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January 24 2004

Essential Services Commission of SA,
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SUBMISSION – INQUIRY INTO WATER AND WASTEWATER PRICING PROCESSES

I should like to make a personal submission to the above inquiry, and in particular make some comments on the document "Transparency Statement Metropolitan and Regional Water and Wastewater Prices in South Australia 2005-6".

I do so with a background of having been a member of the SA Water Resources Council 1985-92, but more specifically as the author of the review *Water Recycling in Australia* published in 2004 under the auspices of the Australian Academy of Technological Sciences and Engineering as a result of support from the Australian Research Council.

In particular, I should like to make the following points with regard to water recycling.

RECYCLED WATER WITHIN CoAG STRATEGIC FRAMEWORK

Although recycled water was initially excluded from consideration within the CoAG Strategic Framework for Water Reform, it was brought within that framework in 2004.

NATIONAL WATER INITIATIVE

Although the Transparency Statement lists in Appendix 4 a number of relevant clauses of the National Water Initiative, including clause 66ii) which reads

66 ii) - development of pricing policies for recycled water and stormwater that are congruent with pricing policies for potable water, and stimulate efficient water use no matter what the source, by 2006;

it does not mention the Urban Water Reform – Outcome, which reads as follows:-

90. The Parties agree that the outcome for urban water reform is to:

i) provide healthy, safe and reliable water supplies;

ii) **increase water use efficiency in domestic and commercial settings**;

iii) **encourage the re-use and recycling of wastewater where cost effective**;

iv) **facilitate water trading** between and **within the urban** and rural **sector**s;

v) encourage innovation in water supply sourcing, treatment, storage and discharge; and

vi) **achieve improved pricing for *metropolitan* water (consistent with paragraph 66i) to 66iv).**

It is considered that ESCOSA should be considering water recycling in terms of the first term of reference of its inquiry.

THE PRICING OF RECYCLED WATER

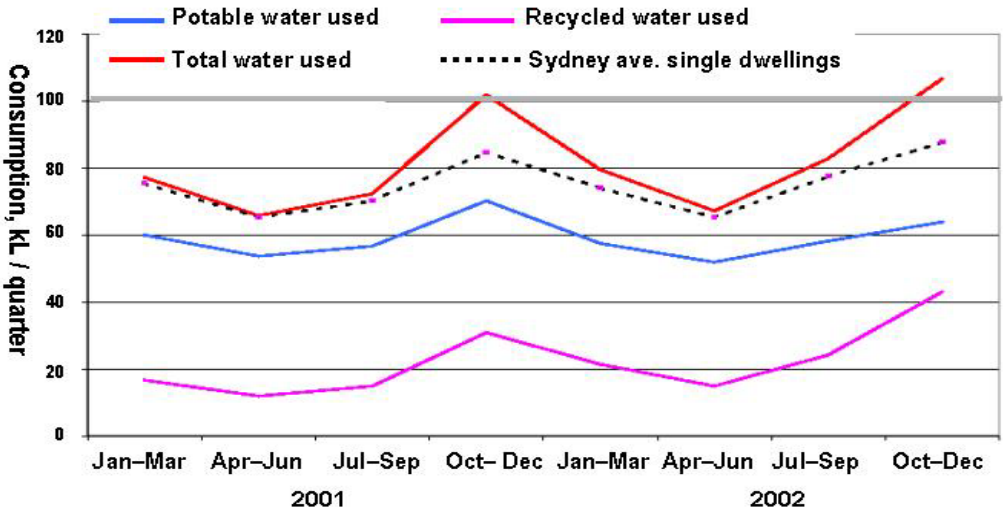
The specific pricing of recycled water is not considered in the Transparency Statement. Currently, recycled water is supplied without charge by SA Water in a number of locations, notably at Class A to Water Reticulation Services Virginia from the Bolivar Wastewater Treatment DAFF plant, and at Class B/C to the Willunga Basin Water Company from the Christies Beach Wastewater Treatment Plant. There are clearly different levels of capital involved in the provision of these two recycled water sources.

