.

### Comments by Line

Lines 1 to 6	<p><i>Sewer laying</i></p> <p>The standard cost estimates are based on statistically derived cost functions which use a common data set from a range of term contracts, specific projects and Scottish Water Solutions standard cost estimates.</p> <p>The standard cost definitions for sewer laying states that the depth of cover to the crown of the pipe should be 2.0m. Sewerage information, including bills of quantities is normally stated against depth to invert. The cost functions used by Scottish Water to prepare the standard cost estimates have been prepared for sewers with a depth to invert of 2m to 3m. Some rates used will be for sewers marginally shallower than the standard cost definition and some for sewers marginally deeper than the standard cost definition. We do not believe that this introduces any bias in the standard cost estimate.</p>
Lines 7 to 8	<p><i>Sewer laying by pipejacking or micro tunnelling</i></p> <p>Scottish Water has not completed these entries because micro tunnelling does not form any significant part of its current programme or historic cost base.</p>
Lines 9 to 14	<p><i>Sewer rehabilitation by insituform</i></p> <p>The standard cost estimates for sewer rehabilitation by insituform are based on estimates from three term contracts and standard costs in the contract between Scottish Water and Scottish Water Solutions</p>
Lines 9 to 14	<p><i>Sewer rehabilitation by pipe bursting</i></p> <p>The standard cost estimates for pipe bursting are derived wholly from the standard costs in the contract between Scottish Water and Scottish Water Solutions.</p>
Line 15	<p><i>Construction of self contained pumping unit</i></p> <p>Scottish Water has not submitted a standard cost for the construction of a self contained pumping unit (see Section 2.3)</p>

### Comments on Engineering Judgement Grade

We have commented on Scottish Water's overall assessment of engineering judgement grade in Section 2.5 and noted that the accuracy assessment included in the engineering judgement grades is not based on a statistical analysis of the cost data and cost functions. However, we believe that the engineering judgement grades attributed by Scottish Water are broadly reasonable subject to any individual differences of opinion noted below. We note that there is broad consistency between the Business Plan estimates and the standard cost estimates. We do not believe that any of the standard costs submitted by Scottish

Water should be excluded from the comparison with the Ofwat benchmarks on the basis of their engineering judgement grade.

Lines	Description	Eng. Judgement Grade	
		SW Return	Reporter
5.1 to 5.6	Sewer laying		
	Grassland	B3	B3
	Rural/suburban highway	B3	B3
	Urban highway	B3	B3
5.9(a) to 5.13(b)	Sewer rehabilitation by insituform	B3	B3
5.10(b) to 5.12(b)	Sewer rehabilitation by pipe bursting	B3	B3
5.14	Sewer rehabilitation of man entry systems	B3	B3
5.15	Construction of self contained pumping station	Not submitted	

#### B1-5.2 Table 6: Sewer projected expenditure

Like the water infrastructure programme the sewer infrastructure programme is again based on the Q&SII programme of 2004/5 as reported in contractor returns to SWS. We understand that a large part of the percentage expenditure ascribed to grassland relates to one contract for a large diameter sewer.

We again conclude that the actual figures for Q&SIII may vary if the nature of the programme changes. We are already aware that some costs will now arise from the work on sewer laterals, rather than the larger sewers of the current programme.

## **B1-6. SEWERAGE NON-INFRASTRUCTURE STANDARD COSTS**

### **B1-6.1 Table 7: Sewerage non-infrastructure standard costs**

#### ***B1-6.1.1 Introduction***

##### **Overview**

Scottish Water has revised Table 7: Sewerage non-infrastructure standard costs for the second draft Cost Base submission of 25<sup>th</sup> February. This section of our report is an addition to our report on the submission of 7<sup>th</sup> February.

##### **Methodology and data sources**

We have commented on methodology and data sources for non-infrastructure estimates in Section 4.1.1. These comments also apply to the non-infrastructure standard costs for wastewater.

##### **Consistency with the Business Plan**

We have commented on consistency between the Cost Base and the Business Plan estimates in Section 4.1.1. These comments also apply to the non-infrastructure estimates for wastewater.

