



TE106/6

Demand Management through Water Retrofit Projects

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About This Report

Title

Demand Management through Water Retrofit Programmes

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Abstract

This paper considers the breadth and scope of demand management water conservation/retrofit initiatives taking place within and across New Zealand. It shows that, at present, there is very little effective or comprehensive strategic activity in this area, and that few councils have identified and implemented programmes to significantly reduce annual water consumption per capita at the household level. The research also identifies the imperatives for reduction of water consumption in New Zealand and details some of the initiatives being used in other countries including those facing more immediately obvious and pressing water scarcity and supply issues. In particular, most cities in Australia have now identified significant reduction targets for annual water consumption per capita and have initiated a broad range of measures and programmes to reduce water consumption. Impressive water savings from the Sydney programme are highlighted.

Reference

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Contents

| | | |
|-----|---|----|
| 1 | Executive Summary | 4 |
| 2 | Introduction..... | 7 |
| 3 | Research Material Sources | 11 |
| 4 | Results | 12 |
| 4.1 | Summary of Local Government Water Saving Initiatives in New Zealand | 12 |
| 4.2 | Waitakere’s Ecowise Water Survey..... | 17 |
| 4.3 | Kapiti District Council..... | 18 |
| 4.4 | Tauranga City Council..... | 19 |
| 4.5 | New Zealand Government Water Programmes | 20 |
| 4.6 | The Sydney Water Experience | 21 |
| 4.7 | End Use Monitoring..... | 22 |
| 5 | Recommendations..... | 24 |
| 6 | Conclusions | 25 |
| 7 | References..... | 27 |
| | APPENDIX 1: Waitakere City Council’s Water Wiseup Survey Results | 28 |
| | APPENDIX 2: Results from the Sydney Water Demand Management Programme | 35 |
| | APPENDIX 3: Privatisation and Conservation in New Zealand | 39 |
| | APPENDIX 4: Least Cost Planning and Integrated Resource Planning | 41 |
| | APPENDIX 5: Demand Management Measures | 43 |
| | APPENDIX 6: Water Savings from Seattle | 46 |

Tables

| | | |
|---------|--|----|
| Table 1 | Summary of Water Retrofit Initiatives by Local and Regional Councils | 16 |
|---------|--|----|

1 Executive Summary

The focus of this research was to establish the scope and level of demand management work being undertaken by local and central government in New Zealand to reduce water consumption at a domestic level through the use of water retrofitting programmes. It was found that, while a number of councils face water scarcity and supply issues, there has been little attempt to use strategic programmes and well-implemented demand management methods at a residential scale, to act as a means of addressing anticipated longer-term water scarcity issues.

In New Zealand, only Waitakere City and Kapiti City Councils have comprehensive and ongoing long-term programmes to reduce water consumption per capita with relatively significant resources allocated to ensuring the programme is successful. Waitakere Council's target is a 25% reduction in per capita water use by 2025. This compares very favourably against the regional target set by the Auckland water authorities which is presently only a 5% reduction per capita by 2024¹. Kapiti has established a target of reducing their present water consumption levels of 600l/pc/pd down to 400l/pc/pd over the medium term using a number of innovative and progressive water conservation methods.

Neither Waitakere nor Kapiti's targets are unrealistic or without precedent. In Sydney and Melbourne, for example, even more aggressive targets have been set. The Sydney Water Conservation and Recycling Implementation Report has a goal for the region of a 35% saving per capita against a 1991 baseline², a figure which if achieved will provide a saving of 145 billion litres of water per year by 2015 (this is close to 20 million litres more water than Auckland consumes in total annually) (see also section 3.5.1)³. Significant Federal Government resources are provided to run the programme and ensure its success.

North Shore City Council and Tauranga City Council are other councils that have invested resources into water conservation programmes although North Shore City Council has been mostly focused on storm water amelioration rather than supply and demand management. Findings and research from overseas highlight the benefits of well thought through and implemented water conservation programmes that integrate supply side management with demand management targets.

■ ¹ *Watercare Services Limited, 2004. "From the Sky to the Sea – the Auckland Water Management Plan".*

² *Of note Sydney's water use per capita is relatively high. The baseline target is 506 l/pc/pd.*

³ *Sydney Water, 2006. Water Conservation & Recycling Implementation Report 2005-06*

Other findings from the report include:

- Well implemented demand side water management programmes offer New Zealand local governments' significant financial, environmental, social and cultural benefits. That these benefits are not well understood is evidenced by their lack of use nationally.
- Most New Zealand councils lack clearly defined per capita water use targets and few have
- There appears to be a lack of imperative with respect to water efficiency in New Zealand, perhaps due to a perception of the resource being relatively abundant. The price of water is also relatively low, even for high volume users.
- There is a lack of consensus or even discussion as to how much water is enough per capita in the New Zealand context and the establishment of national targets would provide an important benchmarking tool for water resource managers.
- Demand side management programmes for water conservation are relatively new and still evolving locally. At present there is a lack of empirical local data documenting actual savings through before/after programmes. However, there are a number of easy to implement initiatives which are known to significantly reduce water consumption, even if it is as yet unclear exactly how much.
- Australia has significantly more advanced water conservation programmes and there is an opportunity for New Zealand to leverage off their experience.
- The installation of water metering coupled with water pricing based on actual use as opposed to a fixed annual fee within annual rates, drives almost immediate and substantial savings in water consumption at a household level and appears to drive longer-term behavioural change.⁴
- Direct user charging for water in areas where it has not yet been implemented remains contentious - due possibly to its status as a “necessity” as opposed to a “luxury” resource and New Zealanders' historic access rights to water as a free good. As such, political opposition to water pricing is a major obstacle for many councils wanting to meter and price the resource according to use. The passing of national legislation requiring mandatory water metering and charging might address this.
- In some cases councils have a disincentive to conserve water as profits generated from throughput are used to fund significant capital investment made to provide water infrastructure.
- Further monitoring of end users' behaviour with respect to water use is required to be able to offer more cost effective and targeted demand management and supply side programmes.
- There are equity issues with respect to the pricing of water. Securing affordable supply to lower-economic socio groups without under-pricing the resource needs to be carefully considered and is an important policy issue

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⁴ See for example: *Nelson City Council, 2006. Water Supply Asset Management Plan 2006 – 2008, p26.*

- The decision to privatise water supply operations, whether through Council Controlled Organisations (CCO's) or Public Private Partnerships (PPP) as has happened in many places may be an impediment to achieving water efficiency savings targets. Nationally legislated targets for reducing water consumption per capita would be the most effective way to achieve a level that could be considered ambitious.

