The Allen Consulting Group

Review of Asset Values, Costs and Cost Allocation of Western Australian Urban Water and Wastewater Service Providers

Water Corporation

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Report to the Economic Regulation Authority, Western Australia

The Allen Consulting Group

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Chapter 1

Introduction

The Economic Regulation Authority is currently undertaking an inquiry into the prices for water and wastewater in urban Western Australia. The purpose of the inquiry is to inform the Government's decisions on the level and structure of water prices in the 2006/07 financial year. The water service providers that are covered by the inquiry include the Water Corporation, Aqwest and Busselton Water.

As part of this project, the Authority is seeking to determine, for each of the specified water and wastewater service providers:

- an appropriate regulatory asset value for each of the service providers;
- the efficiency of forecast operating expenditure;
- the efficiency of proposed capital expenditure;
- the appropriateness of the cost allocation methodologies used by each service provider; and
- an estimate of the long-run marginal costs and short-run marginal costs of water and sewerage service provision.

The Authority commissioned The Allen Consulting Group in association with Arup Water to provide advice on these matters.

This report provides advice relating to the Water Corporation. Other reports will be provided to the Authority in respect of Aqwest and Busselton Water, as well as a report on general principles and methodology applying to the analysis of costs, cost allocation and marginal costs for all of the service providers.

This report is structured in chapters relating to each area of advice requested by the Authority.

As a general statement, as the Corporation has not previously had prices determined by a rigorous cost-based framework of regulation, the Corporation does not have the processes established that would normally support such a determination of prices. The Corporation does not maintain regulatory accounts, have a regulatory asset value established, nor have a methodology in place for the purposes of establishing prices that reflect costs. As such, the advice provided in this report on these matters does not provide a definitive view as to the appropriateness or otherwise of the current practices of the Corporation, but rather addresses a number of matters that the Authority may take into account in taking a view on current prices and on the prices that may be determined if a cost-based framework of price regulation were to be introduced in the future.

The reviews of forecast operating and capital costs and the determination of marginal costs is less reliant on regulatory processes being in place, and more definitive conclusions are drawn on these matters.

Chapter 2

Business Structure, Activities and Services

2.1 Overview

The Water Corporation is a statutory corporation operating under the *Water Corporation Act 1995*. The Corporation was established as a commercially-focused utility on 1 January 1996 following a restructuring of the water industry that also saw the roles of water resource manager (now Water and Rivers Commission) and regulator (now Economic Regulation Authority) separated from the functions of the utility. The Corporation is governed by a Board of Directors acting in accordance with Corporations Law, and is responsible to the Minister for Government Enterprises.[1]

The Water Corporation provides water, wastewater, drainage and irrigation services to both metropolitan Perth and regional centres across the State — in total the Corporation provides services to close to two million customers. In doing so, the organisation employs around 2,000 people and operates 246 water treatment plants, 113 dams and reservoirs and 713 bores in 106 borefields.[2]

2.2 Statutory framework

The principal elements of state legislation that govern the operation of the Water Corporation, or affect its operation, are listed and described in Table 2.1.

[1] Water Corporation 2004, *Information Statement*, May 2004.

[2] Water Corporation 2004, *Annual Report 2004*.

Table 2.1

STATUTORY FRAMEWORK

Legislation	Description
Water Corporation Act 1995	Establishes the Water Corporation as a corporate entity with the function of providing water services.
Water Services Licensing Act 1995	Establishes a scheme of the licensing of water services and confers functions on the Economic Regulation Authority in respect of the licensing scheme.
Water Agencies Restructure Act 1995	Contains the procedural steps and mechanisms for the implementation of the water industry restructure from 1 January 1996.
Water and Rivers Commission Act 1995	Establishes the Water and Rivers Commission which has the role of managing Western Australia's water resources.
Water Agencies Act 1984	Vests powers in the Water Corporation and the Water and Rivers Commission to carry out their functions.
Metropolitan Water Authority Act 1982	Sets out the provisions for the functioning of the metropolitan main drainage system and provides for appeals and objections against valuations and assessments in the metropolitan area.
Fluoridation of Public Water Supplies Act 1966	Permits water authorities to be ordered to fluoridate their supplies and regulates fluoridation.
Country Towns Sewerage Act 1948	Sets out provisions for the functioning of country sewerage systems and for recovery of charges.
Country Areas Water Supply Act 1947	Sets out provisions for the functioning of country water supply systems and recovery of charges.
Land Drainage Act 1925	Provides for the constitution of drainage districts and for making and recovery of drainage rates.
Rights in Water Irrigation Act 1914	Sets out the provisions for the operation of irrigation systems and for the recovery of charges and establishes the rights to water in the State and ways in which the use of water may be controlled.
Water Supply Sewerage and Drainage Act 1912	Contains power for the Minister to function as a body corporate for any water activities.
Metropolitan Water Supply Sewerage and Drainage Act 1909	Defines the metropolitan water, sewerage and drainage area and sets out the provisions for the functioning of the metropolitan water supply and sewerage systems and for the recovery of charges.
Water Boards Act 1904	Provides the constitution of water areas, the appointment of water boards and their financial arrangements.
Municipal Water Supply Preservation Act	Regulates activities on catchments of water supplies operated by local authorities.

Source: Water Corporation 2004, *Information Statement*, May 2004 and State Law Publisher, http://www.slp.wa.gov.au.

2.3 Operations

Water supply

In 2003/04, the Water Corporation delivered potable water to around 957,000 properties across the State. Water is drawn from both surface and groundwater sources, treated and then transported to properties via a 30,000 kilometre water main system. The largest part of the water supply operations entails the delivery of water in the Perth metropolitan area — the area accounts for around 76 per cent of total properties served and around 67 per cent of total water supplied (Table 2.2).[3]

Table 2.2

WATER SUPPLY ACTIVITIES BY REGION

Region	Properties Served	Length of Mains (kilometres)	Water Supplied (megalitres)
Perth	729,047	11,818	225,818
Agricultural	21,983	8,024	11,807
Goldfields	22,843	934	14,534
Great Southern	34,567	3,637	12,808
Mid-West	40,783	2,193	17,526
North-West	28,812	1,244	32,187
South-West	78,800	2,335	23,488
Total	**956,835**	**30,188**	**338,168**

Source: Water Corporation 2004, *Annual Report 2004*.

In 2003/04, 43 per cent of water supplied to the Perth metropolitan region was derived from surface water via the Water Corporation's metropolitan and regional reservoirs such as Stirling, Serpentine and Wungong. The remainder of water was sourced from groundwater supplies (Table 2.3).

[3] Water Corporation 2004, *Annual Report 2004*.

Table 2.3

SOURCES OF METROPOLITAN WATER SUPPLY

Source	Output (megalitres)	Per cent of gross output
Dams		
• South Dandalup	4,288	1.7
• North Dandalup	14,471	5.6
• Serpentine	22,527	8.8
• Canning	6,591	2.6
• Wungong	14,331	5.6
• Churchman	2,112	0.8
• Victoria	4,018	1.6
• Mundaring Weir	1,592	0.6
• **Total Dams**	**69,930**	**27.2**
Other Hills Sources		
• Samson Pipehead	2,017	0.8
• Stirling	27,919	10.8
Total Other Hills Sources	**29,936**	**11.6**
Groundwater		
• Artesian Bores	38,317	14.9
• Mirrabooka	21,473	8.3
• Gwelup	17,740	6.9
• Wanneroo	37,274	14.5
• Jandakot	6,904	2.7
• Neerabup	30,843	12.0
• Lexia	4,094	1.6
• Yanchep/Two Rocks	925	0.4
• **Total Groundwater**	**157,570**	**61.4**

Source: Water Corporation 2004, *Annual Report 2004*.

Wastewater services

The Water Corporation provides services for the treatment and disposal of wastewater in urban areas across Western Australia. Wastewater is collected and transported via a network of over 9,700 kilometres of sewerage mains, it is then treated and disposed of at one of the 92 wastewater treatment plants located across the State. Three large metropolitan plants — Beenyup, Subiaco and Woodman Point — treat approximately 80 per cent of the State's wastewater. All treatment plants are individually licensed by the Department of Environmental Protection.[4]

Wastewater treatment involves a series of processes that remove pollutant materials from wastewater — the process results in the creation of two end products, these being treated wastewater and biosolids.

[4] Water Corporation 2004, *Annual Report 2004*.

The treated wastewater is either returned to the marine environment via ocean outfalls or re-used as irrigation water while biosolids are typically used as fertilisers.[5]

Drainage services

The Water Corporation delivers drainage services — entailing the collection, transportation, treatment and disposal of surface water — to around 309,000 metropolitan properties. Responsibilities for drainage are divided between the Water Corporation, the Water and Rivers Commission and local authorities. The Water Corporation is responsible for the construction and management of main drains in the Perth metropolitan area and areas in the south of the State in the Great Southern and South West regions.[6]

Irrigation services

Irrigation services include the collection and delivery of water, by pipework or open channel, for irrigation purposes. The Water Corporation is a bulk supplier of irrigation water to irrigation schemes in the South West, Carnarvon and the Kimberley serving around 1,600 properties. In 2003/04, the Water Corporation delivered about 424,000 megalitres of irrigation water to rural properties — more water than was supplied to properties as part of the Corporation's potable water supply services.[7]

2.4 Governance

The Corporation is managed by a Board of Directors that report to the Minister for Government Enterprises. The Board of Directors has a legislative authority to perform the functions, determine the policies and control the affairs of the Corporation.

Directors are appointed to three-year terms by the Governor on the nomination of the Minister for Government Enterprises, after consultation with the Board itself. Similarly, the Corporation's Chairman and Deputy Chairman are appointed, from the Directors, by the Governor on the Minister's nomination. The Governor also holds the power to remove Directors from the office.[8]

2.5 Organisational structure

The operations of the Water Corporation are structured along five divisional lines as follows:

- *Water Technologies Division* — manages and operates water supply sources, water quality and treatment, system distribution and the treatment and disposal wastewater and industrial wastes.

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5 Waste Water Treatment Branch 2003, *Annual Report 2003/03*.

6 Water Corporation 2004, *Annual Report 2004*.

7 Department of Industry and Resources, Water Corporation Overview, http://www.doir.wa.gov.au/documents/investment/Water_Corporation_Overview.pdf, accessed 30 September 2004.

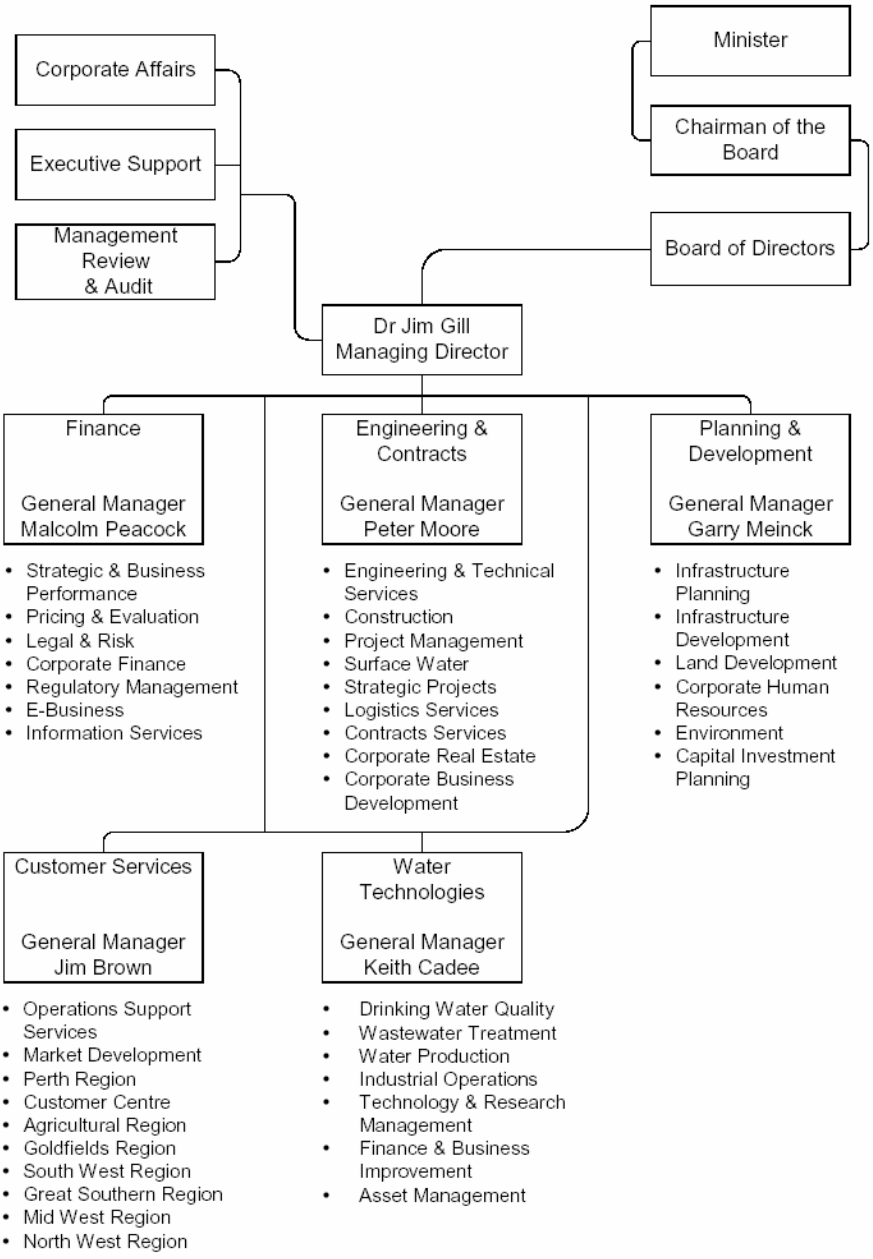
8 Water Corporation 2004, *Information Statement*, May 2004.

- *Planning and Development Division* — provides organisational leadership in the areas of infrastructure planning and development, land planning, and environmental, human resources and information management.
- *Engineering and Contracts Division* — responsible for program and project management, construction and outsourcing, procurement services, contract and land and property management and specialist engineering support.
- *Finance Division* — manages financial and administrative policies, processes and business reporting.
- *Customer Services Division* — provides the principal interface between the Corporation and customers regarding the delivery of, and billing for, water, wastewater, drainage and irrigation services state-wide.

The organisational chart depicted in Figure 2.1 shows the relationship between the Corporation's five divisions and its management structure; key tasks of each division are also depicted.

Figure 2.1

WATER CORPORATION ORGANISATIONAL STRUCTURE CHART



Source: Water Corporation 2004, *Information Statement*, May 2004.

2.6 Regulatory framework

The operation activities of the Water Corporation are subject to regulation by four government agencies:

- *Economic Regulation Authority* — established on 1 January 2004, the Authority oversees the Corporation's Operation License which sets out the conditions under which the Corporation operates. The Authority also monitors the Corporation's performance and reporting.

- *Department of Environment* — prime functions include dealing with issues surrounding management of water resources, wastewater treatment and disposal, water allocations and trading of water allocations.
- *Environmental Protection Authority* — assesses the environmental impacts of significant projects.
- *Department of Health* — regulates drinking water quality.[9]

2.7 The tariff setting framework

During the "budget round" each year, the Water Corporation makes a submission to the State Government on proposed prices for the upcoming year upon which the proposal is considered by the Department of Treasury and Finance. The submissions are further considered by the Expenditure Review Committee before being considered by Cabinet. Subject to revisions made in the review and assessment process, the Minister for the Environment approves by-laws that allow the Corporation to implement the proposed charges.

[9] Water Corporation 2004, *Annual Report 2004*.

Chapter 3

Regulatory Asset Value

3.1 Introduction

The regulatory asset value for a regulated business is a value ascribed to the assets of a business for the purposes of determining a rate of return and a level of depreciation expenses that, along with operating expenses, can be reflected in a regulated revenue stream and prices.

As the Water Corporation has not previously been subject to rigorous cost-based regulation of service prices, there has been no regulatory asset value established for the Corporation's assets. A component of the current inquiry into water and wastewater prices is therefore to determine a regulatory asset value that may be used in both the Authority's determination of whether water and wastewater prices appropriately reflect costs, and also potentially for future implementation of a framework for economic regulation of prices.

This chapter describes and assesses a regulatory asset value proposed by the Corporation, and examines a range of alternative regulatory asset values.

The Water Corporation has proposed a regulatory asset value of $9,099 million as an opening value in the year 2006/07 for the whole of the assets of the Corporation's "regulated business". This has been determined as an asset value implied by the Corporation's current forecast of pre-tax profit for the year 2008/09.

The methodology adopted by the Corporation in deriving its proposed regulatory asset value is consistent, in a general sense, with the "line in the sand" approach to asset valuation as described in the Principles and Methodology Report. That is, it is proposed as the value that, if implemented in a framework of cost-based regulation of prices, would return a set of regulated prices and a value of expected revenue equal to current prices and expected revenue.

There are no obvious errors in the methodology applied by the Corporation. The methodology of "reverse engineering" a regulatory asset value from a given forecast of prices and revenue has been implemented in an unconventional manner by the Corporation, although analysis by a more conventional approach does not give a materially different valuation.

The regulatory asset value proposed by the Corporation may therefore be accepted as the value that preserves the "status quo" of the Corporation's forecast prices and revenues, and by implication the value of the Corporation business. This value may also be presumed to fall within the range of asset values that is dictated by economic principles and commercial practicality, being the range between a maximum of depreciated optimised replacement cost and a minimum of the value consistent with a level of regulated revenue sufficient for the business to be commercially sustainable into the future.

Other than maintaining the status quo of the Corporation's forecast prices and revenues, and by implication the value of the Corporation business, the regulatory asset value proposed by the Corporation has no particular merit. Substantially lower values may still be consistent with the Corporation generating sufficient revenues to be commercially sustainable into the future.

Whether or not a lower value is a more appropriate regulatory asset value will depend upon the Government's preferences for:

- the Government's required financial status of the Corporation in respect of the Corporations balance sheet, level of borrowings and credit rating; and
- the value of the Corporation's business, in particular the net value to the Government of revenues and costs in the form of CSO and dividend payments.

Analysis undertaken by The Allen Consulting Group and described below depicts a range of asset values that could be used if implementing a cost-based regulation of prices. As is explained in this chapter, asset values impact on the financial status of the business while also affecting the flow of dividends and CSO payments between the business and the government, each of these factors must be considered if evaluating appropriate asset values for the Water Corporation.:

- a regulatory asset value of $7,909 in 2003/04 (corresponding to an opening value of $9,226 in 2006/07) is implied by the Corporation's current forecasts for revenue and expenditure. Adding in possible efficiency gains in operating expenditure as explained in Chapter 5 results in an asset value of $8,103 in 2003/04 (which corresponds to an opening value of $9,422 in 2006/07);
- a regulatory asset value in the order of $6,000 in 2003/04 (corresponding to an opening value of $7,301 in 2006/07) results in dividend payments to government being zero in one of the years modelled and brings about the need for the Corporation to take on additional debt as cash flows become insufficient to finance its spending program;
- a regulatory asset value in the order of $3,500 million in 2003/04 (corresponding to an opening value of $4,779 in 2006/07) is considered to comprise the practical minimum necessary to maintain the commercial sustainability of the Corporation in terms of the Corporation's capacity to service the debt required for its planned spending program.

The above analysis of the impact of different asset values on the Water Corporation business was based on the existing financial structure of the business, and in particular the very low level of financial gearing of the business: gearing of only 13 percent (debt to total assets) in 2003/04 and projected to increase to only 16 percent over the modelled period. This level of gearing is extremely low for a utility business such as the Water Corporation. At a more representative (i.e. higher) gearing for this type of business, the interest costs of the business would be greater and hence financial indicators of the ability to service debt would decline.

For example, with an assumed gearing of between 50 and 60 percent (corresponding to an increase in total debt of approximately $4,500 million), interests costs would increase by approximately $240 million per annum. The financial indicators of the interest cover ratio would decline and the debt pay-back period would increase to the extent that even with an assumed regulatory asset value of $8,103 million in 2003/4, and the indicators fall in a band consistent with a BBB to BB credit rating. This suggests that if the Water Corporation had a financial gearing more representative of this type of business, any reduction in regulatory asset values and revenues for the business may cause a decline in the financial status of the business to a level unacceptable to the government. In this situation, a regulatory asset value equal to the value $8,103 million that is implied by forecast prices and costs could be regarded as a minimum value consistent with the sustainability of the business.

3.2 Water Corporation proposal

Proposed Valuation

The Water Corporation's proposed methodology for determination of the regulatory asset value of the assets used to provide water and wastewater services is described in section 5.1 of its submission to the Authority dated 3 September 2004, in which a regulatory asset value at the mid point of the 2007/08 year of $9,502 million was proposed.[10]

Following its initial submission, the Corporation produced revised asset value estimates as part of a further submission to the Authority dated 22 December 2004, with a revised value of $9,099 million at the commencement of the 2006/07 year.[11] There is very little difference in the magnitude of the two estimates which suggests that the methodology used in each instance may be similar. As details of the methodology used to derive the second estimate have not been provided, we focus our analysis on the methodology used to derive the first estimate.

In this submission, the Corporation has proposed determining a regulatory asset value for all assets used to provide services — urban water, wastewater, irrigation water and drainage services — in both the Perth metropolitan and non-metropolitan regions of Western Australia.

The valuation methodology proposed by the Corporation involves the determination of an asset value at 31 December 2007 that is implied by net pre-tax revenues as forecast for 2008/09, with an assumed real pre-tax weighted average cost of capital of 6.5 per cent. (In the most recent calculation of asset value provided by the Corporation,[12] the forecast of net pre-tax revenues is understood to be that indicated for 2008/09 in the Corporation's Draft Strategic Development Plan for 2005/06 provided to the Department of Treasury and Finance in November 2004.)

[10] A 2006/07 value was not provided with this analysis.

[11] A mid -year asset value estimate is not provided.

[12] Provided Monday 15 November 2004.

Full details of the Corporation's determination of its proposed regulatory asset value have not been provided. The following methodology has been interpreted by consideration of selected parts of a spreadsheet model that the Corporation has provided, and for which a large number of cell entries have been converted from calculation formulas to hard-coded numbers.