Water Reticulation Services Virginia then sell the water at end of pipeline for various contractual prices between 7 and 12c/Kl. I understand that the pipeline infrastructure was partly capitalised by the State and Commonwealth governments.

The Willunga Basin Water Company, whose shareholders paid for the entire infrastructure cost of the scheme, sells its water at 53c/Kl.

Recycled water will be supplied in the near future for retail consumers at Mawson Lakes, also from the Bolivar DAFF Plant. The price at which it is supplied will influence the efficiency with which it will be used, and the extent to which consumers will be prepared to conserve drinking water. Recent experience with price-setting by NSW IPART which priced recycled water at 28c/Kl at Rouse Hill, and 83c/Kl at Olympic Park/Newington had the net result of Rouse Hill residents using more water in total (drinking + recycled) than the average for Sydney residential allotment.

Figure 26 Monthly Rouse Hill single dwelling water use compared with Sydney single dwellings, (de Rooy and Engelbrecht 2003)



(de Rooy, E. and Engelbrecht, E. (2003). Experience with residential water recycling at Rouse Hill. CD-ROM, Water Recycling Australia, 2nd National Conference 1-3 September, 2003 Brisbane. Australian Water Association, Sydney.)

The market response to the low recycled water price at Rouse Hill resulted in a perverse response to the CoAG principle of efficient resource pricing. **The outcome also**

indicates that consumption can be influenced by price, whatever the water source, and that price-setting should take account of the need for efficiency of resource use.

POLICY ISSUES

There is a range of general policy issues that impact on the pricing of recycled water. These are encompassed in an extract from "Water Recycling in Australia", attached as Annex 1. A full copy of the review is being forwarded under separate cover, and can be accessed also electronically on the Academy's website at http://www.atse.org.au/index.php?sectionid=597

PERCENT OF WATER RECYCLED

Table 31 on page 105 of the Transparency Statement gives the following figures for wastewater collected that is treated and actually used "in the water business itself or for a business supplied by the water business":-

Table 31: Percent of Water Recycled

	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03
Water Corporation	4.9	4.4	11.4	15.9	15.1	19.2
Brisbane Water	n.a.	1.5	2.0	2.0	5.7	10.9
SA Water	4.0	5.0	4.6	4.6	5.5	7.3
City West Water	0.8	3.2	3.2	2.9	3.8	4.1
South East Water	0.4	0.4	0.7	2.6	5.0	3.5
Yarra Valley Water	4.0	2.4	2.2	4.5	3.9	3.5
Hunter Water	2.4	2.4	2.0	1.9	2.2	2.6
Average all WSAA companies	**1.2**	**1.1**	**1.4**	**1.9**	**1.9**	**2.4**

These figures are not congruent with the figures published in the Academy Review as a result of consultations with state agencies throughout Australia. These established that over 500 sewage treatment plants recycle some or all of their treated effluent, details being given on pages 187-198 of the Review.

The summary information by states given in the tables in the Academy Review is as follows:-

Table 2 Annual water reuse from water utility STPs in Australia, 1996-9 and 2001-2
(Data from Radcliffe, J. (2003). An overview of water recycling in Australia – Results from the recent ATSE study. CD-ROM, Water Recycling Australia, 2nd National Conference 1-3 September, 2003 Brisbane. Australian Water Association, Sydney)

Region	1996-9			2001-2		
	Effluent, GL/yr	Reuse, GL/yr	%	Effluent, GL/yr	Reuse, GL/yr	%
QLD	328*	38*	11.6	339‡	38‡	11.2
NSW	548†	40.1†	7.3	694	61.5	8.9
ACT	31*	0.25*	0.8	30	1.7	5.6
VIC	367	16.9	4.6	448	30.1	6.7
TAS	43	1	2.3	65	6.2	9.5
SA	91*	9*	9.9	101	15.2	15.1
WA	109	5.5	6.1	126	12.7	10.0
NT	21*	1*	4.8	21	1.1	5.2
Aust.	**1538**	**112.9**	**7.3**	**1824**	**166.5**	**9.1**