2 Introduction

Beacon Pathway is a research consortium, established in May 2004, with the aim of encouraging and improving New Zealand's sustainability in the residential built environment. In accordance with Beacon's goal of achieving a high standard of sustainability in 90% of New Zealand homes by 2012, the organisation has created the following water demand target:

- 90% of homes reduce demand for reticulated water by 40% per capita and council supply to domestic uses is reduced by 50% per capita by 2012; and
- Use of water within dwellings is appropriate for the quality and use.

This research contributes towards the development of strategies to achieve this target.

The underlying premise of Beacon's water research work is that water supply and water resource management will become a major issue for New Zealand resource managers during the course of this century and that water use efficiency is a key element in any effort to improve the sustainability of New Zealand's housing stock.

There are a number of reasons for a growing imperative in New Zealand but some of the key drivers include:

- A combination of increasing and competing demands for water resources at the same time as the resource is becoming increasingly scarce. This is especially so in some areas of the country where drought has been a continual and ongoing problem in recent years.
- Internationally water scarcity is becoming an area of serious concern so, relatively, New Zealand has abundant resources while being located in one of the most water deprived regions in the world.
- The effects of climate change and the likelihood of more variable and extreme climatic events over the course of this century which are likely to have unknown and unprecedented repercussions.

Collectively these and other trends will ensure that the days of profligate and free water use in the New Zealand context will, and indeed in many places already has, come to an end.

At present New Zealand still enjoys relatively abundant water resources in many areas and perhaps it is tempting to view water scarcity as being a future issue and that our focus should be on more immediately pressing issues. However, as our neighbours across the Tasman and many other countries are discovering, climatic conditions and their consequences can change quickly. The opportunity currently exists for New Zealand to develop a more resilient and sustainable system for the delivery and use of water resources, but only if we address the issues.

The shift to such a system requires a wide range of investment and strategic decisions made over time. Priorities also need to be set. For example, if existing per capita water use trends in Auckland are not significantly reduced over the next 15 years, then in roughly 20 years the city Introduction is likely to require an additional piped supply from outside the regional catchment i.e. further supply from the Waikato River. If, however, investment in demand management programmes was made over that time there is a high likelihood that future investment in an additional pipeline could be significantly delayed if not made altogether unnecessary. Those demand management programmes would include wide spread installation of rainwater tanks and low flow water efficient appliances, coupled with a campaign to change people's behaviours and attitudes towards the value of water. This lower-cost/lower use approach has the potential to deliver a huge range of sustainability benefits across the triple bottom line – but requires a long-term planning approach to be most effective. It is too late to arrive at that point a few years out from meeting capacity supply as was the case in the early nineties when, following the Auckland region drought, the decision to pursue a costly pipeline option was made. The same applies to the treatment and disposal of wastewater.

Water is a finite resource and, in many places around the country, our existing water infrastructures are being stretched to meet the demands of a growing population and economy. This, coupled with significant under-investment in water infrastructure in recent decades, has seen local government water budgets coming under pressure. The need for significant capital expenditure across the country has also arguably driving a period of reflection as to how we can deliver water services more efficiently – at least in some regions.

According to the Ministry of Health, a total of 300 l/pc/pd is required (Ministry of Health, 2004⁵). However analysis of typical water use shows that only 5 litres of that water need be biologically and chemically safe and 105 litres of biologically safe water would provide a daily shower. In effect this means that New Zealanders in the year 2007 still flush their toilets and wash their clothes with high quality drinking water (BRANZ, 2006)⁶.

Around 85% of New Zealand's population receives water, wastewater and storm water services from local authorities. Local authority water and wastewater infrastructures are valued at approximately \$7.5 billion with around \$600 million spent on operational costs each year. It has been estimated that around \$5 billion of investment will be required over the next 20 years to upgrade water, wastewater and storm water infrastructure⁷. This figure could well be a low estimate.

⁵ *Quoted in: Heinrich, Matthias. 2006. 'Residential Water End Use Literature Survey'. BRANZ study Report 149.*

⁶ *Ibid.*

⁷ *Parliamentary Commissioner for the Environment, (2000). "Ageing Pipes and Murky Waters – Urban Water System issues for the 21st Century*

Reducing water use also reduces the likelihood of non-point source pollution – an important issue with respect to the declining water quality in New Zealand both in residential and rural areas. The Environmental Protection Agency in the United States has identified that using less water can reduce:

- On-site disposal system failures
- Polluted run-off from irrigated agricultural and urban lands
- The need for additional reservoir capacity and associated habitat alterations
- Surface water withdrawals or diversions that result in degraded habitat and wetlands.⁸

When taking all the above factors together, it isn't difficult to see why demand management should become a key component of any strategy to address water supply and scarcity issues. In New Zealand, efforts to date to restrain or reduce water use have largely been targeted at affecting small behavioural changes at the peak of summer when supply is most scarce. Programmes to lower water consumption by reducing actual demand through the use of ubiquitous water metering and charging, retrofit programmes, promoting more efficient water use technologies, or targeting the water use behaviours of end-users, have in most cases been limited and piecemeal, and not a well integrated component of water use conservation strategies.