- The Corporation starts with a forecast of net profit before tax for 2008/09 of $651,292,000, presumably derived from a modelled forecast of the profit and loss account for that financial year.
- The following adjustments are made to this value:
  - addition back to the pre-tax profit of an amount of depreciation expenses ($9,349,000) that would have been incurred in 2008/09 should the Corporation not be projecting a write-down of asset value in statutory accounts by $1,369 million in 2006/07;
  - subtraction of an amount of $36,198,000, being the forecast value of assets "handed over" to the Corporation by developers in 2008/09, and by convention recorded by the Corporation as revenue in its profit and loss statement;
  - subtraction of an amount of $73,802,000, being the forecast value of cash contributions from developers to the Corporation in 2008/09, and by convention recorded by the Corporation as revenue in its profit and loss statement;
  - addition back to the pre-tax profit of borrowing expenses of $89,572,000, and subtraction of interest revenue of $2,623,000;
  - addition back to the pre-tax profit of depreciation expenses of $4,541,000 associated with commercial assets and subtraction of revenue generated by these assets of $15,351,000;

  giving an adjusted pre-tax profit of $626,781,000.
- The present value is determined of an annual pre-tax profit of this amount continuing indefinitely into the future, returning a value of $9,643 million (at a discount rate equal to the Corporation's estimate of the real pre-tax weighted average cost of capital of 6.5 per cent).
- The value of $9,643 million, which is presumably stated in dollar values of 31,December 2008, is scaled by a factor of 1/(1 + 2.5%) to give a value of $9,407,588 in dollar values of 31 December 2007.
- From this value is subtracted the net value in 2007/08 of a range of assets and liabilities other than fixed assets (including assets of receivables, inventories, pensioner rate deferrals, future income tax benefits and other unspecified assets; and liabilities of accounts payable, unspecified provisions and other unspecified liabilities) of -$94,512,000, to give an adjusted asset value of $9,502 million.

The calculation of this value is summarised in Table 3.1.

Table 3.1

WATER CORPORATION PROPOSED REGULATORY ASSET VALUE (2008/09 DOLLAR VALUES EXCEPT WHERE OTHERWISE INDICATED)

Calculation step	Value
Projected 2008/09 net profit before tax	**$651,291,632**
Adjustments	
Depreciation expenses associated with 2006/07 asset writedown	$9,349,466
Value of assets handed over to the Corporation by developers in 2008/09	-$36,198,000
Value of cash contributions to the Corporation by developers in 2008/09	-$73,802,000
Borrowing expenses in 2008/09	$89,572,252
Interest revenue in 2008/09	-$2,623,048
Revenue generated from commercial assets in 2008/09	-$15,350,947
Depreciation of commercial assets in 2008/09	$4,541,219
Adjusted 2008/09 net profit before tax	**$626,780,574**
Present value of indefinite future pre tax profit at discount rate of 6.5 per cent	$9,642,778,063
De-escalation to 2007/08 dollar values (assumed inflation rate of 2.5 per cent)	$9,407,588,354
Subtraction of net value of non-fixed assets and liabilities	-$94,512,051
Proposed regulatory asset value (31 December 2007)	**$9,502,100,405**

Assessment of proposal

The Water Corporation's proposed regulatory asset value has been determined by a methodology consistent, in a general sense, with the "line in the sand" approach to asset valuation as described in the Principles and Methodology Report. That is, the Corporation has determined an asset value consistent with given forecasts of costs and revenue, implied in the Corporation's calculation of a pre-tax profit maintained at a constant real value into the indefinite future equal to the value forecast for 2008/09.

There are no obvious errors in the methodology applied by the Corporation. The adjustments made to the 2008/09 pre-tax profit have the effect of appropriately excluding from the regulatory asset value the value associated with developer contributions, the value of assets used in strictly commercial activities of the Corporation, and interest costs and revenues. It is unclear from the information provided by the Corporation why a correction has been made in respect of depreciation expenses associated with a proposed 2006/07 write down of asset value in statutory accounts, although this is not considered material (accounting for about one per cent of the calculated asset value).

The regulatory asset value proposed by the Corporation does not necessarily, however, meet the stated intent of the Authority in seeking to determine a regulatory asset value for use in a building-block approach to determination of total costs of service delivery. Nor does the proposed regulatory asset value necessarily meet the stated intent of the Corporation in its submission to the Authority to provide an appropriate basis for future cost-based price regulation, with future asset values determined by a "roll forward" of the initial regulatory asset value to account for new capital expenditure and asset depreciation. Deficiencies in this respect of the Corporation's determination of the proposed regulatory asset value are as follows.

- The proposed regulatory asset value was determined on the basis of a projection of future pre-tax profits that presumes that pre-tax profits would remain constant in real terms at the 2008/09 asset value. This projection does not reflect any consideration of forecasts of demand, non-capital costs and requirements for capital expenditure.
- The pre-tax profit calculation used by the Corporation is based on a calculation of profit as would be undertaken in statutory accounts. Cost items in these accounts would not necessarily be the same as costs that would be taken into account in regulatory accounts. In particular, depreciation costs would not necessarily be determined in the same manner (although it is noted that assumed asset lives for statutory accounting purposes as indicated in the Corporation's 2003/04 financial statements (p.6) appear to be consistent with expectations of technical lives). Also, the operating costs used in the Corporation's determined pre-tax profit includes cost items that would not normally be addressed in regulatory accounts, such as a cost considered to arise from the writing-off of assets.

A check can be made on the Corporation's determination of proposed asset value by constructing a set of regulatory accounts and determining the asset value that results in the value of a building block determination of total revenue to equate to a forecast of total revenue. This has been undertaken using information provided by the Corporation on actual cost and revenue data for 2003/04 and forecast cost and revenue data for 2004/05 to 2008/09, and with other assumptions as follows.

- Assets in existence at the beginning of 2003/04 are depreciated over a remaining asset life of 47 years.[13]
- New assets are depreciated over an asset life of 77 years.[14]

[13] Determined assuming that remaining asset lives are 60 percent of new asset lives as indicated for asset classes in the Corporation's 2003/04 financial statements (p.6), and with a weighted average remaining life calculated with reference to written down replacement value of existing assets.

- A return on asset value determined at a real pre-tax rate of return of 6.5 per cent of average asset value for each year.
- Operating and maintenance costs as forecast by the Corporation, but excluding costs of "asset write-offs".
- Capital expenditure as forecast by the Corporation but net of forecast contributions from developers.
- New capital expenditure is financed by debt and retained earnings in the same ratio as evident in the financial statements of the Corporation for 2003/2004, unless constrained by the value of earnings in which case the level of debt finance is increased..

A building-block calculation of total costs of the Corporation is shown in Table 3.2, below.

Table 3.2

NOTIONAL REGULATORY ACCOUNTS AND ASSET VALUES (NOMINAL, $ MILLION)

	Year					
	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Capital Account						
Initial Asset Value						
Opening Value	7,909	7,935	7,957	7,976	7,990	8,001
Depreciation	167	172	176	180	185	189
Closing Value	7,741	7,763	7,781	7,795	7,806	7,811
Capital Expenditure						
Opening Value	0	243	582	1,250	1,786	2,451
Capital Expenditure	239	330	649	513	635	661
Depreciation	2	5	12	21	29	40
Closing Value	237	568	1,219	1,742	2,391	3,072
Total						
Opening Asset Value	7,909	8,178	8,539	9,226	9,776	10,452
Closing Asset Value	7,978	8,331	9,001	9,538	10,197	10,884
Average Asset Value	7,944	8,254	8,770	9,382	9,986	10,668
Cost of Service Calculation						
Return on Capital	516	537	570	610	649	693
Depreciation	169	177	188	201	214	229
Operating and Maintenance	351	388	395	436	458	483
Total Cost	**1,036**	**1,101**	**1,153**	**1,247**	**1,322**	**1,406**
Present Value (9.2% nominal pre tax discount rate)	**5,321**					
Water Corporation forecast revenue (excluding developer contributions)	1,038	1,071	1,173	1,262	1,328	1,396
Present Value (9.2% nominal pre tax discount rate)	**5,321**					

[14] Determined assuming that remaining asset lives are 60 percent of new asset lives, and with a weighted average remaining life calculated with reference to full replacement value of existing assets.

The building block calculation shown in Table 3.2 derives an annual total cost for each year of the period 2003/04 to 2008/09, from which a present value for the entire period is calculated. In Table 3.2, the regulatory value of assets in existence at the commencement of 2003/04 has been set such that the present value of costs is equal to the present value of forecast revenues derived by the Water Corporation given a proposed path of service prices and forecasts of demand. The asset value of $7,909 million at the commencement of 2003/04 is thus the regulatory asset value at this point in time that is implied by the forecast prices and revenue.

The regulatory asset value "rolled forward" in this calculation to the start of 2006/07 indicates an opening asset value for that year of $9,226 million. This is broadly similar to the value of $9,099 million proposed by the Water Corporation in its December submission. While the Corporation's calculation of its proposed value is inconsistent with an appropriate "reverse engineering" calculation for a regulatory asset value from a projection of prices, demand and revenue, the calculation shown in Table 3.2 suggests that the Corporation has, if anything, marginally understated the implied regulatory asset value.

It is noted that the calculation of implied regulatory asset value shown in Table 3.2 was based on costs as forecast by the Water Corporation. As indicated in Chapter 5 of this report, reductions in operating expenditures may be achievable through reducing staff numbers — it is estimated that the Corporation could save around $20 million per year. Incorporating these cost savings in forecast operating costs into the calculation of implied regulatory asset value gives rise to an increase in this value from $7,909 million to $8,103 million in 2003/04 (corresponding to an increase from $9,226 million to $9,422 million at the opening of 2006/07) (Table 3.3).

Table 3.3

NOTIONAL REGULATORY ACCOUNTS AND ASSET VALUES WITH ADJUSTED OPERATING EXPENDITURE FORECASTS (NOMINAL, $ MILLION)

	Year					
	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Capital Account						
Initial Asset Value						
Opening Value	8,103	8,130	8,153	8,172	8,187	8,197
Depreciation	172	176	180	185	189	194
Closing Value	7,931	7,954	7,973	7,987	7,997	8,003
Capital Expenditure						
Opening Value	0	243	582	1,250	1,786	2,451
Capital Expenditure	239	330	649	513	635	661
Total						
Opening Asset Value	8,103	8,373	8,735	9,422	9,972	10,648
Closing Asset Value	8,169	8,522	9,192	9,729	10,389	11,076
Average Asset Value	8,136	8,447	8,963	9,575	10,181	10,862
Cost of Service Calculation						
Return on Capital	529	549	583	622	662	706
Depreciation	173	181	192	205	219	234
Operating and Maintenance	351	368	375	415	436	460
Total Cost	**1,053**	**1,098**	**1,150**	**1,242**	**1,316**	**1,400**
Present Value (9.2% nominal pre tax discount rate)	**5,321**					
Water Corporation forecast revenue (excluding developer contributions)	1,038	1,071	1,173	1,262	1,328	1,396
Present Value (9.2% nominal pre tax discount rate)	**5,321**					

3.3 A broader range of possible regulatory asset values

As indicated in the Principles and Methodology Report, economic principles provide limited guidance in determining an initial regulatory asset base. Economic principles suggest that an initial regulatory asset base should be greater than the scrap value of the relevant assets, but less than the depreciated optimised replacement cost (DORC) value of the assets. As a further practical consideration where prices are in future to be regulated to reflect costs, the initial regulatory asset value should be established at a level commensurate with regulated revenue and prices sufficient for the business to be sustainable into the future without further equity injections.

No DORC value has been estimated for the current study. However, the Water Corporation has provided information on written-down replacement values of assets, indicating a written-down replacement value of water and wastewater assets of $10,600 million at 30 June 2004.[15] While the written down replacement value may not necessarily reflect an optimisation of assets, the excess of this value over the regulatory asset value of $7,909 million or $8,103 million (depending on assumptions made as to forecast operating expenditure) at the same date that would be implied by forecast costs and revenues suggests that this implied regulatory asset value (and hence the Water Corporation's proposed regulatory asset value of $9,099 million in 2006/07) is likely to be significantly less than the DORC value of assets.

Within the range of asset values between the practical minimum and DORC, the choice of any particular initial regulatory asset value has implications for the financial status of the business. In a broad sense, the higher the asset value, the more financially viable will be the organisation when measured against criteria such as interest cover and debt payback periods. The regulatory asset value also has implications for government finances in terms of having the ability to affect the flow of dividends and CSO payments between the government and the Water Corporation. These affects of different asset values are illustrated below.

Table 3.4 indicates the financial outcomes of establishing a regulatory asset value at the commencement of the 2003/04 year at value of $8,103 million implied by the Water Corporation's projections of prices and revenues and taking into account potential reductions to forecast operating expenditure. Modelling of regulatory and statutory accounts of the Corporation enables the estimation of the total costs of delivery of regulated services, required CSO payments, taxation payments and dividend payments, taking into account both the costs and revenues of the Corporation forecast for regulatory accounts and the actual costs as reflected in statutory accounts. Modelling of the statutory accounts also allows determination of a range of financial performance indicators that are routinely used by ratings agencies to assign credit ratings to businesses: *funds flow interest cover*, *internal financing ratio* and *debt coverage ratio*.[16]

The methods and assumptions employed in modelling statutory accounts are described in Appendix A of this report. Definitions of financial parameters and the indicative credit ratings applying to different values of performance indicators are provided in Appendix B. For the purposes of the current study, statutory accounts have been modelled on the basis of the financial gearing (ratio of debt to total assets) of the Corporation as recorded in the statutory accounts for the 2003/04 year, despite the gearing being very low for a utility business of this type. This reflects the purpose of the analysis being to determine the extent to which different regulatory asset values will affect the ability of the Corporation to meet its projected financial obligations, rather than considering the affect on a hypothetical business with a level of gearing more typical of the industry. Notwithstanding this, the sensitivity of the analysis to a higher level of gearing is given consideration (refer to page 22 at the end of this analysis).

[15] Water Corporation, 6 October 2004, ERA Inquiry on Urban Water and Wastewater Pricing Information request No. 1 (11 August 2004) to Water Corporation, p 9.

[16] Projections of financial indicators should be considered as indicative estimates based on assumptions rather than the results of an in-depth modelling of the Corporation's internal accounting variables.

It is noted that the financial modelling undertaken for this analysis is indicative of the potential impacts of different regulatory asset values (and hence regulated revenues) on the financial status Water Corporation. A number of simplifying assumptions were made in the modelling of statutory accounts, and as such this modelling is not intended to be definitive.

For a regulatory asset value of $8,103 million at the commencement of the 2003/04 year, CSO payments are projected to increase over the period to 2008/09 while dividend payments fluctuate over the period with no clear trend exhibited. Financial indicators suggest a credit rating of AAA in respect of performance indicators relating to the ability of the business to service debt and BBB in respect of internal financing of new investment, consistent with an "industrial grade" or better credit rating for the business.

Table 3.4

WATER CORPORATION FINANCIAL OUTCOMES WITH A REGULATORY ASSET VALUE OF $8,103 MILLION

Financial Parameter	Year 2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Initial regulatory asset value ($million)	**8,103**					
Forecast revenue and financial outcomes (2003/04 = actual)						
Regulated total revenue ($million)	1,047	1,098	1,150	1,242	1,316	1,400
Forecast customer revenue ($million)	770	797	831	918	959	1,010
Implied value of CSO payments ($million)	268	301	319	325	357	389
Dividend payments to Government	286	299	71	208	144	164
Additional Corporation debt requirements	0	0	0	0	0	0
Corporation financial indicators						
Interest cover ratio	11.7	11.1	10.3	10.1	9.7	9.5
Indicative rating	AAA	AAA	AAA	AAA	AAA	AAA
Internal financing ratio	0.8	0.8	0.8	0.8	0.8	0.8
Indicative rating	BBB	BBB	BBB	BBB	BBB	BBB
Debt pay-back period	1.7	1.8	2.1	2.2	2.3	2.4
Indicative rating	AAA	AAA	AAA	AAA	AAA	AAA

Table 3.5 shows the effect on financial outcomes for the Corporation of a reduction in the regulatory asset value at the commencement of 2003/04: as an illustrative example the regulatory asset value is reduced to $6,000 million, a reduction of $2,103 million. With this reduction, the value of regulated total revenue is reduced, reflecting a reduction in the regulatory cost items of return on assets and depreciation. The regulated total revenue is still, however, in excess of that corresponding to the Corporation's projection of regulated retail prices and hence CSO payments are still made in each year, albeit at reduced values. With lower revenues (resulting from the lower CSO payments), the profitability of the Corporation is reduced, resulting in lower dividend payments. In 2005/06, when dividends fall to zero, cash flows are not sufficient to finance planned investment and the Corporation is forced to take on additional debt.

With reductions in revenue to the Corporation the interest cover ratio reduces and the debt pay-back period increases, although these indicators remain in the band consistent with an AAA credit rating.

Table 3.5

WATER CORPORATION FINANCIAL OUTCOMES WITH A REGULATORY ASSET VALUE OF $6,000 MILLION

	Year					
Financial Parameter	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**	**2008/09**
Initial regulatory asset value ($million)	**6,000**					
Forecast revenue and financial outcomes (2003/04 = actual)						
Regulated total revenue ($million)	1,047	917	967	1,058	1,131	1,213
Forecast customer revenue ($million)	770	797	831	918	959	1,010
Implied value of CSO payments ($million)	268	120	136	141	172	202
Dividend payments to Government	286	173	0	77	13	32
Additional Corporation debt requirements	0	0	58	0	0	0
Corporation financial indicators						
Interest cover ratio	11.7	8.2	7.5	7.5	7.3	7.3
Indicative rating	AAA	AAA	AAA	AAA	AAA	AAA
Internal financing ratio	0.8	0.8	0.7	0.8	0.8	0.8
Indicative rating	BBB	BBB	BBB	BBB	BBB	BBB
Debt pay-back period	1.7	2.2	2.8	2.8	3.0	3.0
Indicative rating	AAA	AAA	AAA	AAA	AAA	AAA

Table 3.6 shows the effect on financial outcomes for the Corporation of a further reduction in the regulatory asset value at the commencement of 2003/04. In this case, the regulatory asset value is reduced to $4,000 million in 2003/04. With this regulatory asset value, regulated revenues in 2004/05 are reduced to the revenue commensurate with the predetermined 2004/05 prices, hence CSO payments are reduced to zero for most of the period. The profitability of the Corporation is reduced further and this results in there being no dividend payments to government after 2004/05. The Corporation is now forced to take on additional debt in most of the years modelled.

With reductions in revenue to the Corporation the interest cover ratio reduces and the debt pay-back period increases, this results in a deterioration of these financial indicators to levels consistent with credit ratings of AA or A for much of the period.

Table 3.6

WATER CORPORATION FINANCIAL OUTCOMES WITH A REGULATORY ASSET VALUE OF $4,000 MILLION

Financial Parameter	Year 2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Initial regulatory asset value ($million)	**4,000**					
Forecast revenue and financial outcomes (2003/04 = actual)						
Regulated total revenue ($million)	1047	745	793	883	954	1035
Forecast customer revenue ($million)	770	745	793	883	954	1010
Implied value of CSO payments ($million)	268	0	0	0	0	24
Dividend payments to Government	286	52	0	0	0	0
Additional Corporation debt requirements	0	0	184	52	122	108
Corporation financial indicators						
Interest cover ratio	11.7	5.5	4.7	4.8	4.6	4.5
Indicative rating	AAA	AAA	AA	AA	AA	AA
Internal financing ratio	0.8	0.8	0.5	0.7	0.6	0.6
Indicative rating	BBB	BBB	BBB	BBB	BBB	BBB
Debt pay-back period	1.7	2.9	4.1	4.1	4.6	4.8
Indicative rating	AAA	AAA	AA	AA	A	A

Table 3.6 shows the effect on financial outcomes for the Corporation of a further reduction in the regulatory asset value to $3,500 million in 2003/04. With this regulatory asset value, regulated revenues for 2004/05 onwards are reduced to the revenues commensurate with the predetermined prices, thus eliminating the CSO payments altogether. At this level of regulated revenue, the Corporation must further increase its additional debt requirements. With the reductions in revenue to the Corporation and the increases in additional debt required, the interest cover ratio reduces and the debt pay-back period increases, and for the most part the indicators fall to a band consistent with an A credit rating. The Corporation's internal financing ratio also falls to a BB rating during one of the years. These credit ratings may be close to the minimum that the Government would accept for the Water Corporation.

Table 3.7

WATER CORPORATION FINANCIAL OUTCOMES WITH A REGULATORY ASSET VALUE OF $3,500 MILLION

Financial Parameter	Year 2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Initial regulatory asset value ($million)	**3,500**					
Forecast revenue and financial outcomes (2003/04 = actual)						
Regulated total revenue ($million)	1047	701	749	839	910	990
Forecast customer revenue ($million)	770	701	749	839	910	990
Implied value of CSO payments ($million)	268	0	0	0	0	0
Dividend payments to Government	286	22	0	0	0	0
Additional Corporation debt requirements	0	0	216	85	156	144
Corporation financial indicators						
Interest cover ratio	11.7	4.8	4.1	4.2	4.0	3.9
Indicative rating	AAA	AA	A	A	A	A
Internal financing ratio	0.8	0.8	0.5	0.6	0.6	0.6
Indicative rating	BBB	BBB	BB	BBB	BBB	BBB
Debt pay-back period	1.7	3.2	4.5	4.7	5.2	5.6
Indicative rating	AAA	AAA	A	A	A	A

The above analysis of the impact of different asset values on the Water Corporation business was based on the existing financial structure of the business, and in particular the very low level of financial gearing of the business: gearing of only 13 percent (debt to total assets) in 2003/04 and projected to increase to only 16 percent of the modelled period. This level of gearing is extremely low for a utility business such as the Water Corporation. At a more representative (i.e. higher) gearing for this type of business, the interest costs of the business would be greater and hence financial indicators worse.

For example, with an assumed gearing of 60 percent (corresponding to an increase in total debt of approximately $4,500 million), interests costs would increase by approximately $240 million per annum. The financial indicators of the interest cover ratio would decline and the debt pay-back period would increase to the extent that even with an assumed regulatory asset value of $8,103 million in 2003/4, and the indicators fall in a band consistent with a BBB to BB credit rating. This suggests that if the Water Corporation had a financial gearing more representative of this type of business, any reduction in regulatory asset values and revenues for the business cause the financial status of the business to decline to a level unacceptable to the government.

Chapter 4

Forecasts of Capital Expenditure

4.1 Introduction

This chapter provides a review of the Water Corporation's capital expenditure forecasts.

The Corporation's capital program over the next five years averages $600 million per annum. Key drivers of the capital program relate to the distribution network, the development of new water sources and the ongoing infill sewerage program. These and other key projects, which are described in detail in the chapter, are briefly described below:

- water sources ($1,000 million over five years) — involves the sourcing of new water supplies and improving the security of supply. Key components of this category relate to the construction of the desalination plant, the South West Yarragadee and Stirling-Harvey schemes as well as other new water supply storage options;
- distribution network (approximately $770 million over five years) — entails over one quarter of the Corporation's future capital program and involves upgrading and replacing parts of the distribution network and servicing new developments. Key projects include the Kalgoorlie pipeline, and metropolitan and country water distribution works;
- wastewater treatment ($390 million over five years) — involves upgrading existing wastewater treatment plants in both metropolitan and regional areas. Key projects include the Alkimos wastewater scheme, country and metropolitan wastewater treatment and odour control works;
- infill sewerage program ($218 million over five years) — the program has been in operation for around 10 years and involves the provision of sewerage services to both metropolitan and regional properties across the state; and
- drinking water quality ($93 million over five years) — dominated by expenditure in regional areas, the program involves barriers to stop pollutants entering water networks to ensure compliance with drinking water guidelines.

The key drivers of the Corporation's capital expenditure are similar to most other water providers, with the most important factors being base capital maintenance and investigation of new water sources. The means by which capital projects are delivered, primarily through a tendering process involving design and construction contracts, is also relatively typical of methods adopted by other water companies.

