Community Water Forum – 12 August 2006

Water: "The Big Picture"

Economics of Water Tanks

The cost for water from water tanks is estimated to be $1.67/kL, substantially less than the anticipated costs of desalination of $3.50/kL (in 2006 dollars). The community would be better off with water tanks than with desalination, provided water tanks are able to meet future water demand.

Over a 10 year period and taking interest payments into account, a householder would expect to face an additional one-off cost of $36 in total by installing a water tank compared to taking all water from the reticulation system. There would be further savings in the remaining 40 years life of the water tank.

If the water authority funded the upfront cost of $2250 for purchase and installation of a water tank, the householder could pay off the loan at $330/year (in dollars of the day). After expected savings in reticulated water charges of $148/year, the net annual cost to the householder would be $182/year.

Economics of Water Tanks

Preamble

This paper sets out to answer a number of questions in regard to options for meeting present and future water demand on the Central Coast:

- what are the relative costs of augmenting supply between desalination or water tanks?
- for householders who install a water tank, how do the expenditures compare to the savings from reduced water rates?
- what level of subsidy might be considered by the community to householders to encourage them to put in a water tank?

Question 1: the relative costs of desalination vs water tanks

Question 1 relates to making the 'best' use of community resources, and ignores issues about who will pay for water supply which are deferred to question 2 and question 3 below. The assessment for question 1 is a form of cost benefit analysis or CBA, and it is referred to as social CBA since it considers the community as a whole (rather than an individual or an organisation).

It is common practice in CBA to ignore the effects of inflation and conduct the analysis in *constant dollars*, This approach is adopted for question 1. All financial amounts are expressed in 2006 dollars.

This report does not set out to determine what level of augmentation of water supply will be sufficient to provide assurance that the community's future water needs will be met to a satisfactory level. Instead the analysis is based on estimates of supply requirements that have been provided to us.

Equivalence between desalination and water supply

It is assumed that to supply the equivalent of 1 ML/day would need 4500 water tanks of 3000 litre capacity. In other words, one water tank saves 81 kL of water per year.

Water tanks

The following assumptions are made:

- life of water tank - 50 years
- cost of purchase and installation of a water tank - $2250 (including cost of pump)
- replacement of pump – every 10 years
- cost of pump replacement - $250.

If a loan at a 5% interest rate (*real*) were taken out to pay for the initial cost plus the cost of pump replacement every 10 years, the annual payments to pay off the loan over the 50 years life of the tank come to $135. As explained before, the $135 payment each year is expressed in constant dollars. To be consistent, the interest rate of 5% is expressed in *real*

terms (ignoring inflation). Since the water tank saves 81 kL per year for an annualized cost of $135, the cost of water is $1.67 per litre (in 2006 dollars).

Desalination

The mobile desalination plants are reported to have a capacity of between 1 and 3 ML/day (*Central Coast Express Advocate*, 16 June 2006: page 1). The same article indicated that the upfront cost for a plant is $400,000 and that ongoing costs (including lease payments) come to $1.35 M per year.

In terms of the annual costs alone, for a throughput of 1 ML/day, the cost of water from desalination is $3.70/kL and for 1.5 ML/day the cost is $2.47/kL.

To determine the cost per kilolitre associated with the upfront cost of $400,000 we again assume that a loan at 5% real interest rate is taken out at the time the desalination plant is commissioned. The additional cost per kL depends on the timeframe over which the loan is to be repaid. For a throughput of 1.5 ML/day, the upfront cost adds 9 cents per kL if the plant is operated for 10 years and 4 cents per kL for 50 years. All of these amounts are expressed in 2006 dollars (without inflation and at a real 5% interest rate)

In the 19-30 July 2006 issue of the *Australian* newspaper (*Inquirer*: page 25), David Cathers of Wyong Council was quoted as saying that each desalination plant would supply 1ML of water per day at a cost of $3.50/kL.

Assessment

Clearly, the cost of water from water tanks is substantially less than the cost of water from desalination. For the range of assumptions above, the difference can be in excess of a factor of 2.

The conclusion from the above analysis is that the community would be better off by installing sufficient water tanks rather than going for the desalination option. In other words, it would be in the best interests of the community (possibly through the water authority) to provide incentives to householders to put in sufficient water tanks to avoid the need for desalination.

It should be noted that the above analysis has ignored the differences between 'water' as supplied from tanks and from a desalination plant. Firstly, water from tanks is not suitable for potable use. Secondly, water tanks cannot provide the same level of water supply security as desalination, where water supply security is 100% for all practical purposes.

On the other hand, the operation of desalination plants generates a number of environmental impacts that have not been assessed here.

Question 2: the net costs faced by the owner of a water tank

Question 2 relates to the impacts on a householder who elects to install a water tank. The impacts will obviously vary across householders depending on water use patterns. The

analysis here is for 'typical' water usage, though it is likely that people who choose to install a water tank may tend to have higher than average expected savings in their water bills (as well as heightened awareness of environmental considerations).

Since we are here considering the impacts on an individual, it is more appropriate to conduct the analysis in terms of dollars of the day. After all, when a householder pays a water bill in the future, the payment by definition will be in the (inflated) dollars for that year.