Standard cost estimates prepared for sewerage structures are based on a more detailed assessment of scope than the Business Plan estimates to ensure that the particular definitions and exclusions of the Cost Base specification are complied with. The rates used to price the standard costs come from a range of sources including programmes of work which provided the data used to develop the cost functions for the Business Plan estimates. While the rates applied to the standard cost estimates appear to be broadly reasonable we have not been able to confirm that they are consistent with the Business Plan estimates.

#### ***B1-6.1.2 Sewage structures***

*Lines 7.1 & 7.2 - Storage tank to combined sewer overflows, capacity 750m<sup>3</sup> and 3000 m<sup>3</sup>*

Revisions                      Scottish Water has revised the scope of the standard cost estimates from the draft submission by:

1. A sacrificial ring accounted for in the rates for the draft estimate has been removed. We believe that this is reasonable. However, we believe that the estimate omits the cost of securing the site during construction.

2. The time taken for ring construction has been reviewed and reduced. We believe that the revised time is reasonable.
3. The scope of work for the shaft cap has been developed in greater detail to demonstrate that the scope of work is reasonable.
4. The scope of pipework has been developed in greater detail.
5. A pumped cleaning system has been included.
6. The electrical and ICA works have been developed in greater detail.

The following changes were made to the unit rates and cost functions used for the draft submission:

1. The rate for excavation and disposal off site has been reduced to reflect the ideal conditions required by the standard cost specification.
2. Rates for pipework have been reviewed to reflect the same source of cost data as that used to estimate pipework associated with the UID programme.
3. Rates have been adjusted for inflation to bring rates from various sources to a common base date of Q3 2002 (COPI 128).
4. Contractor's general items, design and management costs have been included.

#### Scope of Works

Scottish Water has prepared an estimate based on circular shaft storage tanks. The Business Plan estimates are based on a similar configuration of tank.

Scottish Water has assumed that the storage tank will be founded in a hollow adjacent to the sewer. As a result the depth of the tank above the soffit of the incoming pipe is minimal. In the Business Plan, Scottish Water has assumed that the ground level at the storage tanks is the same as the ground level over the sewer. In the Business Plan this adds of the order of 20% to the net storage volume included in the estimates.

We confirm that Scottish Water has provided the net storage volume required in the standard costs. The top water level in the tanks are assumed to be at ground level.

Scottish Water has assumed that the shaft will be of the order of 5 m deep to match the pump head given in the standard cost specification. The internal diameters of the two storage shafts are 15 m and 25 m respectively. For the Business Plan estimates Scottish Water has assumed a depth to diameter ratio of 1:1 or greater for storage shafts.

A guide collar is included at the top of the shaft. The volume of concrete and the cost rate appear to be low for a concrete collar constructed above ground and left in place.

Scottish Water has assumed that the standard cost specification for a well drained site not subject to flooding means that the shaft is not subject to floatation pressures from groundwater. This is consistent with the standard specification (well drained site) and the standard cost check lists (no allowance for uplift).

Scottish Water has assumed that the shaft will be excavated through good ground but will be founded on rock. As a result it is assumed that the base slab is not subject to any significant stress and a nominal slab thickness and nominal reinforcement has been assumed.

A pumped recirculation system has been included based on one sixth of the installed pump power. The second draft Business Plan estimates assume that larger storage shafts have a pumped jet mixer and smaller storage tanks have self cleansing benching.

Scottish Water has assumed that no benching will be required in the storage tank. It is assumed that the mixing system required in the standard cost estimate will be sufficient to re-suspend any deposits. The Business Plan estimates for storage tanks include an allowance for mixing and will also have an allowance for benching to the extent that it was included in the historic projects on which the estimating system is based.

An allowance has been made for valves and pipework in the shaft, connections and recirculation pipework which appears to be reasonable.

A single cover is provided for access to the sump and shaft. No access ladders are provided. We have asked Scottish Water to provide examples of similar installations to confirm that this is the configuration included in the Business Plan cost functions and consistent with current policies on access.

The detailed scope and estimate for the electrical and ICA equipment has been developed significantly for the final estimates. The electrical plant costs are based on the pump size set out in standard cost specification and direct on-line starters. A simple electrical panel specification has been developed. A simple pump control mechanism has been assumed relying on the trip amplifiers within the ultrasonic control and relay logic used in place of a PLC. The system is significantly different from the "Form 4" panels and PLC control which is likely to form the basis of the Business Plan estimates. For the final estimates the detailed scope and estimate for the electrical and ICA equipment has been developed significantly.