†1996 *1998 ‡Subject to revision

Figures for the capital cities were:-

Table 3 Recycled water use in State capital cities expressed as a percentage of sewage effluent treated, 2001-2

State Capital	% recycled water use
SYDNEY	2.3
MELBOURNE	2.0
BRISBANE	6.0
ADELAIDE	11.1
PERTH	3.3
HOBART	0.1

These figures have since been updated for presentation at a conference to be held at the University of Wollongong 14-17 February 2005, as follows:-

Table 1 Recycled water use as a percentage of sewage effluent treated, and future water consumption and recycling targets of capital cities
(From J.C. Radcliffe, *The Future Directions for Water Recycling in Australia*, International Conference - Integrated Concepts in Water Recycling – Wollongong, February 14-17 2005)

State Capital	% recycled water use 2001-2 *	% recycled water use 2004 **	Future recycling targets [3, 10, 13]
SYDNEY	2.3	2.6	35% reduction in per capita consumption by 2011
MELBOURNE	2.0	14	15% reduction in water consumption, 20% wastewater recycling by 2010
BRISBANE	6.0	3.5	Increase recycling to 17% by 2010
ADELAIDE	11.1	19.2	30000 ML/yr (33%) recycling, 2025
PERTH	3.3	4.1	20% recycling by 2012
HOBART	0.1	negligible	10% reduction in water consumption

* J.C. Radcliffe, Water Recycling in Australia. Australian Academy of Technological Sciences and Engineering, Melbourne, 2004, 233pp http://www.atse.org.au/index.php?sectionid=597

** S. Phillips, A glass half empty? *Waste management and Environment* 15 (10) (2004) 34-37

Without going through all the anomalies, it is suggested that the figures given for South Australia in the Transparency Statement are underestimated. Those from other states may have been over-estimated where treated water returned back into the treatment plant is counted as "recycling". **Whatever the details, it should be anticipated that there will be an increase in the market for recycled water and it should be encompassed within the ESCOSA inquiry.**

COMPETITION – WATER SUPPLY

The Transparency Report does not discuss the fact that there are developing alternative suppliers to SA Water for the provision of water. The Corporation of the City of Salisbury is harvesting storm water, treating it to an acceptable standard for recycled use by industry, and it is being marketed to GH Michell and Sons Pty Ltd for wool scouring, and to Holden Ltd for the motor industry. I understand that some of this water is likely to be made available to Mawson Lakes for amenity use.

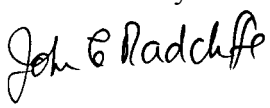
There are some interesting legal ramifications regarding the Salisbury scheme with respect to title to the water, whether it resides with the Council or the State, particularly where it may be temporarily stored by aquifer storage and recovery (ASR), requiring agreement with the Northern Adelaide Plains and Barossa Catchment Water Management Board. This issue may be outside your terms of reference.

COMPETITION – WASTEWATER SERVICES

The Transparency Review makes no mention of the possibility of competition for the provision of wastewater services. Whilst I am not aware that this is an immediate prospect in South Australia, the issue by the National Competition Council (NCC) in August 2004 of a draft recommendation[α] on the application by Services Sydney Pty Ltd for a declaration of sewage transmission and interconnection services provided by Sydney Water, and its subsequent recommendation to NSW Premier Carr who must "declare" the services within 60 days or choose to do nothing, has introduced a completely new aspect into the potential for water recycling in Australia. This could open sewage services to retail competition in a similar way to that in which electricity, water, railway and urban public transport services have been opened up to competition in recent years. **Competition in the provision of wastewater services is a matter that ESCOSA may ultimately need to consider.**

I hope these comment may be useful to your deliberations.