It is then also necessary for consistency to use a *nominal* interest rate that incorporates inflation. The interest rates quoted by banks or other financial institutions are always in nominal terms. The nominal rate is approximately equal to the real interest rate plus inflation. In fact for a real interest rate of 5% and assumed inflation of 2.5%, the nominal rate is 7.6%.

It is also sensible to take a timeframe shorter than the 50 year life of a water tank which is outside the time horizon for most people. The analysis described here uses a 10 year timeframe.

Water usage charges

The NSW Government Independent Pricing and Regulatory Tribunal (IPaRT) has made the following determination for price path of water supply usage charges on the central coast:

- $1.12/kL from 1/7/2006 to 30/6/2007;
- $1.33/kL from 1/7/2007 to 30/6/2008; and
- $1.57/kL from 1/7/2008 to 30/6/2009.

All of these usage charge rates are subject to inflation. In view of the rapid rise in the usage charge for the three years of the price path, it has been assumed that there will be further increases over and above inflation after June 2009. The annual increase has been assumed to be 3% real (equivalent to 5.6% nominal) so that in year 10 the usage charge is $1.87/kL expressed in 2006 dollars or $2.34/kL in 2016 dollars.

Comparison: water tanks vs reticulated supply

The variation in water usage rates across the 10 years prevents a direct comparison on a year-by-year basis of costs to the householder between the with tank and without tank situations. To get around this problem, we imagine that the householder takes out a loan to pay for the 81 kL/year of water provided by the tank for the with and without water tank situation, as described below.

In the situation where a householder installs a tank, the loan would need to pay for the supply of 81 kL/year of water where the annual cost of the water is estimated at $135 (in 2006 dollars) as derived for question 1. At a nominal interest rate of 7.6% over 10 years the loan principal is computed to be $1044.

If the householder did not install a tank, he would need to obtain the 81 kL/year from reticulated supply. The size of the loan is computed to be $1008.

The conclusion is that over the 10 years analysis period, there is a small financial cost associated with putting in a water tank. The additional cost of the 'loan' when worked out over 10 years is $36 ($1044 minus $1008) for water obtained from a tank compared to water taken from the reticulation system.

Question 3: incentives for installation of water tanks

A major hurdle in the way of greater adoption of water tanks is that, regardless of how attractive over time it may be for the householder to install a water tank, it is still necessary to meet the upfront cost. Many householders may be reluctant, or find it difficult, to spend $2250 on a water tank.

For practical purposes, question 2 shows there is very little difference in the cost of water between water tanks and town water supply taken over 10 years. This is perhaps, at first sight, a surprising finding given that at the end of this period the estimated savings in reduced water bills ($1008) is less than half the initial installation cost of $2250. At the end of the 10 years, it appears that the water tank has left the householder well behind financially in comparison to the alternative of continuing to source all his water from the water authority.

This ignores the fact that the water tank has a life of 50 years. At the end of year 10, the householder has another 40 years of savings on his water bill to look forward to. During those 40 years, the outstanding amount will be wiped off plus some further gain. However, as indicated earlier, 50 years is an unrealistically long time horizon for most people, and so we consider how assistance could be provided to get over this hurdle.

Providing assistance for installation of water tanks

Various forms of assistance could be considered to encourage people to install water tanks. We analyse a straightforward example where the community (through the water authority) pays for the purchase and installation of the water tank (assumed to be $2250) and then recoups this amount over 10 years. If we consider the upfront payment for installation of the tank of $2250 as a loan, the annual payment to pay off the loan in 10 years is $330 (in dollars of the day).

The actual reduction in the water bill due to the water savings from the water tank will vary as the usage charge increases over the 10 years as outlined above in the IPaRT price path and assumed further rises. If for the purpose of this analysis we make the reduction in the water bill the same each year (so that is resembles annual repayment of the $1008 'loan'), then the annual reduction in water rates is computed to be $148.

Thus for each of the 10 years, the householder has a net cost of $182 ($330 minus $148). Under this assistance model, he pays nothing at the start when the tank is installed and after 10 years he has a water tank with a further 40 years of life to generate further reductions in water bills.

Further assistance

It should be noted that we do not have a sense of the response by householders to such a scheme where the upfront costs for a water tank are met by the water authority and are paid back over 10 years. If the take-up is insufficient (or not rapid enough) to meet water demand, then it may be that the level of assistance could be made more attractive. After all, based on the $3.50/kL for desalination as set out in Question 1, the water authority could afford to pay a subsidy for people to install water tanks and still leave the water usage charge below charge in the case of desalination (assuming full cost recovery)

For example, the water from the four desalination plants is anticipated to provide approximately 10% of total supply. Under the assumptions for question 2, the annualised cost up to year 10 from the existing water supply infrastructure is $1.61/kL (in 2006 dollars). If desalination plants are installed (with water costing $3.50/kL), then the new usage charge will rise to $1.80/kL.

In the situation with water tanks (assuming the costs are spread over all water customers, there is only a modest increase in water usage rates and after rounding these remain at $1.61/kL. Because the rise in water rates as computed here is so small, it has been ignored in the analysis presented above.

While there are equity arguments regarding preferential treatment for householders who install water tanks, paying a subsidy for tanks may still result in lower water rates for <u>all</u> customers if the outcome is that the desalination option can be avoided.

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