#### Costs

An outline bill of quantities was prepared for the proposed scope of works and priced using estimated rates obtained either from suppliers or from Scottish Water Solutions' experience of a current programme of work in England.

We have not been able to follow audit trails to the source data which underpins many of the rates. The build up of these rates appears to be reasonable. However, we understand that they are selected from a range of possible rates. Both the choice of rates and the assumed production rates are based on judgement. We have not been able to establish a clear relationship between the cost rates and the costing system used to develop the Business Plan estimates.

The estimate includes an allowance for contractors' preliminaries and management costs based on an analysis of project tenders. The project analysed included water and wastewater treatment as well as uID schemes. Individual categories of on-costs were analysed including general items, contractor's design, management fee and risk. For the standard cost estimate the minimum percentage in each category was selected from all projects considered including treatment works schemes. No assessment was made of whether the minimum percentages were a result of the scale of the project, the method of procurement, the type of work or choices made by the contractor when distributing tender cost between measured items and preliminaries.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

The denominator used is unity as required in the standard cost specifications.

*Line 7.3 – Combined sewer overflow chamber with powered screen*

Revisions            Scottish Water has revised the scope of the standard cost estimates from the draft submission by the following:

1. The depth of the screen chamber has been increased to the minimum allowed in the Business Plan for operation of the screen.
2. The electrical and ICA works have been developed in greater detail.

The following changes were made to the unit rates and cost functions used for the draft submission:

1. The rate for excavation and disposal off site has been reduced to reflect the ideal conditions required by the standard cost specification.

2. Rates for pipework have been reviewed to reflect the same source of cost data as that used to estimate pipework associated with the UID programme.
3. Rates have been adjusted for inflation to bring rates from various sources to a common base date of Q3 2002 (COPI 128).
4. Contractor's general items, design and management costs have been included.

Scope of works Scottish Water has prepared an estimate for a combined sewer overflow (CSO) chamber constructed adjacent to and just off-line from an existing sewer.

The size of the CSO chamber has been determined from the principles in the WaPUG Design Guide. A rectangular chamber has been assumed. For the Business Plan estimates Scottish Water has adopted a circular chamber based on shaft rings as the least cost option.

The inlet pipe is assumed to be 10 m long and enters the CSO chamber at an angle. The inlet pipe is assumed to have the same diameter as the existing sewer. For the Business Plan estimates the pipework layout has been developed to ensure that the pipe enters the overflow chamber along the axis of the chamber. We recommend that the standard cost estimate design is reviewed to ensure consistency with the criteria adopted for the Business Plan.

Costs An outline bill of quantities was prepared for the proposed scope of works and priced using estimate rates obtained either from suppliers or from Scottish Water Solutions' experience of a current programme of work in England.

We have not been able to follow audit trails to the source data which underpins many of the rates. The build up of these rates appears to be reasonable. However, we understand that they are selected from a range of available rates. Both the choice of rates and the assumed production rates are based on judgement. It is not clear how the rates reflect the small quantities of work and the complexity of construction which might not be covered fully by the quantities in the outline estimates. We have not been able to establish a relationship between the cost rates and the costing system used to develop the Business Plan estimates.

The estimate includes an allowance for contractors' preliminaries and management costs based on an analysis of project tenders. The project analysed included water and wastewater treatment as well as uID schemes. Individual categories of on-costs were analysed including general items, contractor's design, management fee and risk. For the standard cost estimate the minimum percentage in each category was selected from all projects considered including treatment works schemes. No assessment was made of whether the minimum percentages were a result of the scale of the project, the

method of procurement, the type of work or choices made by the contractor when distributing tender cost between measured items and preliminaries.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

The denominator used is unity as required in the standard cost specification.

### ***B1-6.1.3 Sewage pumping stations (Lines 7.4 to 7.11)***

Scottish Water has completed standard cost estimates for Lines 7.4 to 7.11 excluding Lines 7.8 and 7.9 (see our comments in Section 2.3 above).

