14. WATER LOSS REDUCTION FOR WATER SUPPLY PUBLIC RETICULATION

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Corporate Plan Output: Water Supply	

The purpose of this report is to update progress with the programme to reduce the unaccounted for water from the city's pipework from 20% unaccounted to 15% unaccounted over five year period, to discuss international trends in this area and suggest targets and funding requirements for the future.

BACKGROUND

Councillors may recall that in 1994 concern was expressed that the Council was expending considerable effort encouraging private property owners to modify their water usage patterns to reduce consumption (and thus delay the time when alternative water sources will need to be developed), but that the Council did not appear to be doing much to reduce water losses from the publicly owned reticulation. As a result funds where allocated to determine the amount of unaccounted for water, and then from 1995/96 funds have been provided to reduce unaccounted for water from the estimated 20% to 15% by June 2001. (Note these funds relate to initiatives concerning losses to Council owned/controlled pipes and not residential pipework.)

Firstly, it is important to stress that unaccounted for water is not all leakage from pipes, but also includes water for fire fighting (and training), flushing of pipes, illegal unknown connections, meters stopped or reading inaccurately, emptying reservoirs for maintenance, water sold in bulk from hydrants, as well as the water lost through leakage from pipes, reservoirs and similar.

Establishing the true unaccounted for water in any water supply system is difficult. In 1994 the UK Water Research Council publication on the subject was used as the methodology to establish the 20% figure, and to recalculate the % in subsequent years to determine progress. About then the UK experienced a severe drought and water shortage. As a result the regulatory body in the UK Office for Water (OFWAT) imposed maximum water loss rates on the UK water companies, and this prompted a considerable amount of further research into the subject, including more precise and comparable performance indicators, methods to establish the losses, and means to systematically reduce losses. Mr Allan Lambert was heavily involved in this UK work, and latterly has been similarly involved in producing International Standards for water losses. Much of this work is only now being completed and published. Mr Lambert was recently in New Zealand and the opportunity was taken for him to peer review the Council's work to date, and to bring staff up to date on the work that he has been involved with.

AUDIT AND RESULTS TO DATE

Mr Lambert has confirmed that the methodology originally used in 1995 was inline with the then recognised best practice for doing so. Using this methodology and despite the endeavours of the last five years, the unaccounted for water is unlikely to be at the target 15% by June 2001. A likely figure is 18%. One of the reasons that the figure is high is that at the same time that the programme has been running, the total water demand has varied up and down from year to year (50.5 million cubic metres in 1995/96, 46.4 million in 1999/00). If the total demand for these two years had remained the same, the % of unaccounted for water would be now close to 17%. The reduction in unaccounted for water does translate into 1.5 million cubic metres per year less water being abstracted from the aquifers. This is a very significant amount.

As well as endeavouring to reduce the amount of unaccounted for water the programme has been very successful as a tool to survey the total water supply system over a five-year period and thus a greater understanding of the infrastructure and the customers connected to the system. Examples include:

- Valves open when they should be shut, and vice versa.
- Cross connection on private premises with the potential to cause contamination.
- Backflow potential issues.
- Premises with unmetered connections
- Premises with illegal second connections.
- Wastage of water.
- Condition of parts of the infrastructure
- Identifying work and improvements

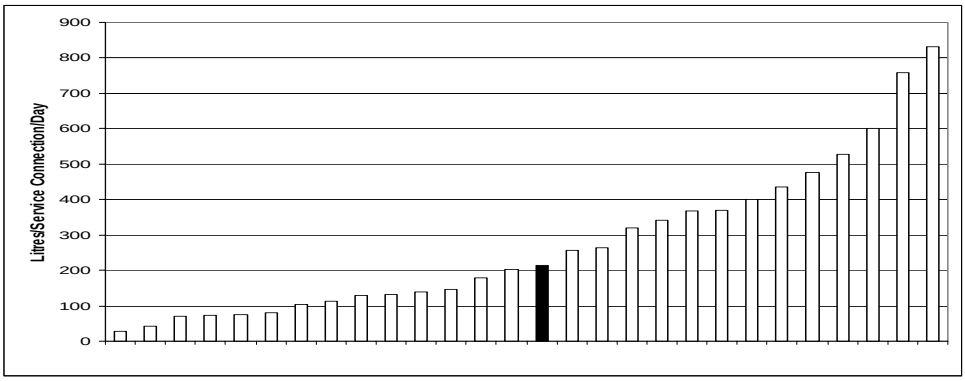
While the apparent reduction in unaccounted for water is disappointing, Mr Lambert has pointed out that this is fairly typical when authorities commence these programmes. Also the UK and International experience strongly indicate that the performance indicators (e.g. % of total water) of 10 years ago are not reasonable in that the "goal posts" tend to be always shifting as external factors change. Also the indicators used make a fair comparison between water supply authorities virtually impossible.