While the tendering of design and construction contracts is still very much the norm among water companies, it is worth noting that some companies have begun to move away from this method of capital delivery and are instead adopting project partnering and alliance approaches to procurement. Proponents of project partnering and alliances claim that they enable both a greater level of capital to be invested in public infrastructure and a better sharing of risks between parties — such approaches are also considered to be more conducive to innovation. Partnering and alliance approaches are also promoted as being able to achieve cost savings of 10 to 15 per cent over more traditional procurement approaches.[17]

4.2 Forecast capital expenditure

The Water Corporation has provided detailed capital expenditure forecasts for the five year period spanning from 2004/05 to 2008/09 as well as details surrounding the proposed capital program. These data comprise the Corporation's estimates of capital expenditure for all of Western Australia as at 2 November 2004.

Discussions with Water Corporation staff have confirmed that government intervention and the internal capital prioritisation process have the potential to significantly alter capital program drivers and the associated capital spend. Therefore, although capital projections have been provided for information, more general commentary on the capital delivery process, its drivers and its efficiency are seen to be more relevant to this review than an assessment of the exact magnitudes of forecast expenditure.

4.3 Capital programs

The Corporation's forecast capital expenditure program has been prioritised and constrained by budget limitations. A summary of the major capital programs is provided below.

Distribution network

Approximately one quarter of the proposed capital program over the next five years consists of works to expand, upgrade and replace the distribution network and includes some works related to servicing new developments. The high value of this program is not surprising given the majority of any water company's assets are made up of distribution assets such as water mains and sewers. This is no different for the Water Corporation — around 75 per cent of the organisation's $8.2 billion of assets as measured by the written down replacement value are classed as distribution assets.

Infill sewerage program

Commencing in 1994, the infill sewerage program aims to provide sewerage services to more than 100,000 properties on the Swan coastal plain and to date the program is around three quarters complete. Over 1,150 km of new sewers in the Perth metropolitan area and 500 kilometres in regional areas are now finished. Work on this program continues in both metropolitan and regional areas.

[17] Based on the experiences of United Kingdom water supply companies.

Wastewater treatment

Capital works for wastewater treatment form part of a maintenance and improvement program to upgrade some of Corporation's existing treatment plants. The split of predicted capital expenditure on wastewater treatment between metropolitan and regional areas is approximately two thirds metropolitan and one third country.

Water sources

A program is in place to increase source development within Western Australia and to improve the security of water supply. The Perth desalination project forms a large part of the water sources budget between 2004/05 and 2006/07. Also included within this program is the South West Yarragadee Scheme and approximately $300 million in capital expenditure over the next five years for dams and other water source development. The Corporation is also investigating other potential water sources within the state to increase the volume and diversity of supply. The projected capital expenditure on water sources is almost solely related to metropolitan water supply.

Dam safety

Capital works for dam safety relate to remedial and upgrade works to dams in accordance with the national guidelines for large dams, issued by the Australian National Committee on Large Dams (ANCOLD).[18]

ANCOLD has produced a wide range of guidelines to cover design, construction, maintenance and surveillance of dams with the aim being to ensure safety. Dam safety remains a prime concern as dams are a potential high risk area for most water providers. Similar expenditure programs are underway in other states to address dam safety.

1996 Australian Drinking Water Guidelines (ADWG) Compliance Program

The drinking water quality program comprises capital works to ensure compliance with the 1996 Australian Drinking Water Guidelines. Water supplies in the metropolitan area generally comply with these standards already, hence the main driver of expenditure relates to water quality for regional water supplies. The current capital budget is estimated to allocate 10 per cent ($9 million) for the metropolitan area and 90 per cent ($84 million) for regional areas. The program will extend beyond 2008/09 in order to complete the currently identified scope of works.

The program involves construction of barriers to stop possible pollutants entering water distribution networks. Works include enclosing tanks and reservoirs, catchment management, country water treatment, chlorination and system improvements. The program is currently under review and the projected scheme budget has the potential to rise from its initial estimate of $110 million made in 1998 to the current estimate of around $390 million.

In addition to the capital works, increased operating expenditure will be required for water treatment and monitoring to ensure compliance with the guidelines.

[18] ANCOLD 2003, *Guidelines on Dam Safety Management*.

All states have had to undertake works relating to water quality since the release of the 1996 Australian Drinking Water Guidelines, with the majority of works undertaken in regional areas where economies of scale and generally poorer raw water quality cause difficulties in meeting these guidelines.

Odour management

The odour management program is undertaken to reduce the odour from sewage treatment plants by covering open areas and scrubbing gas emissions before release. Programs of this nature are being undertaken elsewhere in Australia and internationally due largely to ongoing reductions to buffer zones between wastewater treatment plants and urban developments. This program is relatively minor and represents less than half of one per cent of the proposed capital program over the next five years.

Aesthetic water quality

The aesthetic water quality program provides for the improvement of non-health related water quality issues such as taste and odour.

Results of ongoing "willingness to pay" research undertaken by the Water Corporation show that despite poor customer perceptions of water quality, the willingness to pay for water quality improvements is relatively low.[19] It is the Corporation's view that the expenditure required to improve quality exceeds what customers are wiling to pay and therefore the program has been deferred. The Corporation has indicated that no funds are budgeted for aesthetic water quality works over the next five years.

SCADA

Capital works on SCADA (Supervisory Control and Data Acquisition) systems relate to continuation of a program to automate and link the Corporation's assets to central control systems. This program is being undertaken to reduce operating costs and improve overall system control of both water and wastewater assets.

4.4 Potential capital program savings

A number of issues have been identified upon review of the Corporation's capital programs and their drivers. These range from questioning the basic need for capital works to the method by which works are procured. Three programs where potential may exist to reduce capital expenditure are described below.

Infill Sewerage Program

Upon review of the Infill Sewerage Annual Report for 2001/02, it is evident that over 380 contracts have been awarded and managed over the eight years to 2001/02.[20] The average value of each contract is $1.13 million.

It is our view that the program would be better suited to a smaller number of larger framework contracts over a set period, say three to five years. This would not only significantly reduce the contract management input required by the Corporation, but also offer benefits to contractors, including:

[19] Water Corporation 2002, *Willingness to Pay Research*, July.

[20] Water Corporation 2002, *Infill Sewerage Annual Report 2001/02*.

- long term contracts with increased turnover;
- contract security;
- ability to forward plan workload; and
- favourable and secure payment terms.

Overall savings of 5 to 15 per cent are thought to be achievable from adopting such an approach. Taking the mid-point and assuming additional savings of 10 per cent could be achieved would result in a total saving of $22 million over the next five years.[21]

1996 Australian Drinking Water Guidelines (ADWG) Compliance Program

A total review of the drinking water quality program by the Corporation is underway. The review involves an assessment of the key drivers of the program as well as a detailed investigation into the experiences of other Australian states. To date, the results of the review suggest that current capital cost estimates of $110 million for the 10 to 15 year long program are likely to increase to around $390 million.

SA Water undertook a similar review following the release of the Drinking Water Guidelines in 1996. In some small regional areas where water quality does not meet the required guidelines, the South Australian Water Corporation declared the water supply system 'non-potable' and provided residents with alternative arrangements, such as rainwater tanks, for sourcing potable water. This provides a cost effective solution that requires relatively low capital investment and minimal, if any, increases in future operating expenditure. It is our view that the potential cost impacts of declaring some country water supplies non-potable should be examined by the Corporation in light of the large potential increase to overall program costs. The political and market perception issues associated with such an approach should also be addressed.

Water treatment

The Water Corporation is one of the few organisations that only undertakes disinfection at the majority of its water treatment plants (in 2002/03, 22 of 31 treatment plants in operation undertook disinfection only). The Corporation is heavily reliant on groundwater which is effectively already naturally filtered and contains only minor amounts of suspended material therefore requiring less treatment than surface water.

In contrast, SA Water sources all its water from open catchments, or the River Murray, and therefore needs to remove a considerable amount of suspended material and organic matter prior to distribution. SA Water operates six metropolitan water treatment plants, all of them providing full water treatment encompassing chemical dosing, filtration and disinfection.

[21] Note: the infill sewerage program is already around 75 per cent complete hence cost savings are only calculated on work not yet complete.

Disinfection is the simplest level of water treatment for potable supply, and is by far the cheapest. Further treatment by the Corporation to improve taste and odour issues would increase treatment complexity and current operating costs substantially while having no affect on drinking water quality from a health point of view. However, additional treatment would likely reduce the number of water quality related complaints, however, as discussed above, customer willingness to pay for such a program is relatively low.[22]

4.5 Long range source development timetable

A summary of each of the Corporation's options for long range source development is detailed below — options for source development listed after the South West Yarragadee should be considered as indicative only.

- *Harvey Water Trade I* — involves the purchase of additional water made available from the piping of irrigation channels and the subsequent elimination of seepage and evaporation from the existing open channel irrigation systems. Work undertaken to date has yielded an additional 10 gigalitres per annum and the Corporation is confident of achieving a total yield of 17 gigalitres per annum once the project is complete. The project is expected to cost the Corporation around $60 million.

- *Desalination Plant No. 1* — investigations into the viability of constructing a seawater desalination plant commenced in 2001. The project is now at the tender stage and two consortia are currently preparing submissions, due in February 2005, to construct and operate the plant which will produce 45 gigalitres of water per year. A pilot plant is currently in operation at the proposed site for the plant to confirm pre-treatment requirements and operational issues. Capital cost estimates for the scheme have been developed by independent sources and detailed hydraulic modelling has been utilised to determine the required pipeline water transfer requirements.

- *South West Yarragadee* — involves the construction of new bores, a water treatment plant, a pump station and a pipeline to extract and transfer 45 gigalitres of groundwater per annum into the Perth supply system. The Yarragadee aquifer is a large resource of good quality water with an estimated sustainable yield of 300 to 400 gigalitres per annum.[23]

  It is envisaged that the scheme will be located approximately 250 kilometres south of Perth and connect into the southern section of the water supply network. The proposed transfer system will pump to a local high point and flow will gravitate to the supply network via a 1.4 metre diameter pipeline.

  Current abstraction from the aquifer is in the region of 60 gigalitres per annum which would rise to just over 100 gigalitres per annum with the commencement of the Corporation's planned scheme. This level of extraction is thought to be well within the Corporation's estimate of a sustainable abstraction level from the aquifer of 300 to 400 gigalitres per annum.

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[22] On average, the Water Corporation receives 18.6 water quality complaints per 1,000 properties compared to 1.6 complaints per 1,000 properties for SA Water

[23] Yield estimates provided by the Water Corporation on 20 January 2005.

- *Eglinton Groundwater* — a coastal supply scheme proposed to supply new housing development in the north of Perth. The timing of the scheme is based on the Corporation's estimates on the progression of urban development.
- *Catchment Management* — a developmental scheme involving the thinning of regrowth which is expected to result in increased catchment runoff. A 12 year trial is currently being considered to prove, or otherwise, the benefits of thinning regrowth.
- *Wellington Pumpback* — involves the transfer of water from the Wellington Dam. Water within Wellington dam has a total dissolved solids (TDS) measure of approximately 1000 milligrams per litre, which is twice the recommended salinity level for potable water. At present, the high level of salinity is causing problems for irrigation usage and therefore the Corporation can only utilise small volumes of water from Wellington Dam which has to be blended with other supplies to reduce salinity. The Corporation has an in principle allocation of 17 gigalitres per annum which is adequate to cover the proposed yield of 12 gigalitres per annum.
- *Harvey Water Trade II* — an extension to the Harvey Water trading scheme which involves piping irrigation in the Collie irrigation district. Water yields are again based on savings achieved by eliminating seepage and evaporation from existing open channel irrigation systems.
- *Yanchep Groundwater* — similar to the Eglinton groundwater scheme, Yanchep groundwater involves new local groundwater supplies to cater for urban development and local demands. Again, the timing of the scheme is based around the Corporation's estimates on the progression of urban development.
- *Brunswick Dam* — a proposal for a new dam in a relatively undeveloped catchment. The scheme has an estimated sustainable yield of 25 gigalitres per annum. Estimates of yield are based around the last 7 years of climate sequence.
- *Aquifer Storage and Recovery* — the current proposal is to inject part of the 100 gigalitres of treated wastewater which currently flows into the sea into groundwater resources to the north of Perth whereby it can then be extracted at some later point in time.
- *Gingin Groundwater* — a proposal to source water from a number of aquifers. There are still a number of issues yet to be resolved for this scheme, with the prime concern being the sustainability of the proposed yields as the CSIRO is predicting the area will be heavily affected by a drying climate.

The process underlying the selection and ordering of capital projects involving long term source development is one that encompasses a wide variety of issues and does not simply focus on costs alone. Key among the factors assessed by the Corporation in determining future water sources are both social and environmental impacts. Given the nature of the Corporation's ownership structure, that is, the fact that it is a government-owned corporation, it is to be expected that the organisation considers environmental and social factors as well as economic factors. This is so because the organisation's capital projects must be approved by governments that operate within a political environment.

The Corporation's long range source development plans do not entail explicit demand management options. In some cases it would be considered appropriate that demand management options be considered by water service providers as potential alternatives to source development options and therefore should be priced and assessed in long range source development plans. However, the Corporation operates within a constrained environment in terms of demand management in that it is already bound by the State Water Strategy to implement demand management options to achieve per capita demand of 155 kilolitres per annum. It follows that the long-range source development plan is framed within a demand scenario of 155 kilolitres per person.

The 155 kilolitres per person scenario is considered to be a relatively aggressive target though one which the Corporation is aiming to achieve. Present levels of demand are already at around 155 kilolitres per person but this has been largely met through the enforcement of watering restrictions which the Corporation hopes to lift in the future. Given the Corporation's desire to meet the target, it is likely to be achievable in future years, however, the question of how much money will need to be spent on demand management and the extent of water restrictions required to maintain demand at targeted levels is currently unknown.

From an engineering perspective, it is our view that the Corporation has demonstrated that sufficient technical investigations on each option have been undertaken and informed decisions on source development have been made. Communications with the Corporation have also indicated that the Corporation has considered, and will likely continue to consider, many different options for future source development before finalising the program.

The process of planning future water source options appears to be an ongoing one and while this is to be expected, the degree to which the long range capital program has changed over the course of this review is worth noting and serves to emphasise the fact that the current source development timetable is subject to change.

4.6 Capital cost forecasting methodology

In estimating capital expenditure, the Corporation's estimating group uses a standard "project-estimate" matrix describing the project staging, type of estimates prepared and the design input. The accuracy of estimates is reported to be as follows:

- initial estimate: +75 per cent to –10 per cent;
- planning estimate: +50 per cent to –10 per cent;
- definition estimate: +20 per cent to –5 per cent; and

- detailed implementation estimate: +15 per cent to –5 per cent.

The estimating group also operates and maintains a unit cost database (UCD) containing historical cost information. This system is utilised for the majority of cost estimates once they have passed the planning phase, and can be used for planning estimates. The extent to which the database has been used to forecast capital expenditure for the five-year capital works program cannot be determined, as projects are at different stages of approval.

UCDs are used extensively in the United Kingdom to forecast capital costs, or "standard costs". In the UK, historical capital costs are examined and broken down into unit costs which are stored in databases for use when forecasting new capital projects. In this situation, after a period of time it follows that changes in actual capital out-turn costs will result in changes to "standard costs" and thus a measure of relative capital cost efficiency is developed.

UCDs are also used to develop target costs for performance based contracts to drive down capital costs and allocate pain/gain payments. The reliance on UCDs for capital cost forecasts in the United Kingdom requires effective management of UCDs in regard to data capture, sorting, age, analysis and use. This is a complex task and as such, Ofwat requires company UCDs to be audited on a regular basis.

From the capital cost estimates examined it appears that cost estimates are generally prepared by the estimating group using a number of data sources. These include external consultants, tender estimates, the UCD and internal estimates. Costs generally allow for corporate charges, overheads and contingencies. Risk-management allowances are not allocated on a project level, but rather are held by the Capital Investment Planning branch to cover all capital schemes.

An initial assessment of the capital cost forecasting system shows that capital costs are generally estimated in a consistent manner, using historical data when available. The Corporation appears to obtain further advice when specific expertise is required to develop capital cost estimates, as has occurred for the desalination plant.

4.7 Capital drivers

The Corporation has adopted industry standard capital drivers based on those used by Ofwat and IPART (Independent Pricing and Regulation Tribunal of New South Wales). These comprise the following:

- *base capital maintenance* — including works to maintain, refurbish or replace current assets to ensure satisfactory performance;
- *supply and demand balance* — including works to maintain water supply system capacity to meet demand;
- *quality and standards* — including works to comply with current and future standards;
- *enhanced service* — including works to improve levels of service to existing customers and operational improvements[24]; and

[24] Capital expenditure under the title of enhanced service may include services such as advanced water/wastewater treatment, operational enhancements like automation of equipment and control

- *commercial business development* — including the Corporation's own externally-funded commercial projects outside the regulated pricing environment.

Historical and projected capital expenditure by driver is depicted in Table 4.1.

Table 4.1

WATER CORPORATION CAPITAL EXPENDITURE BY DRIVER

Expenditure driver (financial year ending)	2000 ($m)	2001 ($m)	2002 ($m)	2003 ($m)	2004 ($m)	2005 ($m)	2006 ($m)	2007 ($m)	2008 ($m)	2009 ($m)
Regulated Business Program										
—Base capital maintenance	100	98	86	81	85	126	138	159	138	181
—Supply and demand balance	219	250	159	69	85	137	435	307	430	378
—Quality and standards	102	96	66	43	51	94	88	64	70	83
—Enhanced service	9	19	27	138	111	28	24	25	34	56
Sub total	*431*	*463*	*338*	*331*	*331*	*386*	*685*	*555*	*671*	*697*
Other Business										
Commercial business development	na	na	na	na	na	18	1	1	1	1
Capital support	na	na	na	na	na	24	38	27	28	28
Sub total	*na*	na	na	na	na	*42*	*39*	*28*	*29*	*29*
Capital Investment Total	**431**	**463**	**338**	**331**	**331**	**428**	**724**	**583**	**700**	**726**
Less Developers Contributions	77	48	64	86	105	165	112	119	110	110
Capital Expenditure less Developers Cash Contributions	**354**	**415**	**274**	**245**	**226**	**263**	**612**	**464**	**590**	**616**

Note: As at 2 November 2004.
Source: Water Corporation.

The accuracy of the above allocation of projects to the industry standard drivers has been queried given the allocation process is undertaken at a project level, generally by individual project managers. The Corporation has standard internal guidelines for selecting capital drivers and has utilised a translation table to convert the old drivers to the new industry drivers. The Water Corporation conducted an audit on the use of the new industry drivers in October 2004 for all projects costing in excess of $500,000 within the capital program. Following this, the Corporation maintains a high level of confidence in the allocation of projects to drivers going forward, as well as a high degree of confidence in the historical data.

Base capital maintenance

Base capital maintenance comprises nearly one quarter of the overall capital expenditure program. Such a ratio is considered reasonable given the current condition of the assets owned by the Corporation.

systems and improvements to reliability of plant and equipment. Some water source projects may be classified an 'enhancing service' if they improve security of supply or can reduce the risk of water restrictions.

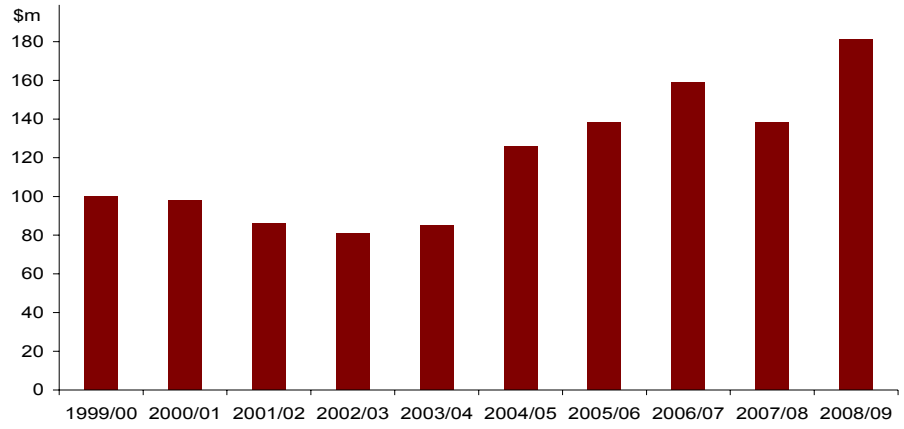
The level of acceptable base capital maintenance is dependent upon factors such as the type and age of assets, asset materials and construction standards as well as the way in which assets are operated. A review of water and irrigation infrastructure assets within Australia, undertaken by the Institution of Engineers Australia in 2001 found that the average annual renewal expenditure allocated by the major utilities for water supply and wastewater assets is about 0.5 per cent of replacement value.[25]

In 2003/04, the Corporation spent around $85 million on base capital maintenance. Using the Corporation's total asset replacement value estimate of $16,703 million, the amount spent on base capital maintenance equates to just over 0.5 per cent of total asset value and is therefore in line with the Australian average. A similar ratio of expenditure to asset values was achieved in both 2001/02 and 2002/03.

Looking forward, the Corporation's projections for base capital maintenance show an upward trend relative to current levels (Figure 4.1). Between 2004/05 and 2008/09, the average annual expenditure on base capital maintenance is projected to be around $150 million or 67 per cent greater than the average annual expenditure for the five years to 2004/05. In the years leading up to 2004/05, base capital maintenance has, on average, accounted for less than one quarter of total capital expenditure and forward projections have this ratio staying broadly the same for the period from 2004/05 to 2008/09.

Figure 4.1

ACTUAL AND PROJECTED BASE CAPITAL MAINTENANCE EXPENDITURE



Source: Water Corporation.

According to the Corporation, expenditure on base capital maintenance has been constrained since 2001 due to budget limitations and additional drought-related expenditure. As many of the base capital maintenance projects can no longer be delayed, the Corporation is planning to increase expenditure on base capital maintenance in coming years. A number of larger maintenance and rehabilitation projects are also planned within the next 5 years, these include:

- overflow risk management projects;

[25] Institution of Engineers Australia 2001, *Australian Infrastructure Report Card*.

- increasing the metropolitan water treatment program relating to the automation and centralisation of water treatment plants (2005/06 and 2006/07) and upgrading facilities at the Wanneroo water treatment plant (2007/08);
- increased expenditure on dam safety mainly relating to the Wellington Dam remedial works in 2007/08 and 2008/09;
- increased spending on the refurbishment of the Kalgoorlie Pipeline (2008/09);
- spending on information technology of approximately $1 million per annum more than that of the previous five years;
- increased expenditure on SCADA mainly due to the availability of resources and the further developments in technology; and
- the proposed Subiaco effluent reuse project and the replacement of the Woodman Point to Cape Peron connection.

While it is difficult to say that the Corporation's planned base capital maintenance will be sufficient to maintain asset quality into the future, the fact that the ratio of planned expenditure to assets is around double the Australian average suggests that the Corporation is not grossly under-funding base capital maintenance relative to other service providers.