The standard costs for these lines have been built up using current framework suppliers prices together with labour and plant rates in exactly the same way as for lines 3.11 to 3.18, described in Section 4.1 of this report.

Our points of note and conclusions are generally identical to those lines.

Line 7.6 shows a very significant reduction from the draft cost base submission. This results from a budget price from KSB. The previous price resulted from a quick telephone response from Flygt. We accept that the current price is consistent with the KSB letter on budget prices.

### ***B1-6.1.4 Sewage treatment***

#### *Line 7.12 – First time rural sewage treatment p.e. 200*

**Revisions** Scottish Water has not made any changes to the scope of works or cost functions applied from the draft Cost Base submission. The on-cost percentages have been recalculated to ensure consistency with the Business Plan.

**Scope of Works** The main process elements included in the standard cost estimate are a septic tank and SAFF plant. In addition the estimate allows for a screen, a sludge recycle pumping station and an outfall. The treatment processes are broadly consistent with those in the Business Plan estimates for similar size of works and treatment standards.

It is assumed that there is an existing overflow which will limit the flow to the treatment plant to the maximum flow of 210 m<sup>3</sup>/d set out in the standard cost specification.

Estimates for work of a similar type and size in the Business Plan include a cost for flow measurement and sampling which is not included in the standard cost estimate. Scottish Water has noted that: “The regulatory requirement for works of this size is to provide a necessary means to measure flow, not an actual flow monitor itself. Therefore, in the standard cost solution the sampling chamber will be fitted with either a flume or V-notch weir as a matter of course. This allows for the installation of a temporary flow monitoring device when required.” This appears to be inconsistent with the approach adopted in the Business Plan. We suggest that Scottish Water’s assumption is checked against the benchmark.

The SAFF plant is assumed to be a package plant with integral humus tank. Scottish Water’s report notes that the plant assumed has an integral return sludge pump to transfer sludge to the septic tank. We believe that the standard cost estimate makes specific allowance for these pumps which are not included in similar estimates in the Business Plan. This configuration is typical of the package plant available for small works. In the Business Plan estimates Scottish Water assumes that package plant cannot be adopted and the Business Plan estimates allow for separate humus tanks after a SAFF plant. Scottish Water has noted that: “SAFF plants within the business plan are being asked to meet a tighter standard than the one within the Cost Base. For this reason it was decided that the business plan would progress with separate humus tanks to ensure delivery of the tighter standard.” Most works of this size included in the wastewater quality programme relate to shellfish water standards and secondary treatment has been introduced as a precursor to tertiary treatment and disinfection. We have previously used package SAFF plant to achieve effluent standards which would be a suitable feed to a tertiary treatment plant.

The standard cost estimate includes a Copasac screen. Estimates for similar work in the Business Plan include a “spiral sieve screen”. We do not believe that this has a material impact on the estimate.

#### Costs

The standard cost estimate was prepared using Scottish Water Solutions’ costing system (System C described in Section 3 above). We were able to confirm that the cost functions applied to the standard cost estimate are the same as the cost functions applied to the Business Plan estimates.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

The denominator used is 12 kg.BOD/d as required in the standard cost specification.

*Line 7.13 – Installation of denitrification at existing secondary works, p.e. 40,000*

Scottish Water has not included for this standard cost. See our comments in Section 2.3 above

*Lines 7.14 & 7.15 – Additional nutrient removal at existing secondary works, p.e. 12,000 and 40,000.*

Scottish Water has not made any changes to the scope of works from the draft Cost Base submission.

**Revisions** Scottish Water has not made any changes to the scope of works or cost functions applied from the draft Cost Base submission. The on-cost percentages have been recalculated to ensure consistency with the Business Plan.

**Scope of Works** Scottish Water has interpreted the requirements of the standard cost specifications as the need to remove phosphorous to an annual average of 2 mg/l from an effluent which is satisfactory in every other respect.

The process elements included in the standard cost estimates are ferric dosing and associated ferric storage; a static mixer at the point of application; and, a sludge storage tank to accommodate the additional sludge produced.

For the Business Plan, Scottish Water has assumed that lime dosing will be required to restore alkalinity after ferric dosing for works which have an ammonia standard. This process has not been included in the standard cost estimates because Scottish Water believes that it would not be included in the Ofwat benchmark standard costs.