Internationally, Seattle in the United States can be seen as a leader in what a sustainable three waters approach can achieve. Appendix 6 shows a graph that illustrates the city's population growth per capita and the level of water saved c/pp over the same 30 year period.⁹ The Seattle Public Utilities and partners' Ten Year Conservation Program Plan identifies:

“Conservation is an economically and environmentally responsible way to accommodate competing demands for drinking water to meet long-term population growth.... as a proven water resource, conservation has demonstrated reliable savings that are expected to continue over the next 20 years.”¹⁰

In New Zealand, the legislative environment is such that social and cultural values must also play an integral part in any decisions relating to water system management issues that local governments make.

The central focus of this research was to establish the scope and level of demand management work being undertaken by local and central government in New Zealand to reduce water consumption at a domestic level through the use of water retrofitting programmes. It was found that, while a number of councils face water scarcity and supply issues, there has generally been

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⁸ *From “Regional Approaches to Efficient Water Uses: Tales from the Trenches”, EPA.*

⁹ *City of Seattle, 2001. “Ten Year Conservation Plan”.*

¹⁰ *City of Seattle, 2001. “Ten Year Conservation Plan”. See also Appendix 6 for Seattle's impressive water savings.*

little attempt to use strategic programmes and well-implemented conservation methods at a residential scale to work as a means for addressing longer-term water scarcity issues.

Many New Zealanders have a perception that, at least in New Zealand, water is an abundant resource. Internationally, over the course of this century, water is going to become an increasingly valuable resource which, if properly managed, could provide the country with a significant economic edge. However, continuing profligate use will not enable the full value of our relatively abundant water resources to be realised.

What is demand management?

Demand management measures aim to minimise either the overall or peak demand for water (or energy or other resource). Measures can be categorised as shown below.

Increase system efficiency: No change in resource usage by consumers but less system losses. Examples: leakage detection and repair; change in system operations such as pressure reduction and changes to mains flushing and reservoir cleaning; installing peak balancing capacity.

Increase end use efficiency: Less resource used by the consumer to provide the same service. Examples: Regulating for AAA rated shower heads and dual flush toilets in new developments; enforce minimum performance standards on new appliances (dishwashing machines, clothes washing machines); offering financial incentives for water efficient purchase and installation; programmes to retrofit efficient equipment into existing buildings.

Promoting distributed sources of supply: Provide services via a locally sourced resource not currently being used. Examples: encouraging household rainwater tanks and greywater reuse systems; provide recycled effluent for non-potable uses via dual reticulation.

Substitute resource use: Provide same service without use of the resource in question. Examples: Planting indigenous plants adapted to local rainfall; use of waterless sanitation.

Improve the market in resource usage: Inform the consumer about the full costs of their resource use. Examples: full cost recovery charges for water use; volume-based pricing set at or above the long run marginal cost; providing better feedback on the level and cost of ongoing water usage by universal metering with at least quarterly billing or smart metering with instant feedback; remove perverse incentive for increased resource use such as declining block tariffs; provide comprehensive information on the environmental impacts of water use, run education campaigns; conduct detailed water use analysis (audits) for water customers in key sectors.

Reference: from “Designing Cost Effective Water Demand Management Programs in Australia”, by S.B White and S.A. Fane, 2001.

3 Research Material Sources

Beacon approached councils with large stocks of residential housing (where change is needed if Beacon's sustainability goals are to be met) and also those councils for whom there was some reason to believe that work in the water conservation area had been undertaken. The work was undertaken between December and January in 2006/07. Subsequent research may expand the survey to additional councils. Following are the councils approached for information:

- Auckland City Council
- Canterbury Regional Council
- Kapiti Coast District Council
- Manukau City Council
- Nelson City Council
- North Shore City Council
- Queenstown Lakes District Council
- Rodney District Council
- Tauranga District Council
- Waitakere City Council
- Wellington City Council
- Wellington Regional Council

An overview and summary of the extent of programmes in the jurisdictions for each of these councils is provided in section 3.1.1 of this report below.

Beacon also contacted the Ministry for the Environment in Wellington and CSIRO in Australia for the purposes of this report and conducted a literature survey.

4 Results

4.1 Summary of Local Government Water Saving Initiatives in New Zealand

The table below provides a summary of the programmes and initiatives being run by some of the local governments across the country. The information was gathered through a combination of personal interviews with water asset managers or similar, as well as through a review of councils' strategic documents or pages posted on websites or otherwise provided.

| Council | Extent of Water Retrofit initiatives |
|---------------------------|---|
| Auckland City Council | Targeting a 5% per capita reduction in water use out to 2024 (as per region-wide Sky to Sea strategy). Water infrastructure and supply managed and provided by Metrowater, a 100% owned council controlled organisation. General conservation messages provided on the web produces brochures and publicity material. Minimal demand management strategy. Metrowater say they are preparing a more comprehensive demand management strategy at present. |
| Christchurch City Council | No water conservation measures, every household metered. No charge for water use. Top 20% of water users are sent letters to assess if their high usage is to do with a leak. No follow up programmes. Charging for water avoided as considered too political. Meter reading contracted out. |