ANOTHER COMPARISON.

Recent research has revealed the following (in hindsight) reasonably obvious findings:

- The amount of water legitimately used by a community varies considerably between communities in the same country (e.g. Auckland consumption per capita is different to Christchurch), and between countries (e.g. New Zealand, Japan, UK). Thus Indicators using % of total water is not a good comparison.
- A % Indicator for unaccounted for water, even within the same authority, can be quite misleading. For example, an effective separate campaign to reduce legitimate consumer consumption demand by a %, and a Water loss reduction programme achieving the same % savings can result in the unaccounted for water % remaining the same. Also drought or wet summers can alter the % without anything else changing.
- Larger leaks on water pipes generally become very obvious on the land surface quickly and thus get reported and repaired.
- The majority of "invisible" unreported leaks (those that a water loss reduction programme is typically trying to locate and attend to) are on small pipes.
- Leaks with a flow of less than 300 litres per hour are virtually impossible to locate utilising present electronic technology, unless the pipe is physically dug up and exposed.
- The majority of the small undetectable leaks are on the pipe and fittings associated with the customers connection (meter, stopcock etc).

For these reasons the Indicator now recommended for unaccounted for water is "Litres of Water per Connection per Day". Using this Indicator Alan Lambert is able to compare Christchurch's water supply system with a large number of other systems around the world, including two others in New Zealand (Waitakere and Auckland). The chart shows Christchurch's system to be in good condition, especially when considering the amount of effort most of the authorities with lower figures are applying to achieve theirs. This is especially so considering that the high cost of treating and distributing water elsewhere gives a direct economic, as well as environmental, incentive to reduce losses. Christchurch's incentive to reduce water is virtually environmental alone.



Comparison of Christchurch City Council for year 99/00 Real Losses in Litres/Service Conn./day with IWA International Data Set of 27 Systems from 19 countries.

WHERE TO FROM HERE?

The amount of unaccounted for water in a system is primarily a function of the following four factors:

- The condition of the Infrastructure. (Increasing renewals etc will generally reduce losses)
- The speed or response to repair reported leaks.
- The system operating pressure. (The higher the pressure the more water that escapes from the same sized hole.)

- The effort being expended to track down leaks that are not obvious on the surface.

Mr Lambert's assessment is that Christchurch's infrastructure is in good condition (a good renewal programme, and reported leaks per connection etc as expected). Our response time to attend to leaks as they appear is also good.

He also states in his report the present level of water loss management is reasonable given the present cost of supplying water. But he makes the point that increasing the effort further in future years will be able to be justified, as increasing effort is required to avoid over stressing the aquifer system or having to develop alternative water sources.

System operating pressures in Christchurch are higher than many other cities. This is partially due to the older parts of the system being designed and constructed when energy costs were not a serious consideration, and partially due to Christchurch's desire for summer irrigation to achieve its garden city appearance. Lowering system pressures in the high pressure Central and Riccarton zones is possible but would require a significant amount of capital expenditure and would likely meet with public resistance. There is already some disquiet with the medium pressures used in the north-west districts. Pipe networks however absorb a significant amount of friction pressure at periods of high demand (e.g. summer irrigation) pushing large volumes of water through the pipes to the individual household taps. At periods of low demand (e.g. winter, and in the middle of the night) when total demand and flow velocities are low, this friction is not absorbed and thus the pressure at the household tap is higher than normal. Pump control technology now allows pump output pressure (pump speed) to be varied to achieve a constant pressure at household taps whether the total network demand is high or low. By avoiding these rises in pressures, water loss from pipes can be reduced and less energy used.