Yours sincerely



(Dr John C Radcliffe AM FTSE)

Forwarded under separate cover:- J.C. Radcliffe, Water Recycling in Australia. Australian Academy of Technological Sciences and Engineering, Melbourne, 2004, 233pp

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[α] National Competition Council, Application by Services Sydney for Declaration of Sewage Transmission and Interconnection Services provided by Sydney Water – Draft recommendation. NCC, Melbourne, 12 August 2004 http://www.ncc.gov.au/pdf/DRAFT%20RECOMMENDATION-SERVICES%20SYDNEY.pdf

ANNEX 1

Extract from:-
J.C. Radcliffe, *Water Recycling in Australia*. Australian Academy of Technological Sciences and Engineering, Melbourne, 2004, 233pp

5.4 Costing and Pricing (pages 146-154)

There is currently great variability in pricing of water in Australia, including recycled water. Examples are given of current prices in Table 21.

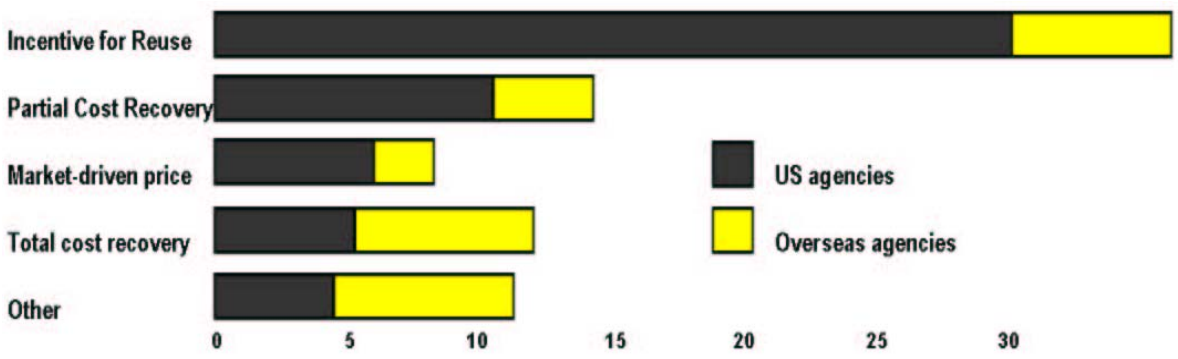
Table 21 Location, use, and price of water from Australian recycling projects, together with price of two drinking waters for human consumption in 2003.

Location	Use	Class	Price, /kL	Reference
RECYCLED WATER				
Northern Adelaide Plains, SA*	Irrigated horticulture/vegetables	A	7-15c	Ringham (2003)
Sydney – Rouse Hill, NSW	Residential supply for toilets, home gardens, washing	A	28c	Sydney Water and IPART (2003)
Geelong, Victoria†	Various agricultural and horticultural irrigation uses	C	35-58c	Byrnes (2004)
Springfield, Qld.,	Residential supply for toilets, home gardens	A	43c	Hall (2003)
Southern Vales, SA*,	Vineyard irrigation	B/C	53c	Templeman (2003)
Olympic Park/Newington, NSW,	Public facilities and Residential supply for toilets, gardens, washing	A	83c	Listowski (2003), IPART (2003)
DRINKING WATER				
Sydney Water Corporation Drinking water	Human consumption (reticulated bulk supply)	-	98c	IPART (2003)
Ride citrus/mandarin sports water	Human consumption (in 500 mL bottles)	-	$6,600.00	*Choice*, Jan/Feb 2004, p27-29

*** Marketed to users by pipeline company – water obtained without charge from water treatment agency. All other cases, water marketed by water treatment agency.**
† Schemes use private infrastructure for transfer of recycled water.

Worldwide, prices do not generally reflect the recovery of the full costs of amortised capital and operating costs (Mantovani *et al.* 2001). Furthermore, the environmental costs are not taken into account either. Mantovani *et al.* (2001) illustrated from their survey the principal rational for determining the price at which water would be sold (Figure 62).