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| <p>Kapiti Coast District Council</p> | <p>Long term (50 year) water strategy in place with defined water consumption targets (though daily per capita usage allowances are generous). Range of water conservation programmes in place with moves to introduce individual house metering by 2008/09. Considering move to water use charges (political challenges). Annual budget of approx \$70,000 p/a assigned for water conservation measures. Annual outdoor garden show sponsored by council – demonstrates garden plantings and techniques for reducing water demand in dry weather with a focus on plants/irrigation/garden-design/climate. The council pays for use of free “green plumber” for fixing and replacing washers and advice to households (approximately 5,000 homes visited to date), fitted roughly 3,500 gizmos to toilets (made available on request). High per capita water consumption in Kapiti at average 600 l/c/pd– attributed to the high number of elderly/gardening culture/sandy soils – aim to reduce to 400 l/c/pd. Future growth in the district taking place within traditionally rural zoned land which now residential – have restricted supply to 1000L of potable water per day (no outdoor uses allowed). Use of grey water, rain water or bore water required for outdoor uses. The installation of rain tanks on these properties is also now mandatory.</p> |
| <p>Manukau City Council</p> | <p>No long-term water saving strategy other than the targets set by the Sky to the Sea strategy. The Council website provides some water savings tips.</p> |
| <p>Nelson City Council</p> | <p>Has a Water Supply Asset Management Plan which provides some water saving advice but is not made widely available to the public. All water connections are now metered – adopted in 1996 – and have been in operation since 1999. Council estimates that adoption of metering has reduced summer period peak flows by over 25%. Apart from during the dry season however, the Council has no intention to further reduce water use as it has recently invested \$26 million in a water treatment plant and requires throughput at present chargeable levels to cover its investment. No programmes or plans to reduce water consumption over the long-term.</p> |

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| <p>North Shore City Council</p> | <p>Long-term city-wide water reduction target of 5% (Sky to Sea region wide target). Has developed its own long term management plan for managing the resource. All houses metered. Council provides gizmos to households on request. Council also offers \$500 grants to households for installation of a rainwater tank that is plumbed for at least two indoor uses as well as outdoor use (20 grants per year). Website provides an interactive water calculator to show a particular household's water consumption. Some minimal water conservation advice is given on the website as well as a breakdown of figures showing typical water consumption within a household. Average daily per capita use in the North Shore is a relatively efficient 180 litres. Although not targeted at the supply side of water management, North Shore City is widely recognised as leading the way in storm water management techniques with plans to make the installation of water tanks mandatory for the upcoming residential development at Long Bay.</p> |
| <p>Papakura</p> | <p>Papakura's water supply services are contracted to United Water, a multinational water supply company that also services Wellington City. United does not have a long-term water conservation strategy or water conservation retrofit programmes. Website provides a link to a booklet detailing how customers can save water. Papakura, like Metrowater, also charges for wastewater.</p> |
| <p>Queenstown Lakes District Council</p> | <p>Council has prepared a technical document "Water Supply Asset Management Plan", which sets a target of 25% reduction in water use per capita (but Council no longer targeting this). Leak reduction programme by surveying 5% of network annually, no metering other than on rural lifestyle blocks, considering ways of encouraging grey water use, letters sent out to high users. Rural lifestyle properties have access to 3100 litres per day. No budget for water conservation, no education work, water charging being considered for next year 2008.</p> |
| <p>Rodney District Council</p> | <p>Has a water services strategy that identifies a policy of reducing demand through investigating water conservation devices and rainwater tank, also encourages recycling and reuse of stormwater and treated wastewater where appropriate. As with North Shore City, the Council also offers a water tank rebate scheme of \$500 per home and payment of any consent costs associated with plumbing the tank into the house - this would be \$1000 per applicant (20 homes per year are eligible). 30% of households in Rodney are on private supply.</p> |

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| Tauranga District Council | <p>All houses metered. Employs a full time water conservation adviser on top of which spends around \$80,000 p/a on water retrofit/conservation initiatives. Two main water conservation programmes, the Schools Programme and the Waterline Programme. Schools Programme consists of five 45 minute classes looking at water conservation, including demonstrating a number of ways to save water and a homework exercise to measure shower flows. Waterline Programme includes a free tap washer service and demonstration how to change; also approximately 4000 gizmos fitted in 9 years for single flush toilets (identified that plumbers were taking them out so precaution about educating plumbers important), showers checked and in some instances a flow restrictor or aerators fitted. Waterline also includes public talks to business and service clubs, and runs water conservation messages via advertisements in newspapers and council publicity. Water metering and charging introduced four years ago. Water use per capita presently at about 200 litres per person. Council website offers fairly substantial array of water conservation information including a break down of how water costs occur around the home.</p> |
| Waitakere City Council | <p>Allocates around \$900,000 per annum to run its Water Demand Management Programme. Has set a target of 25% reduction in water use in l/pc to 2025. Programme includes a range of initiatives and suggestions targeted at reducing residential water use include: large diameter rain tanks (mandatory for new properties, subsidised for retrofits), dual flush toilets (subsidised for retrofit), efficient washing machines (subsidised for retrofit), a retrofit package which includes showerhead, aerator, gizmo, audit and leak repair (council subsidy for retrofit), low volume shower roses (mandatory for new properties). The council is also considering wastewater charging options. Other initiatives include considering providing tariff incentives (reductions) or an “Eco-tariff” to reward customers who implement demand management measures. Waitakere City estimates that, besides reducing water consumption, there is the potential to save costs of between \$2.9 and \$3 million. Savings in annual running costs due to the options being implemented are estimated to be between \$0.9 and \$1.9 million through deferral and tariff savings.</p> |
| Wellington City Council | <p>Wellington City Council offers some water saving tips on the website but has contracted supply arrangement with United Water (see Papakura above).</p> |

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| Greater Wellington Regional Council | Supplies Wellington City, Porirua, Upper and Lower Hutt with wholesale water. The Council offers a water education programme called “Take Action for Water” a four week teaching programme designed for 8 – 12 year olds. Also offers some water conservation tips and printed materials. Has no long term strategy for reducing water and no water saving targets. Is proposing to spend \$100 million on a new water plant and yet has not identified the potential for deferred costs offered by a demand management strategy. No long-term per capita water reduction strategy or long term water supply strategy. Regional Council mentions water conservation in only one paragraph of its Water Source Development Strategy of 2005. |
|-------------------------------------|---|

Table 1: Summary of Water Retrofit Initiatives by Local and Regional Councils

Local authorities and Regional Councils have a key role to play in the delivery of water infrastructure and associated services to New Zealanders. Similarly, because of the role local government’s play in the management of urban water systems in New Zealand, programmes to reduce water consumption will often be driven by local government.