The Riccarton Pumping Station is currently being renewed, and this presents a good opportunity to provide the capability to vary supply pressure at virtually no extra cost. Riccarton is a small high pressure zone that is ideal to trial the effects of reducing pressure during periods of low demand (e.g. at night and/or winter).

Tracking down leaks that are not apparent on the surface is where the thrust of the water loss reduction programme has been targeted for the last five years. By June this year the total city water infrastructure would have been surveyed and good base data obtained as to minimum night flows. This varies for each sector surveyed but on average is 200 litres per connection per day. Bearing in mind that only leaks greater than 300 litres per hour can be detected, the best that has been achieved (worldwide) to date is about 50 litres per connection per day. Achieving these low amounts involves very vigorous programmes that include reducing operating pressure. Without reducing operating pressures the best Christchurch is likely to achieve is about 100 litres per connection per day. Thus the realistic options for Christchurch in this area for the immediate future appear to be:

	Target: Lit/Con./day	**Cost per annum for five years**	**Cost per annum thereafter to maintain**	**Pumping Savings per annum once target achieved**	**Net cost per annum once target achieved**
1.	100	$450,000	$450,000	$150,000	$300,000
2.	150 proposed	$200,000	$150,000	$75,000	$75,000
3.*	200 current	$80,000	$80,000	nil	$80,000
4.	300	$40,000	$40,000	- $100,000	$140,000
	no target	**nil**	**nil**	**- $100,000**	**$100,000**

* Note: Budget provision in present annual plan is $172,000 (similar provision in draft 2001/02 plan). As in the table 80,000 is sufficient to maintain current unaccounted water loss at this current 200 litres/con/day.

Only the last option (totally cease this work) would negate the possibility of investigating and trialing reducing operating pressures at periods of low water demand in parallel to the leak reduction work.

WATER CONSERVATION CONTEXT

Environment Canterbury's "Water in the Balance" discussion document highlighted the connection between minimum flows in the Avon and Heathcote Rivers and groundwater use. Environment Canterbury are planning to produce a draft Water Chapter of their Natural Resources Regional Plan by June 2001, although the City Council has submitted that this time frame appeared unrealistic to deal with all the issues involved concerning the Christchurch West-Melton aquifer system. Considering the issues as they been presented to date, the likely strategy for the city is for long-term city-wide conservation measures in addition to seeking alternative groundwater sources for the Halswell and Wigram growth areas.

Managing water loss is an attractive method of conservation because there is no inconvenience to customers. It is also important that the Council is seen to be "getting its own house in order" before

expecting its customers to make the effort. Cost benefit analyses suggest it is one of the more economic methods of reducing the city's groundwater take. It would therefore be prudent to put a

moderate effort into further reducing unaccounted-for water. The amount of effort could be reviewed as part of a comprehensive demand management strategy after the draft Water Chapter of Environment Canterbury's Natural Resources Regional Plan has been considered.

CONCLUSION

Taking into account all of the matters discussed in this report it is considered that in the meantime it would be sensible to aim for the incremental improvement in unaccounted water loss indicated by option 2, i.e. a reduction from current 200 litres/con/day to 150 litres/con/day.

SUMMARY

In terms of water loss from the public water supply systems, Christchurch rates fairly well compared with other cities around the world. Various options for an ongoing water loss reduction programme have been reviewed and an increase in this activity combined with and some increased funding is recommended.

Recommendation:

1. That the information be received.

2. That monitoring and survey work for water loss reduction be undertaken in the future to reduce the unaccounted for water indicator from the present 200 litres per connection per day to 150 litres per connection per day. Funding for this to be provided at $200,000 per annum, compared with the present $170,000 per annum.

3. That investigation and trialing of the practicality, public acceptance, economics and effectiveness of reducing system operating pressures in order to reduce unaccounted for water be undertaken.

4. That the performance targets for unaccounted for water be reviewed as part of a comprehensive demand management strategy once the impact of the proposed Water Chapter of the Natural Resources Regional Plan has been evaluated.

Chairman's Recommendation: That the above recommendation be adopted.