Supply and demand balance

The majority of capital expenditure over the next five years is focussed on addressing the supply / demand balance, both in terms of responding to the dry climate as well as population growth. The supply / demand balance program has recently been modified by the Corporation and is now double the size of the $836 million program proposed by Sydney Water over the next four years. Such an outcome suggests that the Corporation's expenditure on maintaining the supply / demand balance is by no means inadequate.

Quality and Standards and Enhancement of Supply

The maintenance of quality and standards and the enhancement of supply together make up less than 20 per cent of the overall capital program. This proportion is considered reasonable and should result in improved operation while reducing operating costs and improving service standards. This has been found to be the case with many water companies in the United Kingdom, particularly in regard to sewage treatment plant operation.

4.8 Developer contributions

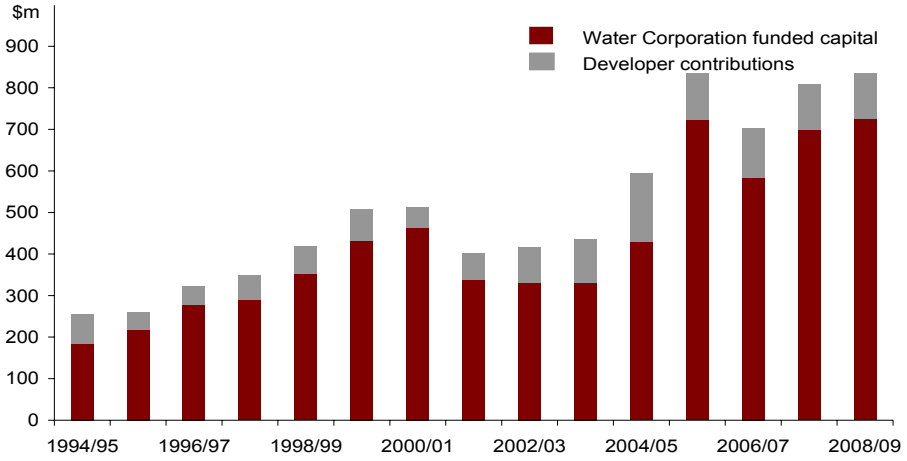
A review of the Corporation's historical capital program expenditure over the last 10 years indicates that developer cash contributions have funded, on average, 20 per cent of the overall capital program — in some years the ratio has been as low as 10 per cent while in others, as high as 40 per cent.

The value set for developer contributions per allotment has been historically set to achieve a pre-determined revenue stream and has not been related to the actual cost of service provision to new allotments.

Figure 4.2 shows the value of capital expenditure over the last 10 years and the percentage funded by developer cash contributions. Developer cash contributions for the 2003/04 financial year totalled $105 million out of a total capital program of $441 million — that is, around 24 per cent of total capital expenditure was funded by developer contributions. Forward projections, also depicted in Figure 4.2 have developer contributions accounting for, on average, around 21 per cent of the Corporation's total capital expenditure.

Figure 4.2

WATER CORPORATION CAPITAL EXPENDITURE AND DEVELOPER CASH CONTRIBUTIONS



Source: Water Corporation.

The Corporation does not allocate cash contributions from developers to specific schemes, instead contributions are regarded as general revenue. It is possible, however, to draw some broad conclusions based on cost recovery using historical levels of capital expenditure for the supply and demand driver. Figures prior to 2001 are most applicable for this purpose as capital expenditure on the supply and demand balance relates more closely to new customers and demand rather than new sources due to the current drought (Table 4.2)

Table 4.2

DEVELOPER CASH CONTRIBUTIONS RELATIVE TO SUPPLY AND DEMAND EXPENDITURE

Item	1999/00	2000/01	2001/02	2002/03	2003/04
Supply and demand expenditure ($m)	219	250	159	69	85
Developer cash contributions ($m)	77	48	64	86	105
Percentage of supply/demand expenditure met by developer cash contributions (%)	35	19	40	125	124

Note: As at 13 January 2004.
Source: Water Corporation.

A review of these figures indicates:

- expenditure on the supply and demand balance has dropped from $250 million per annum in 2000/01 to under $100 million in the last two years;
- developer contributions averaged $76 million per annum over the last 5 years and represented between 19 per cent and 125 per cent of the overall capital expenditure on supply and demand; and
- there is no consistent pattern to relate developer contributions and supply and demand expenditure. A more detailed analysis is therefore required on the level of developer contributions and the actual capital works undertaken to demonstrate cost over or under recovery.

4.9 Efficiency of the capital delivery process

Capital delivery process

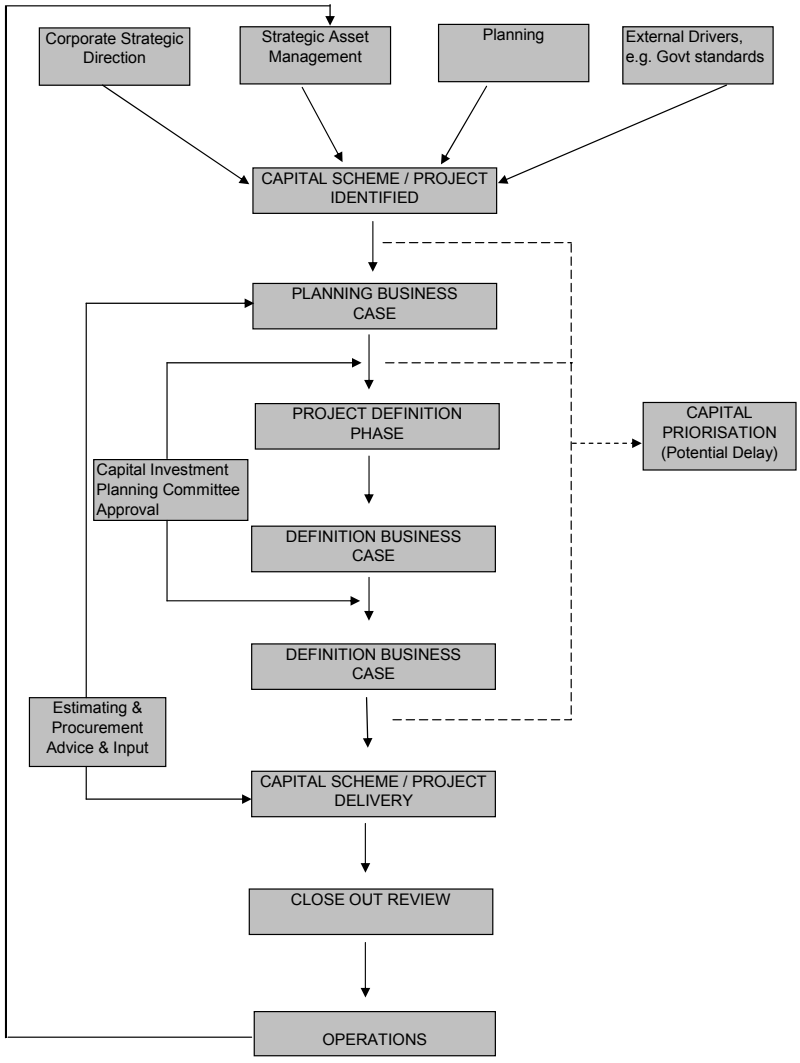
Following a recent re-structure of the Corporation and a refinement of roles and responsibilities, the following sections of the Corporation are involved in the delivery of capital infrastructure projects.

- Strategic Asset Management (asset management process);
- Planning (planning review process, planning role, capital prioritisation);
- Capital Investment Branch (business case process review, approval and prioritisation);
- Estimating (estimating including maintenance of the unit cost database);
- Procurement (advice on procurement practices, framework suppliers/contracts);
- Project Management (project management from business case to implementation and final closeout);

A simplified flowchart summarising the capital delivery process is depicted in Figure 4.3.

Figure 4.3

SIMPLIFIED CAPITAL SCHEME IDENTIFICATION AND DELIVERY PROCESS



Source: Water Corporation.

Until recently all projects of greater than $1 million in value (or greater than $0.5 million if information technology related) underwent the above capital approval and delivery process, with all projects under $1 million (or less than $0.5 million if information technology related) still completing the business case system, but being approved by Business Managers. The Corporation has now adopted a scheme-level approval process. This should streamline the business case and project delivery process.

Capital prioritisation process

The prioritisation of capital expenditure over the last few years has generally been driven externally by Government and internally by Board commitments. The future capital program is not presently as committed and the Corporation is developing a risk-based capital prioritisation process. A brief outline of the process is given below, although it is likely to be subject to revisions as it had not been adopted by the Corporation's Board at the end of October 2004.

The principles behind the Corporation's capital planning and delivery are as follows:

- risk management should form the centre of prioritisation, but not be the only consideration;
- the corporate risk framework should form the basis of risk assessment;
- the assessment of risk at a scheme level should be an ongoing process throughout the life of assets;
- the planning business case will form the key document that presents all project/scheme justifications and whole-of-life costings; and
- capital solutions should be based on optimal timing and staging where appropriate.

A risk framework has been adopted which appears to address the key risk areas for the Water Corporation including financial, people, environment, business interruption and reputation. Risks are then assessed on a scale between minor and catastrophic and given a likelihood of occurrence.

A sound basis for capital prioritisation appears to be being developed taking into account the above risk framework, planning requirements, sustainability assessments and asset management objectives. The final framework has not been reviewed and the overall process is yet to be approved within the Water Corporation.

Capital delivery review

The Corporation has provided high level capital cost forecasts alongside actual expenditure outcomes for 35 large projects were completed in the 2004 calendar year. The final value of the selected projects amounts to around $188 million and hence represents a fairly substantial portion of the organisation's total capital expenditure. For the purpose of analysis, these projects are grouped into various categories and presented in Table 4.3. Analysis of these data allow general conclusions to be made in regards to historical cost forecasting accuracy and the implications this may have on future capital program cost estimates.

Table 4.3

DIFFERENCE BETWEEN FORECAST AND ACTUAL CAPITAL EXPENDITURE, SELECTED PROJECTS, 2004

Project	Planning estimate ($m)	Approval estimate ($m)	Forecast at completion ($m)	Difference between planning and actual (%)	Difference between approval and actual (%)
Collaborative e-procurement project	0.33	0.98	1.04	215	7
Perth region projects	12.98	13.23	15.21	17	15
Infill sewerage program	6.46	8.07	10.58	64	31
North West / Mid West projects and ADWG	21.00	35.41	41.95	100	18
Great Southern and South West region projects	23.19	24.98	26.96	16	8
Goldfields and agricultural region projects	12.37	13.51	15.24	23	13
SCADA projects	1.34	1.11	1.11	-17	0
Water Technologies Division Wastewater projects	34.92	53.61	54.49	56	2
Dam-related projects	17.01	18.03	21.40	26	19
Total	**129.61**	**168.93**	**187.98**	**45**	**11**

Source: Water Corporation.

Using the above information the average difference between the planning estimate and the final out-turn costs was +45 per cent. This is within the Corporation's guidance bounds for planning estimates of between +50 to –10 per cent but does indicate that, for the selected projects, planning estimates have tended to underestimate final cost outcomes.

The difference between the approved capital cost estimate and the final out-turn costs for the selected projects was, in total, around +11 per cent. Again, this is within the organisation's bounds for detailed implementation estimates of between +15 and –5 per cent but does indicate the existence of a slight bias toward underestimating final project costs at the approvals stage of capital planning for the selected projects.

We advise that the best solution to this estimating bias is unlikely to be a change in estimating practice, but rather improvements in project and contract management with a strong focus on the front end of projects which is typically where many cost over-run problems commence.

Gaining an understanding of the effect that any bias toward project cost estimation on current capital forecasts is complicated by the fact that projects currently in the 5 years capital works plan could be at any stage of the project delivery cycle between planning and actual construction.

As such, a detailed assessment on the likely level of possible overspend for the for the 5 year capital program to 2008/09 cannot be undertaken without knowing what stage each individual project is within the delivery cycle. However, assuming most projects are at an approved stage, historical data would indicate that the current capital budget may need to be increased by 10 per cent on an annual basis to cover capital forecasting inaccuracy. This could increase the regulated capital program by approximately $60 million per annum over the next five years. This figure could increase if a number of large projects are only at a planning stage. The Water Corporation has in the past dealt with project budget overruns by delaying capital expenditure programs or projects to ensure the approved annual capital budgets are not exceeded.

Four projects selected by the Corporation are reviewed in detail to asses the capital approval and delivery process and the capital cost estimating practices adopted. The four projects reviewed are:

- Geraldton-Spalding Area, part of the infill sewerage program;
- Woodman Point Wastewater Treatment Plant Tanker Receival Facility;
- Bottle Creek Pump Station Upgrade; and
- Waroona Dam Remedial Works.

In general the review provides an opportunity to examine the business case process which forms the backbone of the capital investment planning structure. All schemes underwent some part, or all of the business case process except the infill sewerage project at Geraldton-Spalding. The sewerage infill program has long standing base costs for scheme estimating.

The review represented a total capital spend of nearly $34 million. The following is a summary of the issues identified:

- two out of the four projects experienced budget-related delays, in one case this was up to five years;
- two out of the four projects exceeded the Corporation's acceptable tolerances for planning and definition cost estimates;
- two out of the four projects achieved lower out-turn costs than predicted at planning and definition stages;
- indirect costs (internal Water Corporation costs and overheads, consultancy fees, etc.) can exceed 25 percent of the project budget, even on large capital schemes (greater than $15 million); and
- costs are estimated from a variety of internal and external sources and can vary considerably from planning to definition and project delivery stages.

4.10 Capital delivery alternatives

The Corporation's capital projects have historically been delivered in a relatively traditional manner generally using internal project managers. These delivery methods include:

- standard detailed design — including detailed design by consultants, preparation of contract documents, tendering, contract award/delivery and site supervision by Water Corporation personnel; and
- design and construction contracts — concept designs sufficient to detail performance requirements are prepared and contract documents prepared. Engineers and contractors tender for projects on a design and build lump sum or performance fee basis.

In an Australian context the above delivery strategies are still fairly common in the water industry, although increasing numbers of Build Own Operate or Build Own Operate and Transfer schemes are being procured using private investment.

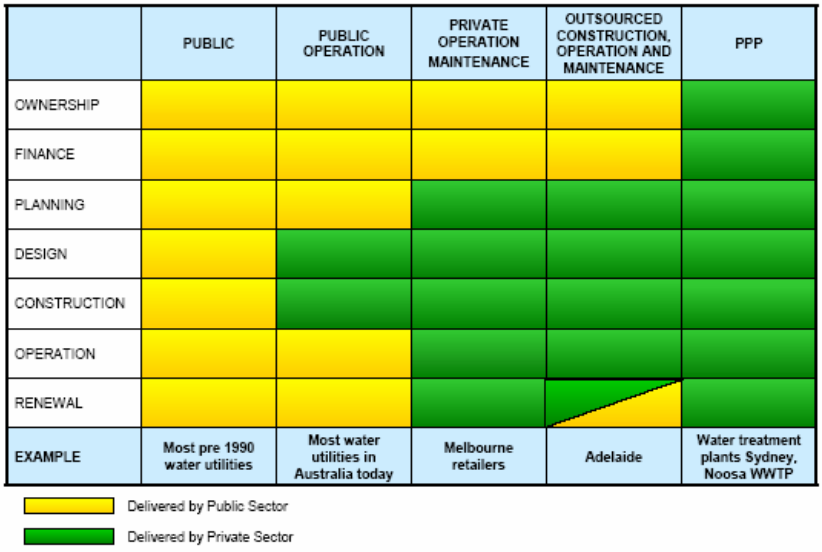
The Corporation is planning to deliver the desalination plant project using a paid tender approach, eventually developing an alliance proposal with one contractor. The alliance team will be responsible for the design and delivery of the project which will be funded by the Water Corporation.

Figure 4.3 depicts different stages of public and private participation among water companies in Australia. According to the Figure, the level of public-private participation in most Australian water utilities is generally limited to the design and construction of assets. This is considered to be the case for the Water Corporation and as such it is classed as operating under the 'public operation' banner.

Despite the largely positive promotion of public-private participation, there are disadvantages and risks that need to be understood and managed in order to achieve the desired outcomes. As with any capital delivery strategy there are examples of very good and very bad public-private transactions, with the remainder lying on a continuum in between.

Figure 4.3

PUBLIC – PRIVATE PARTICIPATION IN THE AUSTRALIAN WATER INDUSTRY



Source: Australian Water Industry Roadmapping Project Discussion Paper, October 2004

Capital Delivery Processes in the United Kingdom

The water industry in the United Kingdom has advanced from the traditional methods of capital delivery. Many water companies in the United Kingdom now favour project partnering and alliance approaches to procurement which are resulting in the sharing of risk, improved delivery performance and cost savings in the order of 10 to 15 per cent over traditional procurement approaches. This process evolved following privatisation in 1990 and continues to evolve. The early years of privatisation were a period of some turbulence, from which many lessons can be learned. A summary of current capital delivery processes for two United Kingdom Water Companies is given below.

Dŵr Cymru Welsh Water

Dŵr Cymru Welsh Water (DCWW) has a unique structure for a United Kingdom water company as it is owned by Glas Cymru — a "not for profit" organisation.

DCWW has effectively created a ring-fenced asset ownership vehicle, which has been used to deliver a highly leveraged funding structure. The attributes of this structure have enabled the use of low cost, long term debt, at a discount to the normal corporate risk premium, thus providing an enhanced return on capital. Inherent within DCWW business model is the virtually complete outsourcing of operational management of the water and wastewater network as well as the long term capital program. This has been achieved through alliance outsource contracts, which means that the core management team of the company is now extremely small.

Outsourcing contracts for the operation, planning, maintenance and delivery of capital projects were subject to a recent competitive procurement process, which has led to the appointment of United Utilities and Yorkshire Water to manage the operation in two separate geographic areas of the organisation. This process passes much of the risk of delivering ongoing operational and capital efficiencies to the service delivery partners, leaving DCWW with an overall management and supervisory role. DCWW has been able to achieve significant efficiencies through the adoption of its new processes.

Yorkshire Water Services

Yorkshire Water Services (YWS) is one of the United Kingdom's largest water companies, serving over 4.5 million domestic customers in North East England. Historically, YWS has been ranked by Ofwat as one of the best performing companies in areas such as capital procurement and operating efficiency.

YWS has operated a number of geographically based contracts over the past five years, giving the "area delivery teams" the responsibility for delivery of capital projects.

In the current price control period (Asset Management Period 3 or AMP3), which runs from 2000 to 2005, these area contracts are let to Capital Solution Partners (CaSPs) with expenditure of approximately £120 million per annum. These are split into four wastewater contracts and a single water area contract.

Larger one-off projects are developed on a scheme basis, which are awarded by competitive tender from a list of seven preferred contractors. In addition, two other framework contracts have been let, which cover sewer and water mains rehabilitation, with expenditure of around £60 million per annum.

Particular innovations during the AMP3 period have included:

- co-location of YWS project managers into CaSP organisations;
- provision of complete asset solution through single supplier;
- CaSP's given problems to solve, not solutions to build; and
- incentivised delivery based on net present cost of solutions against a target solution, derived from Yorkshire's unit cost database (solution may be operational rather than capital).

New processes have been developed to reflect the program-level approach. These include development of Key Performance Indicators, provisions for sharing cost data and dispute resolution procedures.

For the next asset management period (AMP4), which runs to 2010, the company's procurement philosophy is being developed from the existing model, with some modifications, including:

- greater integration between internal parts of the organisation through the development of joint delivery teams, which integrate a number of YWS functions in addition to the project management role;
- an increased focus on the selection of partners with the right attitude, values and business process rather than commercial and technical capability alone; and
- reducing the number of suppliers, with an increased focus on maintaining long term relationships.

4.11 Conclusions

Key findings of the chapter can be summarised as follows:

- The capital planning, business case and prioritisation process, which has only recently been modified, forms a sound basis for capital investment. This process has only recently incorporated whole-of-life costing of capital schemes at inception, which is seen as vital to achieving the best value solutions.

  A review of the historical capital prioritisation process indicates a potential for significant internal delays. This increases overall project costs, particularly internal costs and therefore reduces overall efficiency. The revised capital prioritisation process which uses a risk based assessment tool at its centre should provide a better framework for decision making.

  Capital program areas where further efficiency in capital expenditure may be possible include:

  – Infill sewerage program: Over 380 contracts have been awarded and managed over the eight years of the sewage infill program to 2001/02 with an average contract value of $1.13 million. This type of long term program lends itself to a number of framework contracts over a longer period, say 3 to 5 years. Overall savings of 5 to 15 percent are thought to be achievable for the remaining program.

  - Drinking water quality program: a reduction in capital expenditure should be achievable through a review of the key drivers of this program. A detailed investigation of the problem and solutions in other states is also currently being undertaken by the Corporation.

- In an accounting sense, the Corporation does not channel developer contributions into any form of headworks reserves entity, instead they are added to general revenue. Developer related funds are therefore not allocated to specific schemes and cost recovery cannot be demonstrated.

  Over the past 10 years, developer cash contributions have funded an average of 20 per cent of the overall capital program and forecasts suggest that this ratio will be maintained in future years.

- To date, the Corporation has delivered capital programs in a relatively traditional manner using internal management resources. In an Australian context this is still regarded as being a reasonably efficient method of procurement. A number of privately funded projects to design, build and operate water and/or wastewater treatment facilities are also in operation.

  Moving away from these methods of procurement is a significant paradigm change that requires considerable philosophical and organisational change, as well as sound processes that draw value from project partnering and alliance approaches. Entire capital programs are delivered by this method in the United Kingdom, providing economies of scale and resulting in the sharing of risk between all parties. A fundamental characteristic of programs of this type is the creation and empowerment of capital delivery teams with problems to solve, rather than solutions to build. This approach has demonstrated improved delivery performance and overall cost savings in the order of 10 to 15 per cent over traditional procurement approaches.

  A collaborative, problem solving mindset is the key value driver that needs to be followed by a process that appropriately shares risks and rewards.

- From a high-level review of selected projects it can be concluded that, in general, the Water Corporation has historically underestimated project capital costs, with out-turn costs exceeding both planning and approved implementation estimates. In recent years, the Corporation has dealt with this issue by delaying capital expenditure programs or projects to ensure the approved annual capital budgets are not exceeded. Assuming most projects in the 5 year capital program are at an approved stage, either current capital budgets may need to be increased by 10 per cent (or $60 million) per annum to cover capital forecasting inaccuracy, or project and contract management improved to deliver projects within estimates. If project delivery continues as is, the budget increase figure could be higher if some key projects are only at the planning stage.

Chapter 5

Forecasts of Operating Expenditure

5.1 Introduction

In 2003/04, Water Corporation operating expenditure totalled around $626 million with key components being depreciation ($243 million), labour ($130 million) and hired and contracted services ($76 million). The provision of urban water and wastewater services accounted for around 56 per cent of total operating costs. Operating costs as a whole are projected to steadily increase in each year of the forecast period, such that by 2007/08, costs are expected to be around $785 million.