The Business Plan estimates include flow measurement to allow the ferric dose to be controlled. This has not been included in the standard cost estimate. Scottish Water has noted that it believes the existing works will have an inlet flow signal which could be used to control the ferric dose.

Scottish Water has applied the same minimum sludge storage volume assumed in the Business Plan estimates.

We believe that the storage chemical storage volume in the standard cost estimate might be higher than the storage volume in similar estimates in the Business Plan. We suggest that Scottish Water reviews the chemical storage volume against the Business Plan assumptions to confirm whether they are consistent.

**Costs** The standard cost estimate was prepared using Scottish Water Solutions' costing system (System C described in Section 3 above). We were able to confirm that the cost functions applied to the

standard cost estimate are the same as the cost functions applied to the Business Plan estimates.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

The denominators used are 720 kg.BOD/day and 2,400 kg.BOD/day as required in the standard cost specifications.

*Line 7.16 – Additional ammonia removal at existing secondary works, p.e. 2,000*

Revisions Scottish Water has made the following changes to the standard cost estimates from the draft submission:

1. The recirculation pump cost function has been aligned with that used in the Business Plan estimates.
2. The on-cost percentages have been recalculated to ensure consistency with the Business Plan.

Scope of works Scottish Water has interpreted the requirements of the standard cost specifications as the need to remove ammonia to a 95%-ile of 5 mg/l from an effluent which is satisfactory in every other respect.

The process elements included in the standard cost estimates are a nitrifying filter and associated recirculation/wetting pumping station.

The Business Plan estimates include flow measurement at works where nitrifying filters are proposed. This has not been included in the standard cost estimate. Scottish Water has noted that: “It has been assumed that the existing treatment works already has adequate flow measurement and this will be used for nitrifying filter flow control.” We agree that it would be possible to control flow to the nitrification filter off an existing inlet flow signal.

Costs The standard cost estimate was prepared using Scottish Water Solutions’ costing system (System C described in Section 3 above). We were able to confirm that the cost functions applied to the standard cost estimate are the same as the cost functions applied to the Business Plan estimates.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

The denominator used is 120 kg.BOD/day as required in the standard cost specification.

*Line 7.17 – Additional ammonia removal at existing secondary works, p.e. 40,000*

Revisions Scottish Water has made the following changes to the standard cost estimates from the draft submission:

1. The recirculation pump cost function has been aligned with that used in the Business Plan estimates.
2. A nitrifying filter has been included in line with the process selection in the Business Plan.
3. The on-cost percentages have been recalculated to ensure consistency with the Business Plan.

Scope of works Scottish Water has interpreted the requirements of the standard cost specifications as the need to remove ammonia to a 95%-ile of 2 mg/l from an effluent which is satisfactory in every other respect.

The process elements included in the standard cost estimates are a nitrifying filter and associated recirculation/wetting pumping station.

The Business Plan estimates include flow measurement at works where nitrifying filters are proposed. This has not been included in the standard cost estimate. Scottish Water has noted that: “It has been assumed that the existing treatment works already has adequate flow measurement and this will be used for nitrifying filter flow control.” We agree that it would be possible to control flow to the nitrification filter off an existing inlet flow signal.

Costs The standard cost estimate was prepared using Scottish Water Solutions’ costing system (System C described in Section 3 above). We were able to confirm that the cost functions applied to the standard cost estimate are the same as the cost functions applied to the Business Plan estimates.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

The denominator used is 2,400 kg.BOD/day as required in the standard cost specifications.

*Line 7.18 & 7.19 – Additional UV disinfection at existing treatment works, p.e. 5,000 and 40,000*

Revisions Scottish Water has not made any changes to the scope of works or cost functions applied from the draft Cost Base submission. The on-

cost percentages have been recalculated to ensure consistency with the Business Plan.

**Scope of works** The complete scope of works for the standard cost estimate is a UV disinfection plant. The configuration and details of construction underlying the estimate reflects the configuration and details of construction in the projects used to develop the data in the costing system. This includes the type of plant installed, the UV dose rate and the typical level of support plant required.