Figure 62 Principal rationale for price determination (n=79) (redrawn from Mantovani *et al.* 2001)



Mantovani *et al.* (2001) found that of 29 water agencies that provided responses on what they charged for recycled water *vis à vis* the potable water price: -

- Five US and 2 international agencies charged >75% of the potable price
- Two US and 3 international agencies charged 50-75% of the potable price,
- Two US and 3 international agencies charges 25-50% of the potable price, and
- Five US and 7 international agencies charges <25% of the potable price

Early new users may need additional incentives to get the project started. In an Australian example, the first participants in the Northern Adelaide Plains Scheme involving recycled water being delivered from the Bolivar STP by Water Reticulation Services Virginia were signed up for water in the winter season at 7 c/kL, and in summer at 12 c/kL. The property locations of those signing up determined the most economical layout of the delivery system. Other growers, finding a pipe passing their door, then sought to access the supply, but are now charged a higher delivery price for recycled water to offset their opportunistic accessing of a pipeline system designed to serve the original participants.

Only 12 of 79 respondents sought to recover their costs. The reasons why the prices of recycled water were cross-subsidised by other components of the water business were stated to be: -

- Avoiding potable water capital costs by using recycled water to meet new or growing water demands (Luggage Point, Brisbane (Q), is a good Australian example),
- Avoiding costs to treat and dispose of large quantities of effluent (Christies Beach STP - Southern Vales (SA) pipeline),
- Availability of government financial assistance for water reuse (Australian NHT Coasts and Clean Seas Program),
- Local policy objectives

A variety of issues need to be taken into account.

If the price is set too low, users are likely to regard recycled water as an unlimited resource and use it in a profligate manner, as has occurred at Rouse Hill. On the other hand, if the price is set close to the price of potable water, customers with some insecurity about using recycled water will use potable water for all purposes "to be on the safe side".

- **Regulators and water agencies, in defining pricing strategies for potable water and recycled water, must carefully consider any perverse incentives and how price differentials may affect water-user attitudes.**

In a drought environment in which there were restrictions on the potable supply, users might even be prepared to pay more than the potable price to ensure continuity of supply.

This highlights the importance of actually establishing the size of the likely market for recycled water before commencing the project. Unless use is made mandatory, to get commitment the water agency will inevitably have to quote a supply price to attract firm customers. Mantovani *et al.* (2001) found that only 27 of 62 recycled water respondents

had actually conducted a market survey before initiating the project. Some of the remainder has less than ten customers and felt that a market survey was unnecessary.

- **Recycled water projects must not be initiated without establishing the market for the recycled water produced.**

Mills and Asano (1998) have identified sixteen components that need to be considered in surveying the potential market for recycled water. These are listed below, with parenthetic comments illustrating Australian experience or potential issues to address.

1. Specific potential uses of recycled water,
   (The objective of developing the market needs to be clearly defined – is it driven by the recognition that there are very limited water supplies to support new development [for example, the Gold Coast Pimpama-Coomera investigation], is it primarily to encourage savings by substituting for potable water use [the Illawarra Wastewater Strategy to replace potable water at Bluescope Steel], is it primarily driven as a disposal to land project with opportunities to encourage economic development [Werribee – Balliang], is it an environmental improvement project [Tasmanian local government schemes], or is there a risk of developing projects in the hope that a market will appear from somewhere?)

2. Location of users,
   (Piping infrastructure and pumping are major costs impacting on the economics of a scheme. Distribution costs are in proportion to the user markets. Proximity of the Northern Adelaide Plains vegetable growers to the Bolivar STP has been an encouraging component of that scheme, whereas finding markets adjacent to plants in Launceston and Hobart is likely to be difficult.),

3. Recent historical and future quantity needs (because fluctuations in water demands, at least three years' past use data should be collected),
   (The impact of industry adjustment and technological change has had a significant impact, for example, on Hunter Water's ability to maintain markets)

4. Timing of needs (seasonal, daily and hourly water demand variations),
   (Industrial markets are much more regular in their demands than seasonal irrigation markets, and more nearly match the relatively even supply of sewage effluent provided storm surges can be minimised.)

5. Water quality needs
   (Water quality should be fit for its intended purpose, though it may well ultimately be more economical to generate all the water to advanced Class A to provide greater diversity of market opportunity if no major "lead market" is evident.)