Forecast operating costs are framed within a context of future efficiency gains in the order five per cent per annum. These gains are considered reasonable and will help offset future inflationary impacts. The efficiency gains are expected to arise out of the Corporation's process improvement program (PIP) and savings generated from economies of scale in future operations. The PIP commenced in early 2004 and has its primary focus on improving the management of existing infrastructure to attain longer asset lives. The program also includes the centralisation of certain activities in an effort to simplify processes and achieve efficiencies.

Operating costs per property have been declining in recent years and are currently comparable to SA Water's costs and significantly less than those of Sydney Water. However, total costs per property (which for the purposes of comparison include depreciation and 4 per cent of the written down replacement cost of assets) are high relative to other service providers in Australia. This may be the result of the Corporation having proportionally high asset values and depreciation rates, among other factors.

Benchmarking with other Australian water providers in the area of staff numbers indicates that the number of staff within the Corporation is relatively high. While the Water Corporation does outsource some of its services, such as information technology and various technical engineering services, there remains potential for further outsourcing arrangements to be undertaken. It is relatively typical that water companies outsource functions such as customer billing, call centre operations and sewerage operating contracts — avenues such as these could be pursued by the Corporation in order to reduce costs.

Water Corporation operating costs per property for water and wastewater services have been trending down for the past six years and are currently some of the lowest in Australia. However, there is considered to be further potential to reduce operating costs on a per property basis. Labour costs are one specific area that has been identified as being relatively high in 2003/04. It is assessed that the Corporation could potentially reduce annual operating expenditure by 3 to 5 per cent per annum (excluding depreciation) by reducing staff numbers.

5.2 Water Corporation operations

The Corporation's operations are undertaken on a state-wide basis and include water supply and distribution, wastewater collection and treatment, drainage and irrigation operations. A high level breakdown of urban and regional operating expenditure is depicted in Table 5.1.

Table 5.1

OPERATING COSTS, METROPOLITAN AND REGIONAL AREAS, 2003/04

Expenditure Item	Value ($m)
Regulated business operating expenditure	
Metropolitan	199
Regional	173
Total	**372**
Regulated business depreciation	
Metropolitan	146
Regional	96
Total	**242**
Regulated business total	**614**
Contestable business	12
Total	**626**

Source: Water Corporation.

Table 5.2 depicts a breakdown of 2003/04 operating costs by item. In 2003/04, the largest contributions to operating costs were labour, depreciation and hired and contracted services. The Corporation has not supplied data in the same form for years beyond 2003/04.

Table 5.2

BREAKDOWN OF OPERATING EXPENDITURE, 2003/04

Expenditure Item	Value ($m)	Share of total (%)
Regulated business		
Labour	130	21
Chemicals	13	2
Energy	35	6
Materials	15	2
Hired & Contracted Services	76	12
IT & Telecommunications	25	4
Cost of Assets Retired	25	4
Costs of Assets Sold and Disposed	7	1
Corporate Charges	23	4
Plant & Equipment	14	2
Other Expenses	20	3
Depreciation	243	40
Contestable business	12	2
Total	**626**	**100**

Source: Water Corporation.

A breakdown of urban water and wastewater services operating costs for 2003/04 is shown in Table 5.3.

Table 5.3

URBAN WATER AND WASTEWATER OPERATING COSTS, 2003/04

Expenditure Item	Water ($m)	Wastewater ($m)
Operating expenditure	103	94
Depreciation	63	83
Contestable business	3	3
Total ($M)	**169**	**180**
Volume water consumed / wastewater treated (ML)	**208,491**	**107,000**
Operating cost ($/ML)	**810**	**1,682**

Note: Operating costs include a proportion of contestable business based on the percentage of total metro/regional operating expenditure.
Source: Water Corporation.

Forecast operating costs have not been broken down into future water, wastewater and irrigation costs for the urban and regional areas. Only high level overall operating cost projections for the provision of all Corporation services have been provided. These are depicted in Table 5.4, together with predicted efficiency gains and new levels of service items.

While the Corporation does forecast detailed operating expenditure figures internally, they have stated that estimates of specific items become less relevant as the years progress. Therefore, despite requesting detailed information, the only data provided by the Water Corporation is high level forecasts based on "top-down" modelling as given in Table 5.4. In the absence of a detailed breakdown of operating costs, it has not been possible to review the predicted future cost per megalitre for water and wastewater services.

Table 5.4

HIGH LEVEL OPERATING COST FORECASTS

	2004/05	2005/06	2006/07	2007/08	2008/09
Indices (%)					
—CPI	2.5	2.5	2.5	2.5	2.5
—Growth (weighted average)	2.7	2.4	2.4	2.7	2.5
Base operating costs ($m)					
—Base operations (2004/05)	384	384	384	384	384
—Inflation (CPI and labour escalation)		13	25	39	55
—Growth allowance (weighted average)		9	20	32	44
—Operating subtotal	384	406	429	455	483
Efficiency improvements ($m)					
—Process Improvement Project*		-1	-6	-7	-6
—Additional efficiency		-14	-16	-3	-18
New levels of service items ($m)					
—General			2	7	20
—Desalination plant			24	25	25
—Asset write-offs	14	14	11	12	10
Sub-total	**398**	**405**	**444**	**489**	**514**
Depreciation	248	250	259	268	282
Total	**646**	**655**	**703**	**757**	**796**

* Note: Total Process Improvement Project savings are estimated to be $51.5 million over five years, $6 million per annum of savings have already been incorporated in the 2004/05 base year.
Source: Water Corporation.

Comparisons with Historical Operating Costs

A general comparison of historical and future operating expenses and depreciation is provided in Table 5.5. Operating costs (excluding depreciation) have historically risen between 1 per cent and 9 per cent per annum and have increased at an average rate of 5 per cent per annum between 1999/00 and 2003/04. Future operating costs follow historical trends with an average increase in operating expenditure of 6.5 per cent predicted between 2004/05 and 2008/09.

Table 5.5

HISTORICAL AND PREDICTED FUTURE OPERATING COST SUMMARY, REGULATED BUSINESS PROGRAM

	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09
Operating Expenses ($m)	306	317	346	350	371	392	398	438	484	507
Depreciation ($m)	204	211	225	238	243	248	250	259	268	282
TOTAL	**510**	**528**	**571**	**588**	**614**	**640**	**648**	**697**	**752**	**789**

Source: Water Corporation, 2 February 2005

Appropriateness and performance of functions

The Water Corporation's organisation can be broken into the following three areas:

- internal management — includes the board, branch and regional managers;
- core groups — for the planning, acquiring and maintenance of assets and delivery of services; and
- support groups — comprising occupational health and safety, finance, environment, information resources, procurement, research and innovation, property and facilities.

The Corporation outsources around half of its information technology services including help desk and other technical advice services. Technical engineering consultancy services are also outsourced via framework contracts with various engineering firms. The functions performed by the Water Corporation are generally in line with similar sized organisations within Australia. However, there is scope for the Corporation to further outsource some of its functions such as customer billing, call centre operations and sewerage operating contracts. These functions are commonly outsourced by water companies in Australia but are not, at present, outsourced by the Corporation.

Staff number comparisons for various Australian water and wastewater providers are presented in Table 5.6. These organisations have been chosen as they all undertake both water supply services (bulk storage, wholesale and retail) and wastewater services (wholesale and retail) with the exception of the Melbourne water businesses. Melbourne water providers are divided into wholesale and retail functions, with a consolidated summary provided.

Table 5.6

COMPARISON OF STAFF NUMBERS AMONG WATER AND WASTEWATER SERVICE PROVIDERS (2002/03)

Organisation	Population served	Staff numbers (FTE)	Population served per FTE
Melbourne Consolidated (Water & Wastewater)	3,470,000	1,535	2,260
—Melbourne Water (wholesale)	3,470,000	501	N/A
—South East Water Limited (retail)	1,324,000	426	N/A
—City West Water Limited (retail)	619,000	218	N/A
—Yarra Valley Water Limited (retail)	1,527,000	390	N/A
Gold Coast Water	454,000	350	1,297
Sydney Water	4,198,000	3,516	1,194
Hunter Water	489,000	420	1,164
Brisbane Water	905,000	900	1,006
South Australian Water Corporation	1,077,000	1,190	905
Water Corporation	**1,426,000**	**1,983**	**719**

Sources: Water Services Association of Australia, WSAA Facts 2003 and respective company annual reports.

Viewed as whole, the consolidated Melbourne water businesses supply nearly 3.5 million customers with water and wastewater services and employ 1,535 full time equivalent staff — nearly 500 fewer staff than the Water Corporation — these numbers equate to a population served per full time employee of 2,260. The ratio of population served to staff numbers is over three times greater for the consolidated Melbourne water businesses than that for the Water Corporation. While the disparity appears significant, it can be difficult to draw robust conclusions from the figures presented. It is worth noting that the relatively high population density in Melbourne and the fact that country water services are operated by other organisations would naturally work to allow a higher number of population served per full time employee for the consolidated Melbourne water providers relative to the Water Corporation.

Other service providers listed in Table 5.6 serve greater numbers of customers per full time employee than the Water Corporation does. SA Water has reduced the functions undertaken in-house by outsourcing the operation and maintenance of Adelaide's water and wastewater treatment to external contractors which effectively enables the service provider to have a lower level of staff for a given level of population served. Sydney Water supplies and treats almost three times the water and wastewater volumes of the Water Corporation with only a 77 per cent increase in the number of full time equivalent staff. Although it would be estimated that some economies of scale are achievable with increased population and population density, the disparity does tend to indicate that the number of staff at the Water Corporation is relatively high.

Based on the information in Table 5.6, a conservative estimate of an achievable ratio of population served per full time equivalent staff member for the Corporation may be around 850. Achieving such a ratio would result in a 15 per cent reduction in total staff numbers from 1,983 to 1,685. However considerable investigatory work is required to optimise the ratio relative to set corporate performance objectives, standards and guidelines.

Table 5.7 depicts a breakdown of staff by appointment type for the Water Corporation and SA Water. Although the employment categories differ slightly, it is apparent that the Water Corporation maintains higher levels of professional, administration and operational staff. The increased levels of operational staff at the Water Corporation can partly be explained by SA Water's outsourcing of operation and maintenance contracts as discussed above.

Table 5.7

STAFF NUMBERS BY APPOINTMENT TYPE

Appointment type	Water Corporation	SA Water
Admin officers	351	362
Managers and admin services		20
Managers and administrators	374	
Operational	319	118
Professional	451	141
Technical		120
Executives		40
Construction, maintenance and support	164	389
Para professionals	360	
Total	**2,019**	**1,190**

Note: Water Corporation figures are as at December 2004 whereas SA Water figures are for 2002/03 financial year.
Sources: SA Water and Water Corporation.

5.3 Operating efficiency

The Corporation has in place a process improvement program (PIP) which commenced in February 2004. The main focus of the program has been in the asset management area to improve the management of existing infrastructure so as to attain the longest possible asset life. This has included a consolidation of processes and centralisation of activities aimed at reducing complexities and enhancing service standards.

All benefits reported by the Water Corporation are real and measurable financial gains and do not include non-measurable benefits such as improvements to customer services or reduced complaints.

As reported in Table 5.4 (presented earlier), the total reported benefit from the PIP is expected to be in the order of $50 million over the five years to 2008/09. In addition, the Corporation anticipates that additional efficiency improvements in the order of $50 million are achievable over five years thus taking total expected efficiency improvements to around $100 million. The additional efficiencies depicted in the Table have not been clearly identified by the Corporation but they are based upon rates of efficiency improvements that have been achieved in recent years mainly due to increasing economies of scale achieved as the business grows.

The key areas where efficiencies are proposed for the five year period include:

- $17.5 million in total savings achieved by rationalising procurement practices including suppliers, consultancy, conferences, training and travel;
- $14.5 million in total savings achieved by modifying tactical asset management practices and increasing expenditure on preventative maintenance;
- $11.8 million in total savings achieved via contract efficiency gains created by alliance maintenance and operations contracts; and

- $5.7 million in total savings achieved by rationalising software and hardware.

No full time equivalent staff cuts are proposed as part of the PIP due to current government constraints.

In percentage terms, the efficiency savings of $100 million proposed over five years amount to average annual efficiency savings of 4.6 per cent per annum. These figures are based on the generation of $100 million in savings from the total base operating cost estimate for 2004/05 to 2008/09 of $2,157 million (excluding depreciation).[26] These efficiency gains compare well with the Ofwat reference levels for efficiency factors used by water and wastewater companies during the preparation of their draft business plans (Table 5.8).

Table 5.8

OFWAT REFERENCE LEVELS FOR EFFICIENCY FACTORS

Efficiency assumptions	Continuing efficiency (%)	Catch-up factor (%)
Capital maintenance	0.50	0-12
Capital enhancement	0.75	0-16
Base operating expenditure	0.60	0-4
Operating expenditure (enhancements)	0.75	0-6

Source: Ofwat 2003, *Overview of Companies Draft Business Plans*, p. 166.

Ongoing operational efficiency improvements of up to 0.75 per cent per annum are still being achieved in the United Kingdom as companies there enter the fourth term of regulation. From the United Kingdom perspective, the Water Corporation can be considered to be in the catch up stage of developing efficiency gains. Good efficiency outcomes are being achieved given no staff reductions are included in the current process improvement project. This is particularly relevant given the majority of efficiency gains in the United Kingdom were achieved early in the regulation process by outsourcing services which then allowed for significant reductions in staff numbers.[27]

Operating cost comparisons

Water Corporation operating costs per property for water and wastewater services have been trending downwards over the past six years and are presently among the lowest of all service providers in Australia. They are comparable with SA Water's operating costs and significantly less than those of Sydney Water. One factor contributing to these lower operating costs per property may be the lower level of water treatment undertaken by the Water Corporation as discussed in Chapter 4.

Total costs per property as reported by the Water Services Association of Australia are calculated as:

[26] The derived estimates of efficiency gains of 4.6 per cent per annum are annual average figures and may differ in presentation from previous estimates made by the Corporation.

[27] Ofwat 2003, *Overview of Companies Draft Business Plans*, p. 166.

Total cost = operating cost
+ current cost of depreciation
+ 4 per cent of written down replacement cost of assets

For both water and wastewater services, the total costs per property of the Water Corporation are high in comparison to the other two service providers for which data are presented in Table 5.9. This is likely a result of the relatively high written down replacement costs used by the Water Corporation for both their water and wastewater assets, which may be a result of the Corporation having:

- relatively high depreciation rates due to conservative asset life estimates when compared to other water utilities; and/or
- proportionally more assets per property served including increased sewer and water main lengths and higher numbers of wastewater pumping stations per property.

Table 5.9

FINANCIAL COMPARISONS FOR THREE AUSTRALIAN WATER AND WASTEWATER OPERATORS, 2002/03

Operational or Financial Parameter	Water Corporation	SA Water	Sydney Water
Water Services			
Total number of water properties serviced	621,000	480,000	1,638,000
Operating cost per property for water supply services ($)	145	174	239
Total cost per property for water supply services ($)	444	419	452
Written down replacement cost of fixed water assets ($m)	2,896	2,030	5,223
Wastewater Services			
Total number of properties serviced	534,000	451,000	1,593,000
Operating cost per property for wastewater services ($)	143	120	260
Total cost per property for wastewater services ($)	590	356	579
Written down replacement cost of fixed wastewater assets ($m)	3,582	1,873	8,747

Source: The Australian Urban Water Industry, *WSAA Facts 2003*.

Review of standard asset lives

Standard asset lives have been reviewed for the Water Corporation, SA Water, Northern Territory Power and Water and Yorkshire Water in the United Kingdom. Asset lives are generally dictated by materials, construction standards, operating conditions and the level of ongoing maintenance, but the water industry follows general standards for water mains and sewers for accounting purposes. These form the largest proportion of total assets for most water companies.

Standard asset lives for the Water Corporation and SA Water are depicted in Table 5.10, along with a typical range that is derived from the other water utilities reviewed. The Corporation's determination of standard asset lives for water mains and sewers are within the typical range for engineering assets, although they appear to be at the lower end of the range identified. The allocation of fixed lives to engineering assets is only undertaken for accounting purposes, in reality actual asset lives are highly variable due to the factors previously discussed.

Table 5.10

COMPARISON OF STANDARD ASSET LIVES FOR WATER MAINS AND SEWERS

Capital item	Water Corporation	SA Water	Typical range
Gravity sewers			
PVC wastewater gravity pipes < 300mm	75	100	70-100
Vitrified clay wastewater gravity pipes < 300mm	90	130	70-130
Wastewater gravity pipes main sewer 300-600mm (unlined reinforced concrete)	75	120 (pre 1968 – 75 yrs)	70-120
Wastewater gravity pipes main sewer 300-600mm (plastic reinforced concrete)	110	120	70-120
Water mains			
Water pipes < 300mm – galvanised steel	30	25	25-70
Water pipes < 300mm – PVC/MDPE	80	100	70-100
Water pipes < 300mm – cast iron	90	120	70-120
Water pipes < 300mm – other ferrous	80	110-150	70-150
Water pipes < 300mm – reinforced concrete	80	60	60-100
Water pipes < 300mm – asbestos cement	80	100 (pre 1965 – 60 yrs)	60-100
Water pipes < 300mm – copper	80	100	70-100
Water pipes 300-600mm – ferrous	80	100-150	70-150
Water pipes > 300mm – ferrous	110	100-150	70-150

Sources: Northern Territory Power and Water, SA Water, Water Corporation and Yorkshire Water.

Impact of drought on operating costs

The current drought has affected the overall volume of water supplied by the Water Corporation, although the level of operating expenditure has not decreased. This is not necessarily unreasonable due to the following factors:

- plant and equipment may be operating at below its design capacity and best efficiency point, resulting in general increases in power and operating costs per megalitre supplied;
- chemical costs would reduce slightly, although these only represent 2 per cent of operating expenditure in the case of the Corporation; and
- operator input may be increased due to the change in standard operating conditions.

The Corporation has provided a breakdown of historical energy costs and the impact of the current drought which had a major impact on water supply volumes in 2001/02 (Table 5.11).

Table 5.11

SUMMARY OF HISTORICAL ENERGY COSTS 1999 TO 2004 (NOMINAL $ MILLION)

Year	Total energy cost	Commentary
1999/00	29.0	
2000/01	32.5	Increase due to demand for potable water associated with special agreements and mining industry demand
2001/02	34.4	Energy consumption increased due to reliance on pumping from bores and transfer of water to Mundaring Weir
2002/03	36.3	As 2001/02 and new MIEX plant additional treatment costs
2003/04	35.8	Reduction due to change in Remote Power Supplies Tariff which resulted in $2 million/year savings. Increase in costs dominated by upgrade at Woodman Point WWTP to secondary treatment

Source: Water Corporation.

5.4 Conclusions

In response to the operating expenditure issues raised in the project brief, the following summarises the key findings for the Water Corporation.

- The Corporation undertakes activities relevant to the supply, operation and maintenance of water and wastewater services to metropolitan Perth and various country areas within Western Australia. The Corporation's functions can be divided into internal management, core operating groups and support services and involve the employment of approximately 2,000 full time equivalent staff.
- Operating costs for the Water Corporation's water supply services on a per customer basis are amongst the lowest in Australia. This is partly due to the minimal water treatment provided by the Water Corporation which generally comprises only disinfection. Operating costs for wastewater services also benchmark well when compared to other Australian water companies, however high asset values and high depreciation rates increase the total cost per property for wastewater services to one of the highest in Australia.
- In general the functions performed by the Water Corporation are in accordance with similar sized organisations within Australia. Further reductions in the following functions currently undertaken could be achieved by outsourcing.
  - customer billing;
  - call centre operations;
  - water or sewerage operation and maintenance contracts; and
  - information technology services.
- Given the high level operating cost forecasts provided, it is not possible to differentiate between Perth metropolitan and country operating costs for the provision of water and wastewater services. In the absence of detailed information the costs that appear high include labour and depreciation which amounted to 21 per cent and 40 per cent, respectively, of the 2003/04 operating costs.

- Excluding new levels of service items, average efficiency gains of 4.6 per cent per annum are proposed by the Water Corporation ($100 million savings from $2,157 million base operating costs 2004/05 to 2008/09, excluding depreciation). The efficiency factors adopted are considered reasonable given that no reduction in full time equivalent staff numbers is proposed. The estimated efficiency gains will make a substantial contribution to negating future inflationary impacts.
- Water Corporation operating costs per property for water and wastewater services have been trending downwards over the past six years such that costs per property are currently considered to be relatively low. Despite this, past performance indicates that there is potential to further reduce operating costs on a per property basis. An assessment of the future trends in operating cost per property for urban water and wastewater costs has not been possible given the level of detail provided in operating cost forecasts.
- The Corporation's determination of standard asset lives for water mains and sewers are within the typical range for engineering assets, although they appear to be at the lower end of the range identified.

An estimate of potential reductions to operating expenditure has been made taking into account an estimated 15 per cent labour savings (Table 5.12). This information has been provided as a guide to show the impact labour costs have on operating expenditure.

Table 5.12

INDICATIVE REDUCTIONS IN FORECAST OPERATING COSTS

	2004/05	2005/06	2006/07	2007/08	2008/09
Forecast operating costs ($m)	646	655	703	757	796
—Labour cost component	*130*	*136*	*142*	*149*	*157*
Potential savings in labour costs ($m) 15 per cent reduction	-20	-20	-21	-22	-24
Revised operating estimates ($m)	627	635	682	735	772
Per cent overall cost reduction	3.0	3.1	3.0	3.0	3.0

Source: Arup Water estimates based on Water Corporation data provided on 11 August 2004.

Chapter 6

Cost Allocation

6.1 Introduction

Within a framework of cost-based regulation of prices, the price charged to a customer (and hence the revenue obtained from the customer) implies recovery from that customer of a particular proportion of the costs of service delivery.

Within a regulatory framework, the proportion of total costs to be recovered from a customer or class of customers may be determined explicitly, such as through a fully distributed cost model, or implicitly, where prices are set such that forecast revenue in total is expected to be equal to forecast costs but within this constraint the regulated business is relatively free to set prices according to other commercial constraints. In the latter case the business may be constrained in setting prices to a requirement to ensure that prices meet the broad efficiency requirements of being above the avoidable cost of service provision and less than stand-alone costs of service provision.

As the Water Corporation has not to date been subject to rigorous cost-based regulation of service prices, there are no mechanisms established to either fully allocate costs to customers, or to ensure that prices fall within the range of the avoidable cost of service provision and the stand-alone costs of service provision.

The Corporation does have a cost allocation process for the purposes of performance monitoring in service delivery, whereby costs are allocated to individual water, wastewater, irrigation and drainage schemes. The cost allocation process is not used by the Water Corporation as a forward looking device — the prime purpose of the process being to allocate costs to schemes once they have been incurred. However, the historical scheme costs from the model are sometimes indexed for growth and inflation to give a forward estimate of, for example, the value of CSOs.

In this chapter, the cost allocation process of the Corporation is reviewed and observations made on the attributed cost of service delivery across different service regions and schemes. Observations are also made on the extent of cross subsidies between customers of different regions or schemes.