As can be seen above, there are few extensive programmes being run at present. It is likely that resources to support councils to improve water efficiency will need to be provided by central government. The setting of mandatory charging and water conservation targets would also provide a much needed benchmark and imperative for councils and water resource managers to aim towards.

4.1.2 Waitakere City Council’s EcoWise Programme¹¹

Waitakere City Council first prepared a Water Demand Management Plan in 1991 outlining initiatives to reduce water consumption by 20% over a ten year time frame – or a 2% reduction per annum. In April 2005 the Council updated that initial plan with a new plan which included water consumption reduction targets out to 2025. The key elements of the plan include a key objective of the Council which is to reduce water consumption within the city by 25% per capita by 2025.

The Management Plan outlines two options for implementation for Council, the key difference between the two being that one provides a cost estimate if wastewater charging is introduced while the other does not. The two options both use rain tanks as a primary means of reducing water.

¹¹ *The information here was sourced from the Waitakere City Council’s “Water Demand Action Plan”, 2005.*

The package of initiatives targeted at residential water users include:

- Large Diameter Rain Tanks (mandatory for new properties, subsidised for retrofits)
- Dual flush toilets (subsidised for retrofit)
- Efficient washing machines (subsidised for retrofit)
- House to house survey
- A package which includes showerhead, aerator, gizmo, audit and leak repair (Council subsidy for retrofit).
- Low volume shower roses (mandatory for new properties)¹²

The effect of introducing wastewater charging is a reduction in the cost of running the programmes through the addition of an extra revenue stream and reduction in overhead cost.

Waitakere City estimates that, besides reducing water consumption, both the scenarios that they have developed will save costs of between \$2.9 and 3.0 million. Savings in annual running costs due to the options being implemented are estimated to be between \$0.9 and \$1.9 million through deferral and tariff savings.

The annual cost of funding the Water Demand Management Programme is approximately \$900,000. The Council is considering providing tariff incentives (reductions) or an 'Eco-tariff' to reward customers who implement demand management measures.

4.2 Waitakere's Ecowise Water Survey¹³

The Ecowise Waitakere Water survey provides a representative sample of nearly 10% of all Waitakere City householders' water habits. Over 5000 surveys were collected between January 2004 and July 2005 making this quite likely the most comprehensive survey of urban households' water use in the country.

According to the survey results, water use per capita in Waitakere is relatively low. Some 9.2% of people used 300 litres or more pc/pd while 19% used less than 100 litres. Six houses were using over 900 litres pc/pd.

Waitakere City Council sees other key findings as being:

- 32% of houses surveyed have dishwashers
- 64% of houses surveyed have aerators (flow restrictors) on kitchen taps
- 1/3 of houses surveyed had gizmos still in use
- Only 6% of houses surveyed used front load washing machines, with a perception that front loaders (which are far more water efficient) are more expensive to purchase
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¹² For further details about how these particular initiatives are able to reduce water consumption at the household level readers are referred to Beacon paper TE160 "Water Efficiencies – Report on Existing Technology/Expertise in New Zealand".

¹³ A full copy of the survey is provided in Appendix I.

- There was a strong interest in rain tanks, mainly for garden watering purposes
- 1/2 of surveyed houses used some form of garden watering system
- Publicity and awareness lacked in latter stages of the project – highlighting the need for continued campaigns.
- Housing New Zealand properties used 1/3 more water than the sample average (Housing New Zealand pays water rates on all its properties).

Of those who were at home at the time of calling, nearly 70% agreed to take part in the survey. However, 80% of the survey area's population were not at home at the time of calling. As such the survey largely reflects the behaviours of residents who are at home during the day; it is possible water use patterns of those who are not at home during the day could differ. That said, the survey still provides a relatively comprehensive and clear line in the sand for the Council. In total 26,837 homes were visited with 5138 surveys completed (19.2% of the total survey population).

The survey also measured shower flow rates, toilet types and flush volumes, types of washing machines being used and whether or not economy settings were used (yes in nearly 99% cases), the types of outdoor uses, location and number of leaks (see [Appendix 1](#)).

4.3 Kapiti District Council¹⁴

Kapiti District Council faces some particular water-use challenges. The combination of an elderly population, sandy soil types, and a thriving gardening culture, has led to high daily water use per capita of around 600l/pc. The council has set a target of reducing the demand on articulated supply down to 400l/pc/pd. This figure allows for 250l/pc for “essential” uses – ordinary household water activities and drinking water - and 150l/pd for “non-essential” uses such as gardening.

For residents in rural or lifestyle situations, a total water use limit of 1000 litres per household per day has been set with the use of an outdoor rainwater tank mandatory. The use of grey water is also encouraged and rebates are offered on water tanks where they are plumbed to at least two indoor uses such as for washing machines or flushing toilets.

This target and other water use targets and strategies are outlined in the Council's long-term sustainable water use strategy, a document that takes a 50 year view and which identifies and works with a key assumption that water is a finite resource requiring a significant change in mindset if a reasonable standard of sustainable management is to be achieved.

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¹⁴ *Information for this section of the report draws on personal communication and Kapiti District Council's strategic water document: “Water Matters – Kapiti Coast District Sustainable Water Use Strategy”, 2003.*

The strategy identifies demand management as being the key component to its long-term water management strategy:

“In effect, the key long term issue is that of demand management. The strategy takes the view that the community’s role, via the Council, is to support basic water needs and some lifestyle use – within the capacity of natural systems. This strategy therefore is built on the principle that a key role for community investment in water management, is to reduce demand levels in high consumption catchments.