Estimates for UV disinfection in the second draft Business Plan assume that tertiary filtration is required before UV disinfection to meet the “end of pipe” standards set by SEPA. Scottish Water has not included tertiary treatment in the standard cost estimates because it the Cost Base benchmarks specification is based on an applied dose standard and not a discharge standard.

**Costs** The standard cost estimate was prepared using Scottish Water Solutions’ costing system (System C described in Section 3 above). We were able to confirm that the cost functions applied to the standard cost estimate are the same as the cost functions applied to the Business Plan estimates.

Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.

The standard cost estimate is presented at a COPI index of 128.

The denominators used are 9,000 m<sup>3</sup>/day and 30,000 m<sup>3</sup>/day as required in the standard cost specifications.

### ***B1-6.1.5 Sludge treatment and disposal***

#### *Line 7.20 – New enhanced sludge treatment facility, throughput 2 ttds per annum*

The estimates for new sludge treatment facilities in the business plan under the EC06 driver are for conventional treatment. The Business Plan estimates for the treatment of additional sludge appear to allow for the extension of enhanced sludge treatment facilities. These estimates for extensions appear to be scoped and costed in the same way as a new treatment facility. On this basis the cost based model 7.20 may be considered to be reasonably representative of a significant element of the business plan costs. We believe that it would be reasonable for Scottish Water to include this standard cost in its Cost Base Submission. However, we note that Ofwat did not publish a benchmark for this item in its report of January 2005. In the absence of a comparative benchmark there may be no value in completing an estimate for this standard cost.

*Line 7.21 - Extension to existing conventional sludge treatment facility, additional throughput 1 ttds per annum*

Revisions	<p>Scottish Water has made the following changes to the standard cost estimates from the draft submission:</p> <ol style="list-style-type: none"> <li>1. The digester cost function has been revised in line with changes to the estimating system.</li> <li>2. The on-cost percentages have been recalculated to ensure consistency with the Business Plan.</li> </ol>
Scope of works	<p>The process design is based on mesophilic anaerobic sludge digestion which is consistent with the Business Plan estimates against the EC06 driver.</p> <p>In accordance with the standard cost specification it has been assumed that the existing sludge, screening, thickening and dewatering facilities are sufficient to handle the additional sludge. In the Business Plan estimates for sludge treatment of this quantity it is generally assumed that existing facilities have no spare capacity and must be augmented to cater for the additional sludge.</p> <p>An allowance has been made for an additional post thickening, pre-digestion storage tank.</p> <p>No specific allowance has been made for the provision of quality assurance procedures. These costs are assumed to be covered by the cost function. This assumption is consistent with the Business Plan estimates.</p>
Costs	<p>The standard cost estimate was prepared using Scottish Water Solutions' costing system (System C described in Section 3 above). We were able to confirm that the cost functions applied to the standard cost estimate are the same functions applied to the Business Plan estimates.</p> <p>Scottish Water Level 2 on-costs have been applied as described in the Appendix to our main report on the second draft Business Plan concerning costing systems. These on-costs address tender to out-turn adjustment, risk and contingency as well as procurement and management costs. They have been applied in a way which is consistent with the Business Plan estimates.</p> <p>The standard cost estimate is presented at a COPI index of 128.</p> <p>The denominator used is 3 ttds/a which is the total capacity of the plant including capacity. We recommend that WICS confirms whether the denominator should be the total capacity (3 ttds/a) or the capacity of the extension (1 ttds/a).</p>

### Comment on Engineering Judgement Grades

We commented on Scottish Water’s overall approach to and assessment of engineering judgement grade in Section 2.5 and noted that the accuracy assessment included in the engineering judgement grades is not based on a statistical analysis of the cost data and cost functions. However, we believe that the engineering judgement grades attributed by Scottish Water are broadly reasonable subject to any individual differences of opinion noted below. We note that there is broad consistency between the Business Plan estimates and the standard cost estimates. We do not believe that any of the standard costs submitted by Scottish Water should be excluded from the comparison with the Ofwat benchmarks on the basis of their engineering judgement grade.