The cost allocation process used by the Corporation involves two basic processes:

- expenditures incurred by trade groups or "operational costs" are generally considered direct costs and are directly attributed to the scheme to which the relevant activities and/or purchases relate; and
- overhead and support costs are initially recorded as a common expense for all schemes and allocated to individual schemes by a cost-allocation process.

The overhead and support costs are allocated on the basis of drivers that comprise a range of different measures of the size of each service scheme.

- For water services, this broadly gives rise to an allocation of overhead and support costs to regions and schemes in proportion to the direct operating costs, although a relatively high allocation occurs to customers in the Perth metropolitan area relative to direct operating costs. Regions and schemes with high direct operating costs (comprising mainly schemes in the Great Southern, Agriculture and Goldfields regions) tend to have a correspondingly high allocation of overhead and support costs.
- For wastewater services, the allocation of overhead and support costs is generally similar on a per-connection basis across regions.

From a strictly economic perspective, customers within a region or scheme may be regarded as being cross subsidised if the total payments from those customers are less than the directly incurred operating expenditure within the region or scheme.

- According to this definition of a cross subsidy, customers in 188 of the 281 water schemes that are in operation are currently being cross subsidised. While significant in number, the cross subsidised schemes are generally relatively small in size. The number of connections attributable to schemes that are being cross subsidised totals around 36,000; less than five per cent of the Corporation's 810,000 connections. Just over seven per cent of total water delivered is delivered in cross subsidised schemes.
- 26 of the 105 wastewater schemes operated by the Water Corporation are currently being cross subsidised. As is the case regarding cross subsidisation of water services, the schemes that are cross subsidised are generally small in size — while around one quarter of schemes are cross subsidised, these schemes account for less than one per cent of the Corporation's total wastewater connections.

While the Corporation does not determine prices on the basis of an allocation of costs, the amount of costs recovered from particular services and particular classes of customers is implied by the prices determined and hence the revenue earned from each service and class of customer.

For water services, total revenue in 2003/04 ($355.7 million excluding CSO payments) was similar to total operating costs ($353.7 million including depreciation but excluding returns to capital). For wastewater services, total revenue in 2003/04 ($370.8 million) substantially exceeded total operating costs (232.7 million). These outcomes indicate (with CSO payments excluded from consideration) that the returns to the Corporation in excess of operating costs and depreciation (i.e. returns on investment) are almost entirely recovered from the provision of wastewater services.

The returns to the Corporation in excess of operating costs and depreciation (i.e. returns on investment) are also recovered predominantly from the provision of services in the Perth metropolitan area. For water and wastewater services, revenues from Perth metropolitan customers are in excess of operating costs, while for non metropolitan customers, the reverse applies.

The Corporation has not undertaken any allocation of costs (direct or overhead) to customer classes. As such, it is no possible to compare prices/revenues from different customer classes with costs. It is notable, however that for water services, residential and commercial customers in the Perth metropolitan area payed in 2003/04 similar average prices on a per kilolitre basis ($1.09/kL and $1.24/kL, respectively) while for wastewater services, residential customers paid average prices per connection of about one third of commercial customers ($455/connection and $1,485/connection, respectively).

6.2 Cost Allocation by the Water Corporation

Schemes

The Corporation allocates all costs incurred in the delivery of services, and overhead costs, to "schemes". A scheme is defined by the offering of a particular type of service within a defined geographical area, which is typically a town. For example, the provision of water services within the town of Harvey is defined as a scheme. Similarly, the provision of sewerage services within the town of Harvey is identified as a separate scheme.

The Water Corporation operates around 400 schemes as indicated in Table 6.1.

Table 6.1

WATER CORPORATION SCHEMES BY GEOGRAPHICAL AREA

Region	Water schemes	Wastewater schemes	Drainage schemes	Irrigation schemes	Total schemes
Perth	1	1	1		3
South West	40	33	5	2	80
North West	21	14		2	37
Mid West	66	19		1	86
Gt Southern	59	18	1		78
Agriculture	79	16			95
Goldfields	15	4			19
Total	281	105	7	5	398

Source: Water Corporation.

Under the cost allocation process, costs are allocated to individual schemes by two basic processes:

- expenditures incurred by trade groups or "operational costs" are generally considered direct costs and are directly attributed to the scheme to which the relevant activities and/or purchases relate; and
- overhead and support costs are initially recorded as a common expense for all schemes — these costs are then allocated to individual schemes by a cost-allocation process.

The cost allocation process

The Corporation's financial accounts accommodate the organisation's seven structural divisions as listed below:

- Chief Executive Officer Division;
- Chief Financial Officer Division;
- Budgeting Division;
- Water Technologies Division;
- Customer Services Division;
- Business Services Division; and
- Planning and Infrastructure Division.

Each division comprises numerous cost centres to which costs are recorded at the time they are incurred. The recording of costs on a cost centre basis allows the Corporation to identify funds expended by different areas of the Corporation. For example, within the Chief Financial Officer Division there is a cost centre known as the Pricing and Evaluation cost centre which records all expenses of the Pricing and Evaluation branch of the CFO Division. Transaction recordings within cost centres also track what the money is spent on — labour, legal fees, stationery etc.

Cost centres are categorised according to their types: the two most common forms of cost centre are *support* and *operational* cost centres. Support cost centres typically contain administration-type costs and usually the "home" of salaried staff — it is these cost centres that the cost-allocation model deals with. Operational cost centres are the "working asset" end of the business — in nearly all cases, costs from these centres are easily associated with individual schemes and as such no allocation of these costs is required.[28]

The Corporation has around 1,000 cost centres in total. Costs are recorded within these costs centres and costs for each division can be obtained by summing the expenses incurred by each of the division's cost centres.[29]

Expenditure on capital projects is recorded and identified as capital expenditure on particular projects. Some capital costs are centrally managed, such as IT and vehicle costs. Some IT costs can be directly allocated to schemes (where there is a clear association of IT assets and activities with a scheme) and the remainder are allocated via the cost-allocation process. Vehicles are also generally charged direct to schemes. Interest expenses are treated as centrally managed finance costs that are not allocated to schemes.

In 2003/04 total operating costs (excluding interest) incurred by the Water Corporation amounted to around $626 million. Of these total costs, the cost allocation process deals with around $320 million or 51 per cent of total costs. The remainder of the Corporation's costs are operational and as such are attributed directly to the schemes at the time that they are incurred.

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[28] The Water Technologies Division contains some operational cost centres which traditionally have not been part of the model (i.e funds were directly allocated). These cost centres have however recently been added to the model.

[29] Some minority costs do not pass through cost centres but are attributed to Divisions in other ways.

Once costs have been incurred by cost centres, the cost allocation process passes these costs down to regional corporate overhead clearing accounts.[30] There are seven regional clearing accounts within the Water Corporation representing the different regions served by the Corporation as indicated in Table 6.1.

The costs incurred at the cost centre level are allocated to these regional clearing accounts via cost drivers. Cost drivers can be variable or fixed. Variable cost drivers are those that vary from month to month reflecting up-to-date data that are regularly collected.[31] Fixed cost drivers are based on annual data and as such do not vary from month to month. Fixed cost drivers are used when data limitations prohibit the use of variable costs drivers.

Cost drivers serve as proxy estimates for the size of operations in each region. The general premise behind their use being that the larger the scheme (as measured by a range of different parameters) the greater the proportion of support costs that should be allocated to it. Cost drivers used by the allocation process include:

- staff numbers;
- taxes paid (taxes other than income tax);
- water volumes delivered;
- distances over which water/wastewater services are supplied;
- floor area of operations;
- planned maintenance costs; and
- total primary expenditure.

Once costs have been allocated from the cost centres to the regional clearing accounts, the next step in the allocation process is to allocate these costs to individual schemes. Again the model uses a series of cost drivers to serve as a means to distribute costs from the clearing accounts to the schemes.

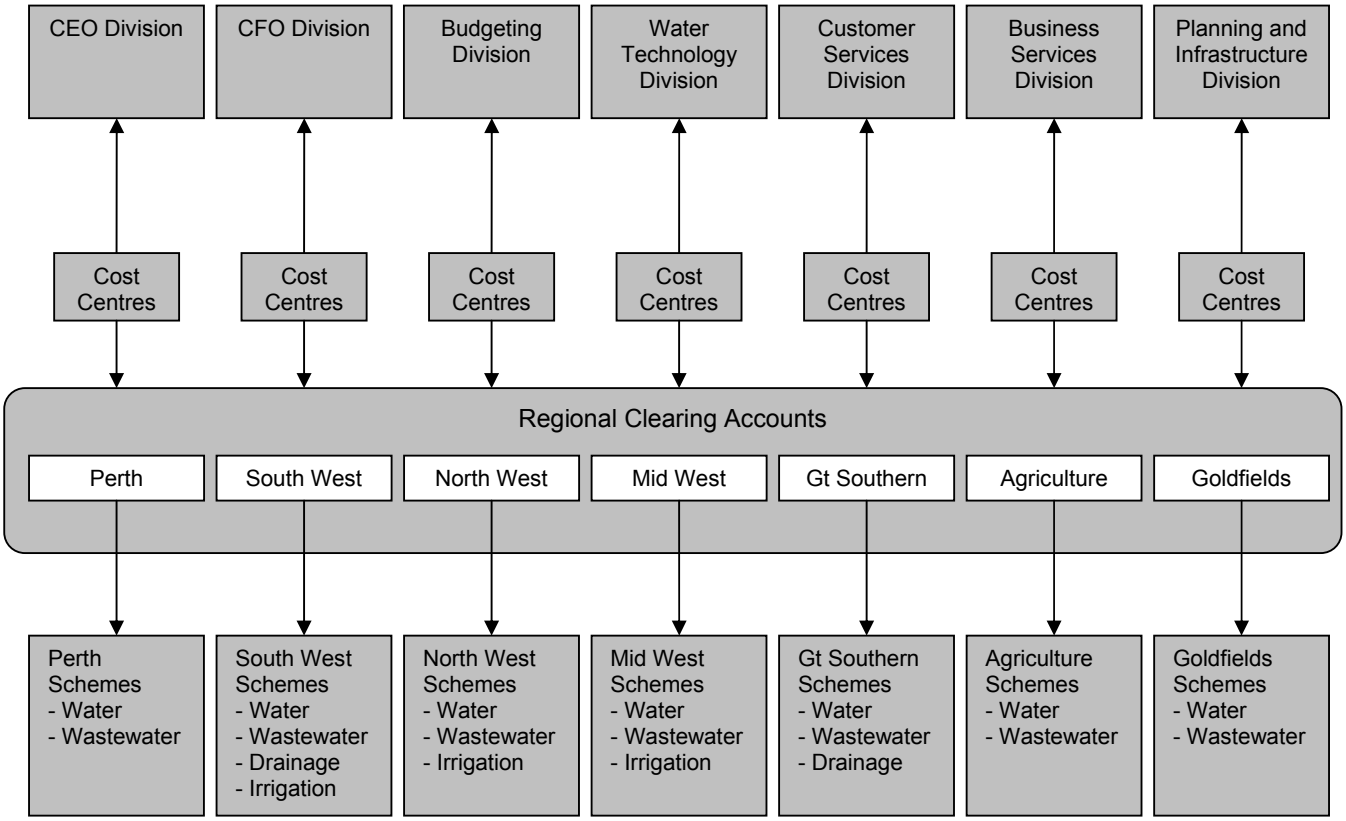
A simplified representation of the cost allocation model is depicted in Figure 6.1.

[30] In reality costs within organisation flow in two different directions, that is they do not just flow from the top of the organisation down to individual schemes. However, for reasons of simplicity the model on treats costs as a one-way flow.

[31] The cost allocation model is run on a monthly basis.

Figure 6.1

SIMPLIFIED REPRESENTATION OF THE COST ALLOCATION MODEL



A working example of the cost allocation model

As a hypothetical example of the cost allocation process, assume the costs incurred by a cost centre operating within the Chief Financial Officer Division are recorded and calculated to be $200,000. The first stage of the process entails allocating these costs the Corporation's regional overhead clearing accounts.[32] In this case the number of customers served by each region is used as a variable cost driver. For the period in question, the South West region is known to account for around 8 per cent of the Water Corporation's total customers served and as such 8 per cent of the $200,000 ($16,000) is allocated to the South West regional clearing house. The remaining expenses are allocated to the other regional clearing accounts on the same basis.[33]

[32] In some instances, a portion of the costs incurred by particular cost centres are considered to be capital-related costs and therefore these costs are allocated to an 'asset under construction' pool of funds which is then washed away to a suitable range of capital projects within the balance sheet. For example, the Chief Financial Officer Division may spend time reviewing expenditure levels on various capital projects — this time is considered a capital-related cost and is treated as such.

[33] In some instances, costs are incurred within a region and therefore do not need to be allocated to a regional clearing account — these costs can be allocated to schemes via a one step, rather than a two step process.

In the same manner, costs incurred by other cost centres are allocated to the regional clearing accounts using cost drivers.

The next stage of the process is to allocate costs from the regional clearing accounts down to individual schemes. Again the model uses cost drivers as a means to achieve this process. To continue the example above, the model now distributes the $16,000 in the South West regional clearing account to the various schemes within the South West area. In this instance the cost driver used is expenditure on operations and maintenance; again the premise being that the greater the expenditure on operations and maintenance, the greater the size of the scheme and therefore the larger the portion of costs that should be allocated to it. The "Mandurah" water scheme is found to account for around 20 per cent of total operations and maintenance expenditure among Perth schemes and therefore 20 per cent of the $16 000 is allocated to the scheme.

This process is undertaken across each of the Corporation's cost centres. Once all support costs have been allocated to individual schemes they can be summed with the operational costs that are directly attributable to the schemes of relevance to derive total costs allocated to each scheme.

Allocation of depreciation costs

The model also deals with the identification and allocation of depreciation costs. The Corporation's depreciation costs in 2003/04 (as represented in statutory accounts) amounted to approximately $240 million. Of this, approximately $200 million was identified by the Corporation's accounting system as depreciation of the assets of the schemes — no allocation was required. The remaining $40 million, of which the greater part is corporate depreciation such as that on computers, fleet and buildings, is allocated to the schemes via allocation parameters that are based on cost drivers in the same way that other costs are allocated.

Allocation of capital expenditure

Capital expenditure on assets not directly associated with a scheme is not allocated to schemes. Rather, it is depreciation expenses associated with the asset that are allocated. Depreciation costs are regarded as operating costs and attributed to the relevant cost centre (based on the assets that the depreciation costs pertain to). The cost-allocation process then allocates these depreciation costs down to schemes as described above.

6.3 Direct and allocated costs in 2003/04 – water services

Allocation to service types

As stated above, the cost allocation process distributed approximately $320 million of corporate overhead costs to schemes in 2003/04. The bulk of these costs were allocated to water and wastewater schemes (about $309 million) with the remainder going to drainage and irrigation schemes. Table 6.2 shows the distribution of direct and allocated operating costs between the different services on both a metropolitan and a regional level.

Table 6.2

HIGH LEVEL FLOW OF DIRECT AND ALLOCATED OPERATING EXPENDITURE, 2003/04

	Direct operating expenditure ($million)	Allocated operating expenditure ($million)	Total operating expenditure ($million)
Metropolitan			
Water	52.2	113.6	165.8
Wastewater	71.5	105.5	177.0
Drainage	7.6	8.2	15.8
Irrigation	0.0	0.0	0.0
Total metropolitan	131.3	227.3	358.6
Regional			
Water	115.6	72.4	187.9
Wastewater	38.0	17.7	55.7
Drainage	2.1	1.0	3.1
Irrigation	8.0	0.6	8.6
Total regional	163.6	91.7	255.3
All areas			
Water	167.8	185.9	353.7
Wastewater	109.4	123.2	232.7
Drainage	9.7	9.3	18.9
Irrigation	8.0	0.6	8.6
Total all areas	294.9	319.0	613.9

Source: Water Corporation.

The directly incurred and allocated of costs to water supply services are shown in Table 6.3 on a region by region basis. In total, allocated costs to water supply services amounted to around $186 million in 2003/04.

Table 6.3

DIRECT AND ALLOCATED OPERATING EXPENDITURE BY REGION — WATER SUPPLY SERVICES, 2003-04

Region	Directly incurred operating costs ($million)	Allocated operating costs ($million)	Total operating costs ($million)
Perth	52.2	113.6	165.8
South West	21.6	8.6	30.1
North West	22.5	7.7	30.2
Mid West	16.4	7.5	23.9
Gt Southern	20.8	17.7	38.5
Agriculture	18.0	14.7	32.8
Goldfields	16.3	16.2	32.5
Total	167.8	185.9	353.7

Source: Water Corporation.

Cross subsidisation

The allocation of costs to regions and schemes results in some regions and schemes being allocated a greater cost per customer or per unit of water delivered than other regions and schemes. This raises then question as to whether some customers are being cross subsidised by other customers.

From a strictly economic perspective, customers within a region or scheme may be regarded as being cross subsidised if the total payments from those customers are less than the directly incurred operating expenditure within the region or scheme. If customers within a region or scheme pay less than the directly incurred operating expenditure, the customers in the remainder of the Corporation's service regions would be better off if the Corporation ceased to provide the service to the region or scheme in question — in other words, customers in the region or scheme in question are being subsidised the expense of other customers.

Conversely, if customers within a region or scheme pay more than the directly incurred operating expenditure (and thus pay a share of overhead costs), the customers in the remainder of the Corporation's service regions would be worse off if the Corporation ceased to provide the service to the region or scheme in question. In this case there is no subsidy being provided, even though all customers may not pay an "equal" share of overhead costs.

Under this concept of cross subsidy, customers in the Great Southern and Agriculture regions appear to be, on average, cross subsidised by customers in other regions Table 6.4.

Table 6.4

DIRECT AND ALLOCATED OPERATING EXPENDITURE BY REGION COMPARED WITH REGIONAL REVENUE — WATER SUPPLY SERVICES, 2003/04

Region	Revenue ($million)	Directly incurred opex $million)	Allocated opex ($million)	Total opex ($million)	Indicative of cross subsidisation
Perth	230.2	52.2	113.6	165.8	No
South West	24.3	21.6	8.6	30.1	No
North West	29.7	22.5	7.7	30.2	No
Mid West	20.9	16.4	7.5	23.9	No
Gt Southern	**13.9**	**20.8**	**17.7**	**38.5**	**Yes**
Agriculture	**13.9**	**18.0**	**14.7**	**32.8**	**Yes**
Goldfields	22.2	16.3	16.2	32.5	No
Total	355.3	167.8	185.9	353.7	No

Source: Water Corporation.

The same analysis of the existence of a cross subsidy can be undertaken at a scheme level. In total, customers in 188 of the 281 water schemes that are in operation are currently being cross subsidised. While significant in number, the cross subsidised schemes are generally relatively small in size. The number of connections in schemes that are being cross subsidised totals around 36,000, thus accounting for less than five per cent of the Corporation's 810,000 connections and just over seven per cent of total water delivered (Table 6.5).

Table 6.5

CROSS SUBSIDISATION OF SCHEMES BY REGION — WATER SUPPLY SERVICES, 2003/04

Region	Total number of schemes	Total volume of water delivered (ML)	Number of cross subsidised schemes	Water delivered in cross subsidised schemes (ML)	Share of total water delivered (per cent))
Perth	1	208,491	0	0	0.0
South West	40	22,490	29	5,517	24.5
North West	21	22,119	9	1,366	6.2
Mid West	66	16,627	38	2,156	13.0
Gt Southern	59	12,253	49	3,743	30.5
Agriculture	79	11,765	52	5,982	50.8
Goldfields	15	13,351	11	2,978	22.3
Total	281	307,096	188	21,742	7.1

Source: Water Corporation.

Allocation of costs on a regional and scheme basis

Further exploring the allocation of operating expenditure on a regional basis reveals how the operating costs are allocated. Under the cost-allocation process the larger the scheme, the greater the portion of corporate overhead costs that is allocated to it. Given this approach, it may be expected that there be a degree of similarity across regions and schemes in allocated costs per unit of direct cost, allocated cost per connection, and allocated cost per unit of water delivered.

Table 6.6 shows the ratios of allocated operating expenditure to direct operating expenditure, indicating that this varies substantially across regions. The Perth region is allocated expenditure that is more than double the direct operating expenditure that it incurs, this is far greater than the ratios of other regions. Ratios of allocated costs to direct costs are, however, similar across non-metropolitan regions.

Table 6.6 also shows the direct and allocated operating expenditure per kilolitre of water delivered and per connection. Allocated costs per kilolitre of water are similar across the Perth, South West, North West and Mid West regions, and two to three times greater in the Great Southern, Agriculture and Goldfields regions. Allocated costs per connection show a similar pattern, although allocated costs per connection in non-metropolitan regions are all greater than for Perth.

Table 6.6

DIRECT AND ALLOCATED OPERATING EXPENDITURE BY REGION — WATER SERVICES, 2003-04*

Region	Direct operating costs per kilolitre ($/kL)	Allocated operating costs per kilolitre ($/kL)	Ratio of allocated to direct operating costs	Direct operating costs per connection ($)	Allocated operating costs per connection ($)
Perth	**0.25**	**0.54**	**2.2**	**82**	**179**
South West	0.84	0.50	0.6	317	190
North West	0.86	0.50	0.6	941	548
Mid West	0.86	0.58	0.7	481	326
Gt Southern	1.55	1.59	1.0	687	709
Agriculture	1.57	1.21	0.8	1,052	813
Goldfields	1.39	1.04	0.7	936	701
Total Regional	**1.10**	**0.81**	**0.7**	**620**	**457**
Total	**0.52**	**0.63**	**1.2**	**198**	**239**

* Note: figures should be taken as best approximations possible given data constraints.
Source: Water Corporation.

The variation between regions in these indices of cost allocation are a result of the drivers used to allocate costs. As discussed above, the cost-allocation process uses drivers such as floor area of operations, distances over which water is transported, and staff numbers to allocate some costs. Some schemes, particularly in the regions, have very large areas of operations with low numbers of connections and volumes of water deliveries.

It is also apparent that these schemes with lower allocated costs per kilolitre of water delivered are generally the larger schemes as measured by both the number of connections and the volume of water delivered (Table 6.7). Conversely, schemes with larger allocated costs per kilolitre of water tend to have fewer connections and a lower volume of water deliveries. There are around 77 schemes (out of 257 in total) that have allocated costs per kilolitre in excess of $2.00 — these schemes only account for around 1.4 per cent of the Corporation's total water delivered.

Table 6.7

ALLOCATED OPERATING EXPENDITURE PER KILOLITRE — WATER SERVICES, 2003/04*

Allocated operating expenditure per kL ($/kL)	Number of schemes	Average water delivery per scheme (kL/annum)	Average number of connections per scheme
0 — 0.50	31	1,623,943	2,999
0.51 — 1.00	65	3,591,107	10,399
1.01 — 1.50	55	299,361	474
1.51 — 2.00	29	86,623	196
2.01 — 2.50	16	50,270	102
2.51 — 3.00	11	57,187	101
3.01 — 4.00	12	137,190	205
4.01 — 5.00	12	51,127	103
5.01 +	26	25,410	94

* Note: some schemes have been omitted from the analysis due to data limitations.
Source: Water Corporation.