“Supply will be secured within this framework of demand reduction. This is very different from an approach that sees demand management and water conservation as an addition to the normal focus on securing supply. The level of demand for which the community will take direct responsibility, provides for basic needs and some lifestyle activities that have been a traditional focus for some communities on the coast.”

The Council also intends to introduce individual house metering by 2008/09 along with water use charges – however there are the associated political tensions and pressures related to instigating such a policy which could as yet derail the proposal, especially in an election year.

The Council also allocates an annual budget of approx \$70,000 to water conservation measures. The main expenditure item is the annual outdoor garden show which is sponsored by the council. The show demonstrates garden plantings and techniques for reducing water use in dry weather with a focus on water efficient plants, irrigation systems, and more economical garden design that takes better account of climate factors such as dry periods.

Other initiatives include the provision of a council funded “green plumber”. The plumber visits houses on request and will fix and replace leaky washers while providing water conservation advice to households (the programme has seen approximately 5,000 homes visited to date). The initiative has also seen roughly 3,500 gizmos fitted to toilet systems to date.

4.4 Tauranga City Council

Tauranga City Council runs two main water conservation programmes. These are the Schools Programme and the Waterline Programme.

The Schools Programme is an educative programme which consists of five 45 minute classes that provide learning opportunities for students to consider water conservation measures that can be employed around the house. Students are also given homework exercises relating to water use such as measuring the flow rate for their shower at home.

The second programme, the Waterline Programme, includes a “green plumber” service which includes a complimentary tap washer service and demonstration of how to change them. When requested, the Council will also fit gizmos into toilet systems for free. To date the programme

has seen about 4000 gizmos fitted in 9 years into single flush toilets. One of the obstacles the council encountered included having plumbers unfamiliar with the devices removing them after they had been fitted. The need to educate plumbers on these devices was identified. The green plumber also checks showers and, in some instances, a flow restrictor or aerator will be fitted. Tauranga City Council employs a full time water conservation adviser, on top of which it spends around \$80K p/a on water retrofit/conservation initiatives. The city was one of the first in the country to move to water metering on all houses.

The water conservation office also makes visits to business and service clubs to discuss the importance of water conservation and provide educative advice. The council also runs water conservation messages in local newspapers and council publicity.

The Tauranga City Council website also provides a range of good water efficiency resources on its website. Water use per capita in the city is a reasonably efficient 200l/pc/pd.

4.5 New Zealand Government Water Programmes

This section provides a brief overview of the three main water programmes being run by the Ministry for the Environment. In terms of water use in New Zealand, there are a number of other agencies and Crown Research Institutes undertaking a broad range of work into water efficiency and sustainable water management (see also section 3.7.1.2).

The operational aspects of the following programmes are, for the most part, the responsibility of local government.

- 1) WELS, or Water Efficiency Labelling Standards, due to be implemented in July 2007 is a product labelling scheme designed to help New Zealanders save water. WELS involves attaching a label denoting both water efficiency and consumption to common water-consuming products; in a bid to encourage the uptake of more water-efficient products and ultimately the design and manufacture of such products.¹⁵
- 2) 'New Zealand: a valuable body of water' is a MfE campaign designed specifically to raise awareness of water issues (such as quality and quantity etc.) in the general public. The website contains links to local governments and other area-specific water programmes so that interested members of the public can learn more or participate.¹⁶
- 3) SWOPA, or the Sustainable Water Programme of Action, is a joint initiative being coordinated by both the MfE and the Ministry of Agriculture and Forestry. The prime focus has been on the rural sector, on the use of fresh water resources, and in particular how these can be better managed for future generations. The MfE says the essence of the programme is about "building new relationships and growing existing ones, especially with industry, Maori, science agencies and both rural and urban communities".¹⁷

¹⁵ www.mfe.govt.nz/issues/water/wels-scheme.html

¹⁶ see: www.4million.org.nz/water/

¹⁷ www.mfe.govt.nz/issues/water/prog-action/index.html

4.6 The Sydney Water Experience¹⁸

Australia, which is much further along the path than New Zealand in terms of implementing water use reduction programmes, shows that Federal Government intervention in the form of regulation as well as adequate funding, provided a stronger basis for reducing water consumption levels across the full spectrum of consumers and users.

There is nothing like an imperative to drive behavioural change with respect to resource use. In Australia, where increasing levels of water scarcity are fast becoming an everyday reality, regarding saved water as beneficial as an actual water resource is becoming prevalent. Sydney Water's Demand Management Strategy is widely recognised as one of the most comprehensive of its type anywhere in the world. Since 1999 Sydney Water has invested more than \$140 million in operating and capital expenditure in demand management initiatives. The water and financial savings of such investment are impressive (see appendix 2 for summaries of the programmes being run including expenditures and annual savings).

The city first started developing a Demand Management Strategy in 1995 and the programmes have grown in scale since then. However, Sydney Water says the key components have consistently been a focus on improving pricing signals, influencing stakeholders and customer behaviour, providing customer incentives (as well as education) and an active leak detection and repair programme (Sydney Water, 2005).

The 2005-06 Water Conservation and Recycling Implementation Report summarises some of the key residential achievements for the latest financial year as being:

- Sydney's water leakage reduction initiatives inspected 18,011 kilometres of mains in 2005-06 achieving savings of more than 18 billion litres of water per year
- Almost 320,000 homes have now been fitted with water savings devices under the WaterFix programme, achieving savings of more than six billion litres per year
- Almost 25,000 rainwater tank rebates have now been paid saving almost 1 billion litres of water per year
- Almost 30,000 Department of Housing homes have now been fitted with WaterFix devices, saving more than 600 million litres per year
- More than 37,000 'Do-It-Yourself' Water Saving Kits have now been distributed to residents throughout Sydney, the Illawarra and the Blue Mountains, saving more than 250 million litres per year
- More than 7,000 washing machine rebates have now been paid, saving more than 140 million litres per year
- Almost 1900 properties have participated in a programme to determine the irrigation needs of gardens – and a web-based plant selector has been developed to identify low-water using plants for the garden.