6. Water pressure needs

   (Recycled water in South Australia is supplied by the Virginia Water Reticulation Services to growers unpressurised, with growers then having to install their own storage, pumping and distribution system, whereas the Willunga Basin Pipeline Company supplies recycled water pressurised to growers who maintain only a filtration and distribution system, but their water price is higher, albeit also because the scheme was totally funded without external grants and subsidies.)

7. Reliability needs – how susceptible is user to supply interruptions,

   (Better continuity of supply resulted in Gladstone (Q) industries moving to recycled water in the recent drought, demonstrating the potential importance of recycled water to critical industrial processes. Slightly more flexibility may be possible for irrigation users, particularly amenity users, and in that part of the growing season where there is adequate natural rainfall – for example, Virginia Water Reticulation Services requires all growers to have sufficient storage capacity for supplying three days demand in the absence of continuity of supply so that plant maintenance can be undertaken. Supplying peak demands to meet the expectation of dual supply markets may present difficulties– the Rouse Hill community in hot weather already consumes recycled water derived from 77% of peak sewage inflows to the Rouse Hill STP.)

8. To what extent is the user likely to want to dispose of residual recycled water after use,

   (An incentive for potential industrial users of the developing Kwinana Water Recycling Project in Perth is the ability to discharge surplus water and industrial effluents [subject to Trade Waste requirements] into the Cape Peron outfall.)

9. Identification of on-site treatment or plumbing retrofit needed to accept recycled water,

   (These issues and their costs were a significant component of developing the stormwater recycling schemes by the Salisbury Council in Adelaide for Michells, Holdens etc. Research showed that while it may not yet become necessary, Michells could establish an in-house wetland-based treatment program following their industrial use of the recycled stormwater. Where the customer faces significant retrofit costs, there may be attraction in a discounted cost for the first couple of years as an incentive to access a recycling scheme. Where recycled supply is being offered to existing potable water-using industries which will need retrofitting, the most economical approach is to target a small number of potentially large consumers close to the recycling plant.)

10. Internal capital investment and operating and maintenance costs for on-site facilities to accept recycled water,

    (Where there is a combined market of agricultural users who can accept lower quality recycled water, and specific industrial users who demand a higher quality water, it may be more attractive for the water authority to

recycle to a base standard, with those users with specialised needs purchasing recycled water relatively inexpensively and installing their own additional treatment plant. The contrast may be noted between the BP-Amoco Refinery at Luggage Point, where Brisbane Water prepared a recycled water of very high standard for its principal customer, with the Eraring Power station in Newcastle which accepts a lower quality recycled water from Hunter Water and provides additional treatment "in-house" to meet its needs for water very low in Total Soluble Salts.)

11. Needed monetary savings on recycled water to recover site costs or the desired pay-back period and rate of return on capital,

    (This issue in Australia has revolved around considerations of private and public benefit, and the extent to which environmental costs and benefits, which may be difficult to quantify, affect the equation. This then can influence the extent of grant funding, such as from the NHT Coasts and Clean Seas Program, which may be invested.)

12. Present source of water, who supplies, and at what cost?

    (Although Australia has in recent years separated the water resource management and supply functions, they have remained within government, even in the case of Adelaide where the service functions are subcontracted from the SA Government's SA Water Corporation to the private sector. This allows governments to maintain an effective integrated policy overview of water and wastewater services, in contrast to much of North America where the water supply and sewage treatment/recycling services may be provided by unrelated private sector companies leading to greater regulatory difficulties (Mantovani *et al.* 2001). There have been examples where a wastewater district implementing a recycling program was sued by a local water district on the basis that the availability of recycled water in the community caused a drop in potable water sales, reducing the revenue to support the loan commitments made to establish the potable water supply infrastructure (Mills and Asano 1996). But are we also likely to see competing suppliers, for example in South Australia between Salisbury Council and SA Water Corporation, which could have a similar effect on capital management? Are the costs of potable supply any more near to the true costs of supply than the recycled sources?)