6.4 Direct and allocated costs in 2003/04 – wastewater services

The directly incurred and allocated costs for wastewater services are shown in Table 6.8. In total, allocated costs to wastewater services amounted to around $123 million in 2003/04.

Table 6.8

DIRECT AND ALLOCATED OPERATING EXPENDITURE BY REGION — WASTEWATER SERVICES, 2003/04

Region	Directly incurred operating costs ($million)	Allocated operating costs ($million)	Total operating costs ($million)
Perth	71.5	105.5	177.0
South West	18.6	8.0	26.6
North West	6.8	3.3	10.0
Mid West	3.8	1.8	5.6
Gt Southern	4.9	2.3	7.3
Agriculture	2.9	1.9	4.7
Goldfields	1.1	0.4	1.4
Total	109.4	123.2	232.7

Source: Water Corporation.

As with water services, the Perth region receives the bulk of allocated operating expenditure. With the exception of the South West, the allocation of operating expenditure to the other regions is relatively minor.

Cross subsidisation

For all regions, revenue earned from customer of wastewater services exceeds its direct operating expenditure and as such there are no regions as a whole for which wastewater services can be regarded as cross subsidised (Table 6.9).

Table 6.9

DIRECT AND ALLOCATED OPERATING EXPENDITURE BY REGION COMPARED WITH REGIONAL REVENUE — WASTEWATER SERVICES, 2003/04

Region	Revenue ($million)	Directly incurred operating costs ($million)	Allocated operating costs ($million)	Total operating costs ($million)	Indicative of cross subsidisation
Perth	315.7	71.5	105.5	177.0	No
South West	33.0	18.6	8.0	26.6	No
North West	12.5	6.8	3.3	10.0	No
Mid West	7.9	3.8	1.8	5.6	No
Gt Southern	10.7	4.9	2.3	7.3	No
Agriculture	3.9	2.9	1.9	4.7	No
Goldfields	2.1	1.1	0.4	1.4	No
Total	385.8	109.4	123.2	232.7	No

Source: Water Corporation.

At a scheme level, 26 of the 105 wastewater schemes operated by the Water Corporation are presently being cross subsidised. As is the case regarding cross subsidisation of water services, the schemes that are cross subsidised are generally small in size — while around one quarter of schemes are cross subsidised, these schemes account for less than one per cent of the Corporation's total wastewater connections (Table 6.10).

Table 6.10

CROSS SUBSIDISATION OF SCHEMES BY REGION — WASTEWATER SERVICES, 2003-04

Region	Number of schemes	Number of connections	Number of cross subsidised schemes	Number of cross subsidised connections	Cross subsidised connections (per cent)
Perth	1	661,388	0	0	0.0
South West	33	51,265	10	352	0.7
North West	14	17,698	2	266	1.5
Mid West	19	10,176	6	281	2.8
Gt Southern	18	14,649	2	546	3.7
Agriculture	16	6,395	5	876	13.7
Goldfields	4	2,999	1	532	17.7
Total	105	764,570	26	2,853	0.4

Source: Water Corporation.

Allocation of costs on a regional and scheme basis

As is the case for water services, there is fairly significant variation in the ratio of allocated to direct operating expenditure charges across the regions. The ratio of allocated costs to direct costs is much higher in the Perth region than for non-metropolitan region. Analysis of operating expenditure per kilolitre of wastewater treated cannot be undertaken as detailed volume data are not available for wastewater services. Allocated operating expenditure per connection is generally similar, with the exception of the Agriculture region (Table 6.11).

Table 6.11

DIRECT AND ALLOCATED OPERATING EXPENDITURE BY REGION — WASTEWATER SERVICES, 2003/04*

Region	Ratio of allocated to direct operating costs	Direct operating costs per connection ($)	Allocated operating costs per connection ($)
Perth	1.5	108	160
South West	0.4	362	157
North West	0.5	381	185
Mid West	0.5	372	178
Gt Southern	0.5	338	159
Agriculture	0.7	448	293
Goldfields	0.4	350	131
Total Regional	0.5	368	172
Total	1.1	143	161

* Note: figures should be taken as best approximations possible given data constraints.
Source: Water Corporation.

As with water services, the variation in allocated costs per connection that is observed above is a result of the cost allocation process using drivers such as floor area of operations, distances over which water is transported, and staff numbers to allocate costs. The use of these drivers means that costs on a per connection basis will be higher for schemes with large infrastructure or that span a large area yet have relatively few connections, as may be the case with the agriculture region.

Further examination of allocated operating expenditure per connection on a scheme basis indicates that just under half of the wastewater schemes have allocated costs per connection of less than $200 (Table 6.12). Similar to the case with water services, it tends to be the larger schemes (as measured by connections) that have the lower allocated costs per connection. Schemes with allocated costs per connection in excess of $250 only account for around 1.5 per cent of total wastewater connections. As was the case with water services, those schemes with relatively high allocated costs per connection only account for a small portion of total services.

Table 6.12

ALLOCATED OPERATING EXPENDITURE PER CONNECTION — WASTEWATER SERVICES, 2003-04*

Allocated operating expenditure per connection ($)	Number of schemes (No.)	Average number of connections per scheme (No.)
0 — 150	22	2,827
151 — 200	19	35,553
201 — 250	12	1,313
251 — 350	15	404
351 +	21	241

* Note: some schemes have been omitted from the analysis due to data limitations.
Source: Water Corporation.

6.5 Suitability of the cost allocation model for regulatory purposes

The Water Corporation does not use the cost allocation process to set prices for services. Rather, the Corporation uses the process for performance monitoring of schemes. As such, the cost allocation process is necessarily backward-looking, and is designed for accounting purposes and performance management rather than for the setting of regulated prices.

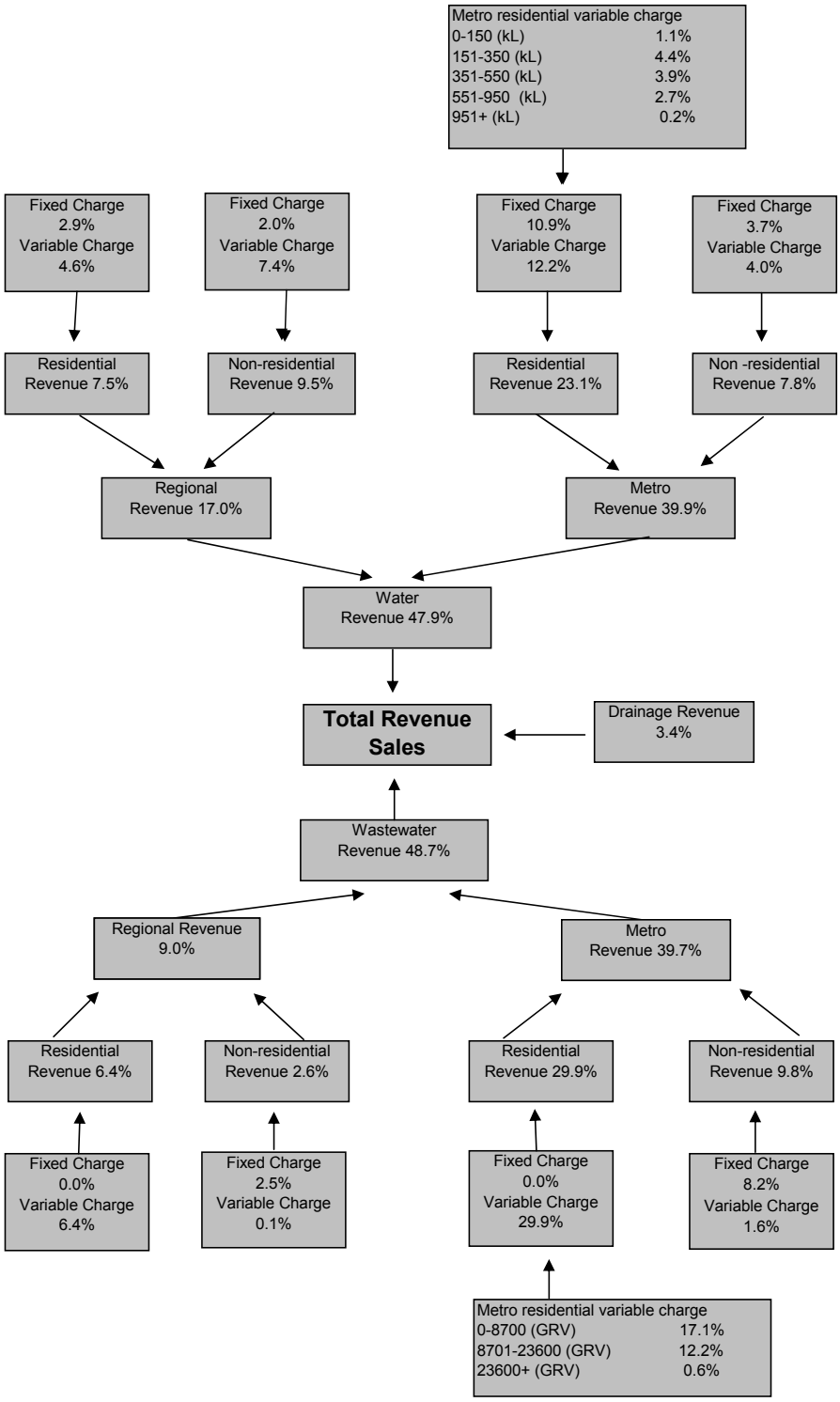
The key limitation of the Water Corporations cost allocation process for use in setting regulatory prices is that it does not allocate costs to different customer classes. For example, residential and commercial classes of customers for water and wastewater services.

Implied cost allocation

A sense of how costs are effectively allocated to different customer classes can be gained by looking into the revenue received by each customer class. In such a manner the revenue received by different customer classes can be assumed to reflect the implied costs of servicing each customer class. Figure 6.2 and Table 6.13 show the share of total sales revenue received by the Water Corporation in 2003-04 by each customer class.

Figure 6.2

SHARE OF TOTAL SALES REVENUE BY CUSTOMER AND TARIFF CLASS, 2003/04



Source: Water Corporation.

Table 6.13

REVENUE RECEIVED BY CUSTOMER CLASS, 2003-04

Service	Revenue ($million)	Share of total sales revenue (per cent)
Total sales revenue	**760.9**	**100.0**
Water*	364.4	47.9
Wastewater	370.8	48.7
Drainage	25.7	3.4
Metropolitan water	**235.1**	**30.9**
Residential fixed	82.8	10.9
Residential variable	93.1	12.2
Total residential	**175.9**	**23.1**
Non-residential fixed	28.4	3.7
Non-residential variable	30.7	4.0
Total non-residential	**59.1**	**7.8**
Regional water	**129.3**	**17.0**
Residential fixed	22.1	2.9
Residential variable	35.2	4.6
Total residential	**57.4**	**7.5**
Non-residential fixed	15.6	2.1
Non-residential variable	56.4	7.4
Total non-residential	**71.9**	**9.4**
Metropolitan wastewater	**302.2**	**39.7**
Residential fixed	227.8	29.9
Residential variable	0.0	0.0
Total residential	**227.8**	**29.9**
Non-residential fixed	62.3	8.2
Non-residential variable	12.1	1.6
Total non-residential	**74.4**	**9.8**
Regional wastewater	**68.6**	**9.0**
Residential fixed	49.0	6.4
Residential variable	0.0	0.0
Total residential	**49.0**	**6.4**
Non-residential fixed	19.1	2.5
Non-residential variable	0.5	0.1
Total non-residential	**19.6**	**2.6**

* includes irrigation.

Water services

Table 6.14 provides a breakdown of total metropolitan water revenue by the Corporation's two classes of customers (residential and non-residential). Revenue received by both the fixed and variable components of the tariff is also included.

Residential customers make up nearly three quarters of total metropolitan water revenue, but as an overall class of customer are charged slightly less per kilolitre of water delivered than are non-residential customers ($1.09 per kilolitre relative to $1.24 per kilolitre).

Table 6.14

COMPONENTS OF METROPOLITAN WATER REVENUE, 2003/04

Revenue category	Revenue ($million)	Share of total metro revenue (per cent)	Implied revenue per connection ($)	Implied revenue per kL ($)
Residential fixed	82.8	35.2		
Residential variable	93.1	39.6		
Total residential	**176.0**	**74.9**	**312**	**1.09**
Non-residential fixed	28.5	12.1		
Non-residential variable	30.7	13.0		
Total non-residential	**59.1**	**25.1**	**826**	**1.24**
Total metropolitan	**235.1**	**100.0**	**370**	**1.13**

Source: Water Corporation.

Data on residential water revenue by tariff class show that around 47 per cent of metropolitan water revenue is obtained via the Corporation's fixed charges. The remaining 53 per cent of revenue comes from variable charges (Table 6.15).

Table 6.15

METROPOLITAN RESIDENTIAL WATER REVENUE BY TARIFF CLASS, 2003/04

Tariff class	Charge	Revenue ($m)	Share of total metro revenue (per cent)
Fixed charge	**$149**	**82.8**	**47.1**
Variables Charges			
0—150 kL	$0.41 per kL	8.4	4.8
151—350 kL	$0.67 per kL	33.1	18.8
351—550 kL	$0.91 per kL	29.4	16.7
551—950 kL	$1.20 per kL	20.4	11.6
951+ kL	$1.50 per kL	1.8	1.0
Total variable charges		**93.1**	**52.9**
Total		**176.0**	**100.0**

Source: Water Corporation.

Wastewater services

Similar to the case with water services, around three quarters of the Corporation's metropolitan wastewater revenue is earned through residential customers — all residential revenue comes from variable charges as there are no fixed service charges for residential wastewater services. In comparison, the bulk of non-residential wastewater revenue arises out of fixed service charges. The Corporation receives over three times the amount of revenue per connection for non-residential customers than it does for residential customers (Table 6.16). Overall, the Corporation receives more revenue per kilolitre of metropolitan wastewater treated than per kilolitre of metropolitan water delivered ($2.82 for wastewater versus $1.13 for water). This compares with average costs of services of around $1.80 per kilolitre of wastewater and $1.14 per kilolitre of water.

Table 6.16

COMPONENTS OF METROPOLITAN WASTEWATER REVENUE, 2003/04

Revenue category	Revenue ($million)	Share of total metro revenue (per cent)	Implied revenue per connection ($)	Revenue per kL ($/kL)
Residential fixed	227.8	75.4		
Residential variable	0.0	0.0		
Total residential	**227.8**	**75.4**	**455**	
Non-residential fixed	62.3	20.6		
Non-residential variable	12.1	4.0		
Total non-residential	**74.4**	**24.6**	**1,485**	
Total metropolitan	**302.2**	**100.0**	**549**	**2.82**

Source: Water Corporation.

The bulk of the Corporation's metropolitan residential revenue comes from properties with a gross rental value below $8,700 (Table 6.17).

Table 6.17

METROPOLITAN RESIDENTIAL WASTEWATER REVENUE BY TARIFF CLASS, 2003/04*

Tariff class (Gross Rental Value, $)	Charge	Revenue ($million)	Share of total metro revenue (per cent)
0—8,700	5.59 cents per $GRV	129.8	57.0
8,701—23,600	3.37 cents per $GRV	93.1	40.9
23,600 +	1.53 cents per $GRV	4.9	2.1
Total		**227.8**	**100.0**

* Note: Figures are estimates only.
Source: Water Corporation.

6.6 Conclusions

The Authority has requested advice on the number of aspects of explicit or implied allocation of costs by the Water Corporation. In particular, the Authority has requested advice on the appropriateness of the allocation of costs:

(a) associated with overheads;

(b) between water and wastewater services;

(c) between customer groups within water and wastewater services; and

(d) between country and urban districts.

The Corporation does not determine prices for services on the basis of an allocation of costs. While the Corporation does have a process for allocating costs to individual service schemes, this is undertaken for accounting and performance-monitoring purposes rather than for the determination of prices. There is therefore no basis for advising on whether the cost allocation process used by the Corporation is appropriate in respect of setting prices.

That said, however, the Corporation's allocation of costs to regions and schemes provides information on the direct or avoidable costs of service provision in individual schemes which can be used in drawing conclusions as to whether prices for services meet the basic efficiency criterion of being in excess of avoidable costs, and the extent to which customers in particular schemes are being cross subsidised.

For water services, customers in 188 of the 281 water schemes that are in operation currently pay prices that are, on average, less than the avoidable costs of service provision. The cross subsidised schemes are, however, relatively small in size. The number of connections in schemes that are being cross subsidised totals around 36,000, thus accounting for less than five per cent of the Corporation's 810,000 connections and just over seven per cent of total water delivered.

For wastewater services, 26 of the 105 wastewater schemes operated by the Water Corporation are presently being cross subsidised. As is the case regarding cross subsidisation of water services, the schemes that are cross subsidised are generally small in size — while around one quarter of schemes are cross subsidised, these schemes account for less than one per cent of the Corporation's total wastewater connections.

While the Corporation does not determine prices on the basis of an allocation of costs, the amount of costs recovered from particular services and particular classes of customers is implied by the prices determined and hence the revenue earned from each service and class of customer.

For water services, total revenue in 2003/04 ($355.7 million excluding CSO payments) was similar to total operating costs ($353.7 million including depreciation but excluding returns to capital). For wastewater services, total revenue in 2003/04 ($370.8 million) substantially exceeded total operating costs (232.7 million). These outcomes indicate (with CSO payments excluded from consideration) that the returns to the Corporation in excess of operating costs and depreciation (i.e. returns on investment) are almost entirely recovered from provision of wastewater services.

The returns to the Corporation in excess of operating costs and depreciation (i.e. returns on investment) are also recovered predominantly from the provision of services in the Perth metropolitan area. For water and wastewater services, revenues from Perth metropolitan customers are in excess if operating costs, while for non metropolitan customers, the reverse applies.

The Corporation has not undertaken any allocation of costs (direct or overhead) to customer classes. As such, it is no possible to compare prices/revenues from different customer classes with costs. It is notable, however that for water services, residential and commercial customers in the Perth metropolitan area payed in 2003/04 similar average prices on a per kilolitre basis ($1.09/kL and $1.24/kL, respectively) while for wastewater services, residential customers paid average prices per connection of about one third of commercial customers ($455/connection and $1,485/connection, respectively).

Chapter 7

Marginal Costs of Supply

7.1 Introduction

This chapter analyses the estimates of both short and long-run marginal costs of supply as provided by the Water Corporation. All marginal cost estimates produced in the chapter are dependent upon Water Corporation data.

For the purpose of this study, the concept of the short-run marginal cost is taken as being the costs associated with supplying an additional unit of water given a fixed supply of capital. Short-run marginal costs are estimated by determining true variable costs on a per kilolitre basis, these are costs that are directly affected by the volumes of water delivered or wastewater treated. In the case of water services, the short-run marginal cost is found to be $0.08 per kilolitre while the corresponding cost for wastewater services is $0.09 per kilolitre.

The Corporation estimates the long-run marginal costs of water services using a version of the Turvey approach, which is widely accepted by industry participants. The approach involves calculating the change in forecast future system costs arising out of a permanent increment or decrement in demand (in the case of the Water Corporation's analysis, a permanent increment is used). The calculation is based on estimating the costs involved in a base case forecast scenario (with per capita demand modelled at 155 kilolitres) and an alternate case (using per capita demand of 170 kilolitres). The alternate case requires higher capital and operating costs to meet the higher levels of demand. Calculating the difference in the per kilolitre costs of the two scenarios and discounting back to a present value yields a long-run marginal cost estimate of $0.84 per kilolitre. Subsequent analyses performed by the Corporation using a similar methodology yet modified capital programs result in long-run marginal cost estimates of between $0.86 and $0.96 per kilolitre.

While we agree with the broad approach taken by the Corporation, we have concerns about the time periods used in the analysis and particularly in the way in which present values of costs and demand are calculated. In calculating present values, the Corporation use a discount period which spans until 2053 whereas the additional capital and operating costs and demand are only modelled to 2023 beyond which time, demand growth is projected to stop. It is our view that taking such an approach may result in an underestimate of the long-run marginal cost.

In conjunction with the Corporation we take a modified approach to calculating the long-run marginal cost. To overcome the perceived shortfalls of the initial approaches, demand, capital and operating costs are forecast out 2105. In forecasting capital expenditure out over an extended period we make the assumption that desalination technology can be used incrementally to boost supply capacity once other water sources are running at capacity. The results of this analysis, which is considered by The Allen Consulting Group to be more robust than the initial analyses, result in a long-run marginal cost estimate of $0.97 per kilolitre — therefore we are of the view that it may be appropriate to consider the long-run marginal cost is of this magnitude.

The Corporation use the average incremental cost approach to estimate the long-run marginal cost of wastewater services which results in an estimate of $1.77 per kilolitre. Similar to the case for water services, the estimate is based on discounting capital and operating costs and demand over a period which spans until 2053 despite the fact that the figures are only modelled out to 2026. Extending the period for which costs and demand are modelled to rectify our perceived shortfalls of the initial analysis results in long-run marginal cost estimates which are of similar magnitude to the Corporation's initial estimate. Therefore, despite some concerns with the Corporation's methodology, we are satisfied that it may be appropriate to consider the long-run marginal cost of wastewater services to be in the order of $1.77 per kilolitre.

7.2 Short-run marginal costs

In the context of the provision of water services, there are two different concepts of short-run marginal cost:

- the cost of supplying an additional unit of water, say an additional kilolitre; and
- the cost of servicing an additional property or connection to the water mains system.

Given the context of this project and the discussions had with the Economic Regulation Authority, the relevant short-run marginal cost is taken to be the cost of supplying an additional unit of water.

The definition of the short run implies that all capital stock is fixed and therefore a short run analysis is only concerned with operating costs, and in this case, only those operating costs that vary directly with the volume of water delivered to customers. For water services, the variable operating costs of relevance are the chemical costs associated with the water treatment process and electricity costs associated with pumping the water from its source to its destination. Similarly for wastewater services, the relevant costs are the costs of chemicals and energy used in treatment and the cost of energy used in wastewater transport.

These costs are indicated in Table 7.1.

In 2003/04, the Water Corporation's variable operating costs for water services totalled $17.3 million. Dividing these costs by the amount of water consumed (208,491 megalitres) results in a short-run marginal cost estimate of $0.08 per kilolitre.

For wastewater services, dividing the variable operating costs of $9.8 million by the amount of wastewater treated (107,000 megalitres) results in a short-run marginal cost estimate of $0.09 per kilolitre.

Table 7.1

SHORT-RUN MARGINAL COST OF WATER AND WASTEWATER SERVICES, 2003/04

Cost Category	Water services	Wastewater services
Chemical costs ($m)	6.0	3.5
Electricity costs ($m)	11.2	6.3
Total variable costs ($m)	17.3	9.8
Total water consumed/treated (ML)	208,491	107,000
Short run marginal cost ($/kL)	**$0.08**	**$0.09**

Source: Water Corporation.

The short-run marginal cost estimates are "average" marginal costs for the respective services. While not so much the case for wastewater services, the costs associated with the provision of water services may vary greatly depending on where the water is sourced from. In particular, it is likely that costs will vary according to the geographic location of the source as well as the type of source and the nature and level of treatment required.