¹⁸ *This section of the report draws on: Sydney Water, 2006. Water Conservation & Recycling Implementation Report 2005-06, August 2006.*

As a result of these and other initiatives, Sydney Water's Water Conservation and Recycling activities are now saving over 40 billion litres of water per year.

The focus of programmes being run by Sydney Water can be grouped into three main areas:

- reduction of leakage from Sydney Water's distribution system
- incentive and education programmes targeting residential and business customers
- regulatory programmes targeting water efficiency in new homes and water efficient appliances and fittings (for example the New South Wales BASIX programme and appliance labelling and standards initiatives)

Independent experts engaged by the New South Wales Government estimate that these measures will save 145 billion litres of water per year by 2015 – more water than Aucklanders consume from a reticulated water supply in total in any given year.

Sydney Water's Operating Licence requires the Corporation to implement initiatives to reduce per capita demand by 35% from a 1991 baseline of 506 litres per capita per day. This target is to be met by June 2011 and is equivalent to a demand of 329 litres per capita per day.

The principal residential programmes include:

- Sydney Water's WaterFix, DIY water saving kits, rainwater tank and washing machine rebates, landscape assessment, outdoor education and water saving measures.
- A range of new pilot programmes are being trialled including a toilet retrofit programme, retrofits and DIY retrofits for business amenities and trailing of a leak detection system for large mains (See [Appendix 2](#), for highlights of the Sydney Water Programmes – note that some of these programmes reach beyond Beacon's residential focus).

The organisation says it has analysed more than 150 demand and supply options in the development of its strategy to date. Sydney Water has also implemented mandatory restrictions during summer periods which have seen significant reductions in peak demand.

4.7 End Use Monitoring

The BRANZ Ltd study report SR149 (2006) entitled "Residential Water End Use Literature Survey" outlines some of the monitoring work that BRANZ is undertaking in residential buildings.

Specifically the report provides a summary of methods that are available to measure the end use consumption of water in residential buildings. A method the organisation says it has been developing over the last couple of years – flow trace analysis monitoring – is explained within

the document. Case studies from different parts of the world and different types of monitoring equipment are also addressed.¹⁹

The paper is a part of the Water End Use and Efficiency Project (WEEP), similar to the HEEP initiative which has recently drawn to a close after ten years of energy monitoring in New Zealand households. WEEP is attempting to identify the volumes of water used in households by each type of end use²⁰. WEEP will provide the first significant end use monitoring project to be undertaken in New Zealand.

A pilot project that involved monitoring of the end uses of 13 houses in the Kapiti Coast was begun in 2006 and is providing a chance to trial the monitoring technology, and data is collected monthly.

The monitoring equipment provides a breakdown of the various end uses. To date, findings show that the highest water use has been the shower followed by washing machines then gardens²¹. Data has been collected continually over a nine month period and is checked every month. BRANZ will have a finished report on the project by the end of March or early April 2007.

¹⁹ *Heinrich, Matthias. 2006. 'Residential Water End Use Literature Survey'. BRANZ study Report 149. Branz Ltd, Judgeford, New Zealand.*

²⁰ *<http://www.branz.co.nz/branzltd/publications/pdfs/SR159.pdf>*

²¹ *Heinrich M, 2007. Personal Communication.*

5 Recommendations

While a number of possible demand management programmes and initiatives have been identified and implemented in New Zealand to date, at present there is a lack of quantitative data which might reveal the most effective demand management programmes to pursue (from both a cost and an efficiency point of view). Data from Australia or America may provide at least indicative targets in some cases but water use is, by its very nature, going to be regionally specific and, as such, monitoring needs to be undertaken locally.

Further research programmes that would assist in successfully reaching the Beacon targets for water use, and which could be undertaken almost immediately, include:

- An opportunity to work with BRANZ and Watercare Ltd to be involved in a large home water use survey in Auckland.
- An invitation to undergo water use modelling with Kapiti Council which will give Beacon the technical ability to estimate the change a water saving intervention may make to the level of reticulated water required.
- An opportunity to partner with CSIRO in a water metering project in which CSIRO would provide approximately 12 high end meters to Beacon for monitoring household water end uses in a bid to receive more explicit data from households.
- Investigate the viability of a comparison group analysis of reduction in demand for water at a residential level utilising existing Waitakere City Council data as a case study. Measure two or three different existing programmes and their relative efficacy also based on cost.^{22, 23}
- Beacon should investigate what is required for an organised study trip to Australia to see first hand demand management programmes in action and speak with water resource managers, academics and scientists about the programmes being run in Australia. Asset managers from selected councils would be invited to attend.

Other potential demand management research topics mentioned in Beacon's Water Research Strategy and relevant to demand management include:

- A consideration of the real costs of providing water including the costs associated with energy required in water supply and how those costs differ between local and reticulated supplies.

■ _____

²² *Comparison group analysis has been used to determine estimates for the impact of retrofit programmes in other instances where detailed information about households taking part in the programmes is not available. This research could complement the regressive monitoring work being undertaken by BRANZ. Assistance for this study could come from researchers who undertook a similar study in Sydney.*

²³ *Reference: Sarac, K. Denise, D. White, S. 2002. "What Are We Saving Anyway? The Results of Three Water Demand Management Programmes in NSW", Institute for Sustainable Futures, University of Technology Sydney (UTS).*

- More in-depth review of technologies, policies, regulations and incentives in Australia and the US and Canada to ensure we have captured all the ideas that work. Additionally investigate what made the implementation and uptake of those interventions acceptable and successful?
- What are the barriers to demand interventions?
- What changes are required to regulations, product availability and information to make it easier for people to adopt water efficiency?