13. When would user be willing to start taking recycled water?

    (Is attraction to use recycled water going to need financial incentives [eg Rouse Hill], and can the level of incentive be correctly judged? Alternatively, is the market influenced by there being no alternative source of supply [eg Kwinana Industrial Area]?)

14. Future land use trends that could eliminate recycled water use, such as conversion of farm lands to urban development

    (This is a potential problem for many schemes, particularly where the plants are close to the edge of cities. Werribee, Victoria, is an example of an area now undergoing rapid development. There may be scope to plan an orderly evolution of the use of recycled water from land-based agricultural use to industrial use.)

15. For developing user projects, when would access be required, and what is the current status and schedule for the development?

    (It has previously been highlighted that many overseas projects have over-estimated the likely market demand. Examples in Australia include the establishment of an industrial precinct with reticulated recycled water at Springfield by Ipswich Water, but yet to attract industrial uptake.

16. After informing user of potential project conditions, a preliminary indication of the willingness of the user to accept recycled water.

    (Accurate forecasts of the recycled water market are necessary to avoid unrealistic cost-recover projections for new projects (Mantovani *et al.* 2001). An example where this will be important is the ambitious scheme by Sydney Water to seek to market from 2008, up to 100ML/day of recycled water from the 53km Glenfield-Liverpool-Malabar pipeline, with potential markets identified for about half the flow.)

Currently, there is also great variability in the costing of recycled water in Australia. Examples are given in Table 22.

Table 22 Estimated costs of producing recycled water from various sources

Location	Use	Class	Price /kL	Reference
Parafield, SA	GH Michell & Sons Australia Pty Ltd, woolscouring	Stormwater	30c (operating cost only)	Pitman, 2003
Springfield, Q	Amenity, schools, oval, residential	A	$1.45	Consultant – (Hall 2003)
Olympic Park/Newington, NSW	Public facilities and Residential supply for toilets, gardens, washing	A	$1.60 (operating cost only)	Listowski 2003
Melbourne	Integrated hydrological system, residential development	A	$2.50	Private sector development consultant, pers. comm.
Melbourne – Eastern STP	Integrated amenity and residential use	A	>$3.00	GHD 2002a
Rouse Hill NSW	Residential supply for toilets, home gardens, washing	A	$3-00 to $4-00 Initially, $7-00	de Rooy & Engelbrecht 2003, de Rooy 2003

Costing and pricing mechanisms of recycled water are not transparent. It is likely that neither the true cost of potable nor recycled water is reflected in current prices. In the case of a number of recycling schemes, the treated water is provided by the water treatment authority without charge for distribution to recycled water users, so the distributing company is only required to service the capital and operating costs of the distribution system. A lack of integration in potable water, sewage, stormwater and groundwater resource management can result in irrational use of resources and failure of market forces. Externalities such as impacts on the environment are generally not costed. (Externalities are the costs or benefits that impact society but are not included in the market price of a good or service - pollution is an example of a negative externality, education is an example of a positive externality benefit when members of society other

than students benefit from a more educated population. Externality is one type of market failure that causes inefficiency.) CoAG principles now allow for externalities to be built into water prices, though the NCC has made only limited incursions into examining the progress states are making with externalities.

- **The cost of externalities should to be built into drinking water, sewage treatment and recycled water prices as provided for under the CoAG water reform principles.**

Often the cost of capital has not been accounted for in determining recycled water costs or prices. There has been dependence on grants to cover the shortfall between willingness to ask users to pay and the actual costs of a project.

Such grants become *de facto* provisions for externalities, notably through the Coasts and Clean Seas Program that had been instrumental in establishing several coastal STP reuse projects in the 1990s, but which went into recess in 2002.

The gap between recycled water costs and alternative supplies can be very project specific, but costs can be something like $25/ML for water from a channel or river versus $400 to $800/ML to distribute recycled water. Potable water is typically retailed at $300 to $700/ML. Hence while including externalities in the price of alternatives to recycled water will result in price increases, it is unlikely that the gap will be easily closed (SKM 2002).