7.3 Long-run marginal costs – water services

Water Corporation submission

Methodologies for the determination of long-run marginal cost are described in the Principles and Methodologies Report. This section describes the methodology undertaken by the Corporation in its initial long-run marginal cost submission, which was made available to The Allen Consulting Group on 12 November 2004.

The Water Corporation use a form of the Turvey approach to estimate the long-run marginal cost of supplying water. This approach involves calculating the change in forecast future system costs due to a permanent increment or decrement in future levels of demand — in this case, the Water Corporation has assessed costs associated with an increment in demand.

The methodology used by the Water Corporation for estimating the long-run marginal cost can be summarised as follows:

- *Generate a base case scenario* — as a base case, the Water Corporation has assumed a per capita demand for water of 155 kilolitres per person going forward. In 2003/04 per capita demand for water coming from the Integrated Water Supply Scheme was 154 kilolitres per person. The 155 kilolitres per person target is chosen as a base case as it reflects one of the stated objectives of the State Water Strategy. Total demand for water coming from the Integrated Water Supply Scheme (which supplies water to metropolitan and some regional areas) is calculated using the per capita estimate combined with population projections from the Department of Planning and Infrastructure. Using this approach, water demand is forecast out to 2023.

- *Forecast capital and operating costs for the base case scenario* — forecasts of capital and operating costs are derived based on the forecast level of demand. The capital and operating costs used in the analysis are only those related to development of new water sources required to meet future expected levels of demand. Key new source developments as forecast by the Water Corporation include the desalination plant, Eglinton groundwater scheme, Wungong outlet, Wellington/Harris Dam, South West Yarragadee and Gnangara Groundwater. Associated operating costs associated with the running of the new source developments are also forecast. The combination of water demand forecasts and associated capital and operating costs forms the base case scenario, as shown in the first four columns of Table 7.2.

- *Develop an alternate scenario* — an alternative scenario is developed by assuming that per capita demand for water over the forecast period is 170 kilolitres rather than the 155 kilolitres that is used for the base case.

- *Forecast capital and operating costs for the alternative scenario* — the required capital and operating costs are forecast based on the requirement of ensuring that there is enough supply to match the permanent increment in demand. The capital program proposed by the Water Corporation for the alternate scenario is broadly similar to that of the base case, however, the timing of many projects is brought forward to satisfy the increased level of demand.

  The combination of the alternate water demand forecasts and associated capital and operating costs forms the alternate case scenario as depicted in columns 5 to 7 in Table 7.2.

- *Compare costs associated with each scenario* — the actual calculation of the long-run marginal cost under the Turvey approach involves a comparison of the costs incurred under each of the two scenarios. Capital and operating costs of the base case are subtracted from those of the alternate case in each year in order to compare costs of the two scenarios (columns 8 and 9 of Table 7.2). Similarly, water demand in each year of the base case is subtracted from the alternate scenario (column 10 of Table 7.2).

  The differences in capital, operating costs and water demand are next converted to net present value terms using a discount rate of 6.5 per cent per annum. In calculating the net present values, the Corporation uses a discount period which runs until 2053 despite the fact that capital and operating cost and demand forecasts are effectively only modelled out to 2023. There are no capital costs modelled beyond 2023 and both operating costs and demand projections for each of the years beyond 2023 are kept constant such that, for each scenario, they are equal to the respective values observed in 2023.

The net present value figures are shown at the bottom of columns 8 to 10 of Table 7.2. The long-run marginal cost of water supply is calculated by dividing the net present value of the difference in capital expenditure by the net present value of the difference in water demand (in this case 180.9 divided by 320.5) and similarly dividing the net present value of operating expenditure by the net present value of the difference in water demand (94.6 divided by 328.5). Adding these two figures together yields an estimate of the long-run marginal cost of metropolitan water supply services of $0.84 per kilolitre.[34] [35]

[34] The Water Corporation notes that the estimate of long-run marginal cost should be considered as an estimate only. The value of long-run marginal cost will vary depending on the point in time at which it is taken and long-range forecasts are typically subject to a high degree of uncertainty.

[35] On 27 January 2005, the Water Corporation submitted additional estimates of long-run marginal cost. These analyses incorporated an updated capital program and were based on a similar methodology to the initial submission. The outcomes of these analyses indicated that the long-run marginal cost is in the order of $0.86 or $0.96 per kilolitre.

Table 7.2

WATER CORPORATION LONG RUN MARGINAL COST CALCULATIONS — WATER SERVICES

Year	Capital expenditure ($million)	Operating expenditure ($million)	Water demand (GL)	Capital expenditure ($million)	Operating expenditure ($million)	Water demand (GL)	Capital expenditure ($million)	Operating expenditure ($million)	Demand (GL)		
			Base Case			Alternate Scenario			Difference		
column 1	*column 2*		*column 3*	*column 4*	*column 5*	*column 6*	*column 7*		*column 8*	*column 9*	*column 10*
2005	29.6		39.1	260.6	29.6	39.1	260.6		0.0	0.0	0.0
2006	279.9		40.7	265.3	279.9	40.7	265.3		0.0	0.0	0.0
2007	102.5		69.5	292.9	102.5	70.0	302.2		0.0	0.5	9.2
2008	43.5		69.6	295.2	277.0	74.9	307.5		233.5	5.3	12.3
2009	30.6		69.8	297.3	202.4	84.0	312.8		171.8	14.2	15.5
2010	39.2		70.3	299.3	39.2	84.6	318.1		0.0	14.4	18.7
2011	45.3		70.5	301.3	45.3	85.1	323.4		0.0	14.5	22.1
2012	16.4		71.8	301.3	9.3	86.6	328.2		-7.2	14.8	26.9
2013	36.0		72.2	305.8	0.0	87.0	333.1		-36.0	14.8	27.3
2014	14.5		77.1	310.2	0.0	87.4	337.9		-14.5	10.2	27.7
2015	22.2		78.0	314.7	0.0	88.2	342.8		-22.2	10.2	28.1
2016	247.4		78.5	319.2	28.3	88.7	347.7		-219.0	10.2	28.4
2017	200.1		89.7	323.6	28.3	91.4	352.4		-171.8	1.6	28.8
2018	0.0		90.9	328.0	0.0	92.6	357.2		0.0	1.6	29.2
2019	0.0		92.2	332.4	111.8	93.9	361.9		111.8	1.7	29.5
2020	0.0		93.9	336.8	128.8	95.6	366.7		128.8	1.7	29.9
2021	0.0		94.9	341.2	17.0	100.0	371.4		17.0	5.1	30.3
2022	0.0		95.8	345.4	0.0	100.9	376.0		0.0	5.1	30.6
2023	0.0		96.8	349.7	0.0	101.9	380.6		0.0	5.1	31.0
							NPV		180.9	94.6	328.5
							LRMC		$0.84/kL		

Source: Water Corporation.

Analysis of the Water Corporation submission

In a broad sense, the methodology adopted by the Water Corporation is sound. The Turvey approach of estimating long-run marginal cost is a well-known and widely-approved method. The approach is recommended by a range of regulators and industry associations including Ofwat[36], the Canadian Water Works Association[37], the California Urban Water Conservation Council[38] and the Queensland Competition Authority.[39]

The Turvey approach is based on consideration of the change in forecast costs arising from a permanent increment or decrement in demand and, as such, the approach is specifically concerned with decision making at the margin. That is, it answers the question of what is the cost per unit of supplying additional (over and above base forecasts) units of water in the long run.[40]

The main criticism of the Turvey approach is that it is highly dependent upon the size of the increments or decrements in demand that are modelled. Given this dependency, it is generally recommended that the Turvey approach be subject to a sensitivity analysis using alternate demand scenarios.[41] It is also recommended by some authorities that an appropriate estimate of long-run marginal cost be derived by considering the impact on future costs of both an increment and a decrement on the central demand forecast and taking the mean of the two results.[42]

The Water Corporation has not undertaken such sensitivity analyses and instead has focussed on only two demand scenarios. It would be useful to undertake such a sensitivity analysis, but given the intricacies of designing an appropriate capital program to meet selected levels of demand, it is not something that can be performed by external consultants within the time-frame of the current study.

Our main concerns with the approach taken by the Corporation is the choice of time frames used for both the modelling of demand and cost forecasts and the calculation of net present values. As explained above, the Corporation has modelled demand and capital and operating expenditure out to 2023 and then, for both operating expenditure and demand, the Corporation has used the values as projected for 2023 to "fill" each of the years from 2023 to 2053 — thus providing figures that are used to form the discount period. In other words, for every year beyond 2023, operating costs are set equal to the forecast value for 2023 and demand in every year beyond 2023 is set equal to the value forecast for 2023. Capital costs are set equal to zero in every year beyond 2023.

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36 Ofwat 2001, *The Role of Long Run Marginal Costs in the Provision and Regulation of Water Services*, Report C.

37 GeoEconomics Association Incorporated 2002, *Economic Principles and Concepts as Applied to Municipal Water Utilities*.

38 California Urban Water Conservation Council 1997, *Designing, Evaluating, and Implementing Conservation Rate Structures.*

39 Queensland Competition Authority 2002, *Gladstone Area Water Board: Investigation of Pricing Practices.*

40 Ofwat 2001, *The Role of Long Run Marginal Costs in the Provision and Regulation of Water Services*, Report C, p. 42.

41 Ofwat 2001, *The Role of Long Run Marginal Costs in the Provision and Regulation of Water Services*, Report C, p. 42.

42 Ofwat 2001, *The Role of Long Run Marginal Costs in the Provision and Regulation of Water Services*, Report C, p. 41.

Such an approach is designed to allow for the fact that capital infrastructure installed over the forecast period (2005 to 2023) will, in all likelihood, supply water beyond 2023 and this needs to be considered in costing estimates. However, the approach used effectively assumes that demand ceases to grow beyond 2023 and from 2023 to 2053, the only costs incurred by the Corporation are operating costs. The implications of using a discount period out to 2053 when capital and demand are only forecast to grow until 2023 will serve to pull down the estimate of long run marginal cost because after 2023 only differences in operating expenditure between the low demand and high demand scenarios are considered, reducing the "average" difference in costs between the two scenarios over the period of the forecast.

A modified approach

A more fundamentally sound calculation of the long-run marginal cost is one that does not assume that demand growth stops at some point in time and instead models both demand and cost projections over a time horizon that is long enough such that values towards the end of the time horizon, once discounted, have an immaterial impact on the long-run marginal cost estimate. Analysis suggests that once beyond around 2070, additional forecasts start to have a very modest affect on the final estimate.

In order to model capital expenditure over the time period required for the analysis, we assume that desalination technology can be used as required as a "backstop" technology. That is, desalination capacity can be incrementally added to the water supply network once existing water sources are unable to meet growing levels of demand.

In adopting such an approach, the Corporation model both the base case and alternate scenario out to 2105 — this gives a 100 year time frame for the analysis which is viewed as more than adequate. The Corporation use long range capital program projections to model capital out until around 2050, and thereafter desalination is installed in periodic increments to meet the forecast growth in demand.

The underlying methodology to calculating the long-run marginal cost is the same as that used in the first submission with the only difference being that present values are now calculated using a discount period that spans until 2105 which is consistent with the period for which costs and demand are modelled.

The approach results in an estimate of long-run marginal cost of $0.97 per kilolitre. While the usual precautions about forecasting given the long range nature of the exercise do exist, The Allen Consulting Group is of the view that this estimate of long-run marginal cost, which is dependent upon Water Corporation data, is based on a sound and robust methodology.[43]

7.4 Long-run marginal costs – wastewater services

Water Corporation submission

The Water Corporation has estimated the long run marginal cost of wastewater services using a form of average incremental cost approach.

[43] The underlying capital estimates used in the modified approach differ from those used in the first approach as the Corporation's capital program was altered during the course of work.

Given existing forecasts of growth in demand for wastewater services (again based on Department for Planning and Infrastructure population forecasts), the Corporation has estimated the optimal capital program required to meet the demand. Operating costs relating to the collection, treatment and disposal of wastewater are also forecast. The time period for which demand and costs are forecast spans from 2004 to 2026. The forecast capital and operating costs associated with the base case are shown in the left-hand columns of Table 7.3.

As described above and in the Principles and Methodology Report, the average incremental cost approach involves calculating the present value of the capital and operating costs of the optimal strategy and dividing this figure by the present value of additional wastewater that is treated to yield a per unit estimate of costs.

In estimating both the additional volume of wastewater treated and the additional capital and operating costs associated with treating the water, the Corporation has used 2004 as the base year — costs and volumes in excess of those observed during the base year are treated as additional and therefore relate to the calculation of long-run marginal cost. These additional costs and volumes are depicted in the right hand columns of Table 7.3.

The approach involves the calculation of net present values of the capital and operating costs and the additional volumes treated — these figures are calculated using a discount rate of 6.5 per cent per annum. Summing these net present value figures and dividing them by the net present value of the additional wastewater treated indicates a long-run marginal cost of $1.77 per kilolitre.

As is the case for water, the Corporation notes that the estimate of long-run marginal cost of wastewater services should be considered as an estimate only as long-range forecasts are typically subject to a high degree of uncertainty.

Table 7.3

WATER CORPORATION LONG RUN MARGINAL COST CALCULATIONS — WASTEWATER SERVICES

Year	Capital Expenditure ($m)	Operating Expenditure ($m)	Wastewater Treated (GL)	Capital Expenditure ($m)	Operating Expenditure ($m)	Wastewater Treated (GL)
	Base Case			Calculation of Additional Costs and NPV		
2004	0.0	40.3	107	0.0	0.0	0.0
2005	27.9	41.2	109	27.9	1.0	2.5
2006	69.3	42.2	112	69.3	2.0	4.9
2007	72.3	43.2	114	72.3	2.9	7.3
2008	99.8	44.1	116	99.8	3.8	9.3
2009	41.5	44.9	118	41.5	4.6	11.4
2010	27.9	45.8	120	27.9	5.6	13.9
2011	26.5	46.8	123	26.5	6.5	16.3
2012	60.0	47.7	125	60.0	7.5	18.8
2013	86.7	48.7	128	86.7	8.4	21.3
2014	101.3	49.6	130	101.3	9.4	23.8
2015	76.9	50.6	133	76.9	10.3	26.3
2016	56.2	51.5	135	56.2	11.2	28.7
2017	10.2	52.4	138	10.2	12.2	31.2
2018	13.8	53.4	140	13.8	13.1	33.8
2019	26.0	54.4	143	26.0	14.1	36.3
2020	41.1	55.3	145	41.1	15.1	38.8
2021	61.2	56.2	148	61.2	16.0	41.2
2022	37.5	57.1	150	37.5	16.9	43.6
2023	16.9	58.0	153	16.9	17.8	46.0
2024	16.9	59.0	155	16.9	18.8	48.5
2025	16.9	60.0	158	16.9	19.7	51.0
2026	0.0	60.3	160	0.0	20.0	53.6
			NPV	543.1	151.0	393.1
			LRMC	$1.77/kL		

Source: Water Corporation.

Analysis of the Water Corporation submission

The average incremental cost approach adopted by the Corporation in calculating the long-run marginal cost of wastewater services is regarded as fundamentally sound and recommended by a range of regulators and industry bodies such as, Ofwat[44], the Queensland Competition Authority[45] and the California Urban Water Conservation Council.[46]

While the approach adopted is acceptable, it is not entirely clear as to why it has been chosen given that the Corporation has calculated the long-run marginal cost of water services using the Turvey approach.

It would be a worthwhile exercise for the Corporation to have undertaken the estimation of long-run marginal cost using the Turvey approach as a means to provide a sensitivity analysis to their estimation as presented above, however, to our knowledge this, or any other sensitivity analysis, has not been undertaken by the Corporation with regard to estimating the long-run marginal cost of wastewater services. Given the intricacies of designing an appropriate capital program to meet selected levels of demand, a Turvey estimate of the long-run marginal cost of wastewater services it is not something that can be performed by external consultants within the time-frame of the current study.

The forecasts of demand for wastewater services used as the basis for the estimation of long-run marginal cost appear reasonable and are consistent with the Corporation's forecasts that are depicted in other publications as well as being consistent with current levels of demand. The Corporation base their population projections on data produced by the Department for Planning and Infrastructure.

Similar to the case for the calculation of the long-run marginal cost of water supply, we have some concerns about the time periods used in the analysis for wastewater services. Despite modelling demand and capital expenditure out to 2026, the Corporation use a discount period which spans to 2053 to calculate net present values of capital and operating costs as well the volume of wastewater treated. The discount period is formed by equating operating expenditure and demand in each year beyond 2026 to the value projected for 2026 — similar to the approach taken in the water supply analysis. Capital expenditure is set equal to zero in each year beyond 2026.

As discussed in the analysis of the Corporation's calculations for water services, the approach taken effectively assumes that demand ceases to grow beyond 2026 and thereafter the only costs incurred by the Corporation are operating costs. It is our view that such an approach is based on an unsubstantiated assumption about demand growth and may result in an underestimate of the true long-run marginal costs of supplying wastewater services.

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[44] Ofwat 2001, *The Role of Long Run Marginal Costs in the Provision and Regulation of Water Services*, Report C.

[45] Queensland Competition Authority 2002, *Gladstone Area Water Board: Investigation of Pricing Practices.*

[46] California Urban Water Conservation Council 1997, *Designing, Evaluating, and Implementing Conservation Rate Structures.*

A modified approach

As a means to rectify the potential problems that may arise from the above approach, we use a modified approach to calculate the long-run marginal cost of wastewater services. The approach taken involves extending the Corporation's demand, operating and capital cost forecasts out to 2105 as was done in the case of water supply services. Extending the forecasts allows the discount period to be set equal to the period over which forecasts are modelled and therefore removing the need to assume that demand ceases to grow after a particular year.

Using the Corporation's projections that form the initial long-run marginal cost calculations, we extend the analysis forward to 2105 based on the trends observed in the 2004 to 2026 modelling period (numerous approaches to forecasting forward are taken as a means of sensitivity analysis). The results of the analysis are found to be broadly consistent with the Corporation's estimate of long-run marginal cost — that is $1.77 per kilolitre. Despite some concerns with the Corporation's methodology, we are satisfied that it may be appropriate to consider the long-run marginal cost of wastewater services to be in the order of $1.77 per kilolitre.

Appendix A

Methods and Assumptions used in Modelling Statutory Accounts

A.1 Statutory Accounts

Analysis undertaken in Chapter 3 involves the modelling of statutory accounts of the service provider over the forecast period to 2008/09. Specifically, this involves the modelling of both the capital and the profit and loss accounts so as to be able to calculate financial indicators of the service providers under different regulatory asset value scenarios. Values from actual 2003/04 statutory accounts form the basis of projections.

Specific methods and assumptions made in modelling each of the items of the capital and profit and loss accounts are detailed below.

A.2 Capital Account Modelling

Current assets

- Cash assets are dependent upon the value recorded in previous years plus any change in cash reserves. In the case of the Water Corporation, where changes in cash reserves are assumed to equal zero, cash assets are held constant.
- Receivables are modelled such that the ratio of receivables to total revenue from operations in 2003/04 is kept constant for each of the forecast years.
- Inventories and 'other assets' are assumed to remain constant in real terms throughout the forecast period.

Non-current assets

- Property, plant and equipment values are rolled forward each year taking into account depreciation, sales and investment.
- Deferred tax assets are kept constant in real terms throughout the forecast period.
- Receivables in the form of pensioner rate deferrals are modelled such the ratio between receivables and total revenue from operating activities in 2003/04 is held constant throughout the forecast period.

Current liabilities

- Both payables and interest-bearing liabilities are modelled such that the ratio of payables to operating expenditure in 2003/04 is kept constant throughout the forecast period.
- Current tax liabilities are modelled such that the 2003/04 ratio of tax liabilities to tax payments is kept constant throughout the forecast period.
- Provisions and other liabilities are held constant in real terms over the forecast period.

Non-current liabilities

- Interest-bearing liabilities are set equal to the previous year's debt plus new borrowings that are incurred minus repayments of borrowings, the latter being held constant at the 2003/04 value of $15 million per year.
- Deferred tax liabilities are modelled such that the 2003/04 ratio of deferred tax liabilities to total revenue is kept constant over the forecast period.
- Provisions and other liabilities are held constant in real terms over the forecast period.

A.3 Profit and Loss Account Modelling

Revenue from operating activities

- Total revenue from operating activities is set equal to total costs as calculated by the cost of service methodology, reflecting an assumption that regulated prices and CSO payments would be set to recover this revenue.

Other revenue

- Revenue received from the sale of property, plant and equipment is assumed to remain constant in real terms over the forecast period.
- Interest revenue is held constant over the forecast period because cash reserves are held constant.
- Developer contributions are taken as projected by the Corporation.

Expenses from ordinary activities

- Depreciation figures are taken as projected by the Corporation.
- Other expenses are set equal to total operating expenses as projected by the Corporation.

Borrowing costs

- Interest charges payable are modelled such the 2003/04 ratio of interest charges payable to interest bearing liabilities is held constant over the forecast period.
- Amounts capitalised are assumed to equal zero over the forecast period as is the gain on general loan fund repayment and the premium on the repayment of debt.

Net profit

- Profits are determined based on modelled revenue and expenditure. Income tax is modelled as a constant proportion of profit before tax and net profits are determined by subtracting tax payments from profits.

Borrowing and investment activities

- The repayment of borrowings is modelled as being constant in nominal terms over the forecast period.

- Investment in property, plant and equipment is set equal to total capital expenditure over the forecast period.
- New borrowings are modelled such that 45 percent of new investment is financed by new borrowings, which gives a value of net debt of between $2.5 and $2.6 billion in 2008/09, consistent with the Water Corporations projections.

Appendix B

Financial Ratios and Credit Rating Criteria

B.1 Financial Ratios

Financial ratios for the business of the service provider were calculated as follows.

- Interest Cover Ratio: profit before tax less proceeds from sale of property, plant and equipment less developer contributions plus depreciation plus interest, divided by interest.
- Internal financing ratio: profit after tax plus depreciation less dividends, divided by net investment.
- Debt payback period: current debt plus non-current debt less cash, divided by profit after tax plus depreciation.

B.2 Indicative Credit Ratings

Indicative credit ratings were assumed for ranges of values for the financial indicators as follows:

Table B.1

INDICATIVE CREDIT RATINGS FOR RANGES INVALUES OF FINANCIAL INDICATORS

Financial Indicator	Range for Indicative Credit Rating					
	<BB	BB	BBB	A	AA	AAA
Interest Coverage	<1.8	1.8–2.8	2.8–3.8	3.8–4.5	4.5–5.5	>5.5
Debt payback period	>13.3	10–13.3	6.7-10	4.5–6.7	3.3–4.5	<3.3
Internal financing ratio	<0.4	0.4–0.5	0.5–1.0	1.0–1.4	1.4–2.0	>2.0

The indicative credit ratings were based on key utility financial ratios for indicative credit ratings for an "average risk" utility business as reported by Standard & Poors.[47]

[47] Standard & Poors, 28 October 2004, *Corporate Ratings Criteria – Ratings and Ratios: Ratio Medians; Ratio Guidelines*