Lines	Description	Eng. Judgement Grade	
		SW Return	Reporter
7.1 to 7.3	Storage structures	B3	B3
7.4 to 7.7	Pumping stations	B2	B2*
7.10 & 7.11	Pumping stations	B23	B2
7.12 to 7.19	Sewage treatment works	B3	B3
7.20 & 7.21	Sludge treatment and disposal	B3	B3

Notes: \* Subject to comfort that current framework supplier budget prices are proved to be consistent with its contract.

#### B1-6.2 Table 8: Sewerage service – composition of expenditure by asset type

As for the water service Scottish Water has completely re-worked the standard cost estimates for Table 8.

Scottish Water describes the basis of its Table 8 submission in Section 3.8 of its narrative. We have examined the basis of the calculation and generally confirm Scottish Water’s statements. We have the following comments on the table.

1. Scottish Water’s 2<sup>nd</sup> draft business plan database was used to allocate costs. The database is used to generate Table C information for the business plan and contains many projects by site. It therefore gives an accurate split of costs for both tables 4 and 8, subject to our further comments below. We confirm that the expenditure over the 4 years of the business plan was used for the allocation.
2. While the vast majority of the costs have been mapped directly from the database some costs have been mapped either from other databases or pro-rata to other costs. These other items are:
  - Sewer flooding has been allocated 73% to sewers and the remainder to sewer structures. We understand that SWS have prepared this allocation

but we have been unable to see the supporting data at this time. The resulting figure appears to be reasonable.

- Capital maintenance of non infrastructure assets, calculated using the SARRAS generic model, was mapped from information in that model.
  - Odour costs were mapped from the costs derived at each site in the odour database.
  - Development constraints costs were mapped from individual lines in the development constraints database.
3. For this submission Scottish Water has reviewed each item of its projected M&G costs and allocated them to either the water service or sewerage service as appropriate. Where this has not been possible costs have been allocated 50% to water and 50% to wastewater. Overall the splits remain very close to the 50/50 split previously assumed.

Overall we conclude that the allocation is based on detailed information and is a good representation of the likely allocation of Scottish Water's expenditure in the strategic business plan period.

## B1-7. CONCLUSIONS

We have reviewed and audited the systems used by Scottish Water to cost the Q&S III programme and have set out our comments and recommendations in the preceding sections of this report. On the basis of our audits we have concluded the following:

1. Standard costs for infrastructure assets have been obtained from Scottish Water's projects and are generally reflective of Scottish Water's cost base of 2003-04.
2. We audited the costs for the AR04 submission and at that time had a number of reservations, which we have repeated in this report. However, we do not believe that our reservations are sufficiently serious to alter our overall conclusion that the resulting standard costs are a reasonable representation of Scottish Water's Cost Base.
3. The costs are derived from a number of projects and term contracts. These give a spread of costs, which based on a statistical analysis, generally indicate a confidence grade of B3 if applied to individual projects. However, again, we believe that the costs are acceptable for inclusion in the Cost Base.
4. We believe that the infrastructure costs are generally consistent with the investment plan. Some minor items in the investment plan are based on historic spend.
5. Standard costs for non-infrastructure have been developed using costing systems which are broadly consistent with those used to cost the Business Plan. Scottish Water applies different costing systems to the pumping station estimates in the Cost Base and the non-infrastructure maintenance estimates in the Business Plan. Scottish Water has undertaken a comparison to show that the pumping station estimates generate by these two systems are broadly consistent.
6. We believe that Level 2 on-costs have been applied to the Cost Base and Business Plan estimates in a consistent way to the investment plan costs and taking account of tender to outturn adjustments and company specific factors. The linkage is complex and described in the Appendix to our main report on the second draft Business Plan concerning costing systems.
7. There is broad consistency between the scope of the non-infrastructure standard costs and the scope of equivalent work items in the Business Plan estimates. We have commented on exceptions in the detail of this report.
8. The allocation of costs to asset type has been carried out using the full data set making up Table C for the final business plan. The allocation has been competently carried out and subject to a few relatively minor points in our detailed narrative we believe that the allocations give a broad indication of how the final costs are likely to be apportioned.
9. The allocation of costs to surface type is less accurate as it is based on the current year's work rather than the proposed plan. We are unable to say whether the current work is likely to be reflective of future work but note that for water mains much of the current programme to date has been carried out in predominately rural areas.