A disincentive for adoption of recycled water with dual supply systems by developers has been the custom to impose a charge component representative of the capital invested in the water resources facilities ('headworks charges'), but with no reduction in the size of this charge when up to half of the water in a development may be derived from a recycling source rather than all from potable reservoirs.

- **'Headwork charges' imposed by water agencies for provision of water supplies to new subdivisions should relate to the nature of the supply systems being adopted and to the proportionate use being made of the 'headworks' in the total water supply system rather than being applied as a flat charge.**

An interesting example is that of the Bolivar STP in Adelaide. It has been estimated that about 4 000 Ha of seagrass has been destroyed in consequence of effluent discharges from STPs into St Vincent Gulf. Costanza *et al.* (1997) have estimated the value of seagrass to be $US 19,004/Ha/year, putting the value of the benefits forgone at $US 76m (say $A100m at early 2004 exchange rates). Though it is perhaps 'drawing a long bow', this figure may be compared with the $55 million of capital invested in the Bolivar DAFF plant and the Virginia reticulation scheme to reduce nutrient discharges to St Vincent Gulf via the outfall channel (Ledger 2003).

There are inconsistencies between governments in the management and regulation of their water resources and water services. An integrated water cycle management anomaly

has been evident in the National Water Reform Agenda, which examines the effectiveness and efficiency of Australia's water and wastewater services, but excluded recycled water from its considerations (Campbell 2003). This anomaly was amended in 2003.

The States' Regulators' Forum has given little attention to water. Some states, including Victoria, South Australia and Western Australia have had no effective price regulation (Owens 2003), and the Western Australian regulator was unable to access objective financial data (Parry 2003). The Victorian Essential Services Commission is assuming a role of water pricing regulator from 2004, while a new Economic Regulation Authority has been set in place in Western Australia.

- **Industry regulators should have an obligation to examine costs and prices as well as service standards, but should also review water prices from a perspective of total water cycle management.**

There can be a conflict of interest within government with regard to water management, flowing through into pricing strategies. Water resource managers may be seeking to restrain per capita consumption by increasing the cost of water in two or multi-tiered pricing structures beyond a certain threshold level of consumption. (Aggressive leak detection programs to restrain total water use can be helpful there too.) However, state-owned water utilities can have an obligation to maximise returns to their principal shareholder, the state governments, with one option for achievement being through selling more water. A movement into recycled water may undercut revenue streams from more profitable potable water sales. The extent of the dividend from SA Water to the South Australian Treasury after tax of 119% in 1998-9 and 124% in 1999-2000, subsequently drew unfavourable comment from the National Competition Council (NCC 2001).

- **Governments must resolve at whole-of-government level the conflicts of interest that may be extant at portfolio level in environmental management, resource provision, revenue generation and water pricing objectives.**

The evidence from North America, where water supply management agencies have in some areas been allowed to develop independently of wastewater management agencies, often serving areas that are not concomitant, is that the approach has led to inefficient use of the water resources from a total water cycle perspective.

- **Any separation of responsibilities for the ultimate management of water and wastewater resources as has developed in USA, should be discouraged in Australia.**

As well as identifying a market for recycled water, it is essential that those wishing to access the newly found availability of recycled water for processes, particularly

agricultural production, have addressed the market demand for the additional produce so generated. This is a potentially important component of such schemes as the Werribee – Balliang pipeline scheme. Horticulture Australia Ltd, the R&D arm of the horticulture industry, and Land and Water Australia are currently exploring the scope for increased horticultural production from the potential availability of additional recycled water (Chapman 2003; LWA 2003).

There is a risk that a potentially large reuse projects initiated with economic development as a primary driver, for example increased horticulture, if not tied to a reduction in potable water demand, will offer little in net resource and environmental benefits. Water conservation, demand management and reuse opportunities need to be considered together in the development of pricing policies and investment decisions.

A view has been expressed that any water can be made safely potable if strained through enough money.