6 Conclusions

Demand management programmes as a means to achieve more efficient water resource use and significant cost savings appear to be a poorly understood and under-utilised tool at present in New Zealand. Australian researchers believe that demand management programmes are “amongst the cheapest, least resource intensive, long lasting and beneficial options to society and the environment that can be chosen by any regional water planner.” All major cities in Australia are now utilising a wide array of demand management programmes to gain the dramatic water savings required for Australian cities to remain viable settlements into the future. So why are they not more widely used in New Zealand?

This research finds that, where demand management is being used, the programmes are largely ad hoc and not implemented as part of a comprehensive strategic water sustainability plan by councils. There is a definite lack of focus in terms of councils’ prioritising reductions in water use at a household level. Work done overseas and in Waitakere all suggests a commitment to ambitious water savings is only effective where it is implemented as part of such a broad overall strategy.

Waitakere City is probably the best example of a council with a significant budget allocated to running demand management programmes, but even this spend pales into insignificance when compared with the level of funding given to similar projects in Australia where hundreds of millions of dollars are now being spent.

In New Zealand, current water conservation through the use of demand management tools at local government level is still largely targeted at small scale publicity and “tips” – information usually buried away on council websites. Despite the reality that water is becoming an increasingly valuable resource, water charging remains a political hot potato in many parts of the country including major cities such as Christchurch and Wellington. The experience in both New Zealand and abroad is that a shift to water metering and charging affects an almost immediate leap in water savings – especially at peak times. On top of that it gives water planners access to water use data that can be used to target a range of other demand management programmes and much more effective water management.

At present then there are also few or no disincentives for high volume users. Nationally there are no set water targets and there is a wide variation in pc/pd usage across the country so that what constitutes a “water conservation” target in one region may in fact be quite a high daily use when compared to other regions.

And yet internationally the literature shows that significant and stable reductions in water consumption can be effected through the use of relatively simple water conservation methods targeted towards individual homeowners. As this report shows by implementing well constructed and adequately resourced water retrofit programmes important steps can be taken toward achieving considerably greater levels of sustainable water use across the country.

7 References

City of Seattle, 2001. “Ten Year Conservation Plan”.

Heinrich, Matthias. 2006. ‘Residential Water End Use Literature Survey’. *BRANZ Study Report 149*. Branz Ltd, Judgeford, New Zealand.

Kapiti District Council, 2003. “Water Matters – Kapiti Coast District Sustainable Water Use Strategy”, January Nelson City Council, 2006. Water Supply Asset Management Plan 2006 – 2008.

Parliamentary Commissioner for the Environment, (2000). “Ageing Pipes and Murky Waters – Urban Water System issues for the 21st Century, June 2000, Wellington.

Queenstown Lakes District Council, 2006. “Water Supply Asset Management Plan”, prepared by Rationale Limited, June 2006, accessed January 2007, source:

<http://www.qldc.govt.nz/Portal.asp?nextscreenid=201.102.101.101&categoryid=68&sessionx=9B6D5D69-09EF-433E-A405-5C8709B92BFC>.

Rodney District Council, 2005. “Water Services Strategy - An Integrated, Three-Waters Approach to Providing Water Services to the Rodney District”, July 2005.

Sarac, K. Denise, D. White, S. 2002. “What Are We Saving Anyway? The Results of Three Water Demand Management Programmes in NSW”, Institute for Sustainable Futures, University of Technology Sydney (UTS).

Sydney Water, 2006. Water Conservation & Recycling Implementation Report 2005-06, August 2006.

Turner A., White S. 2006. “Does Demand Management Work Over The Long Term? What are the Critical Success Factors?”, paper prepared for the Sustainable Water in the Urban Environment II Conference, Sippy Downs, Queensland, accessed December 2006, source: <http://www.isf.uts.edu.au/publications/pubsubyhtml#water>

Waitakere City Council, 2005. Water Demand Action Plan, prepared by Maunsell Limited on behalf of Waitakere City Council, April 2005.

Watercare Services Limited, 2004. “From the Sky to the Sea – the Auckland Water Management Plan”.

Wellington Regional Council, 2005. “Water Source Development Strategy”.

White, S. Fane, S.A. 2001. “Designing Cost Effective Water Demand Management Programs in Australia”, Institute for Sustainable Futures, University of Technology Sydney.

APPENDIX 1: Waitakere City Council's Water Wiseup Survey Results

EcoWise Waitakere Water

Water Demand Management Programme Survey Results Summary



6 March 2006

Purpose of this Report

The purpose of this report is to provide EcoMatters Environment Trust and EcoWater with an analysis of over 5000 surveys collected between January 2004 and July 2005 by the EcoMatters Water Wiseup Survey Teams. This represents nearly 10% of the total number of households in Waitakere.

1. Background

1.1 Survey Area

This survey area includes all residential streets in EcoWater's Water Billing Areas 01 (Henderson), 02 (Glen Eden), 03 (New Lynn) and 05 (Te Atatu South), 06 (Glendene-Kelston) and 07 (Sunnylands, Kaurilands).

1.2 Survey Method

The survey method is by way of a door-knock visit to each property in a street. Residents that are home either: complete the survey with the assistance of the Survey Teams, make an appointment to complete a survey at a later date, or refuse to complete a survey. A 'Sorry we missed you' card encouraging residents to complete a survey at a later date is left in the letterbox where there seems to be no-one home, or where dogs are loose on the property.

1.3 Education, Advice and Information

The survey teams have been trained to educate survey participants on general water use reduction techniques, identify high water use appliances and behaviour in the home and advise on alternatives, plus provide printed information brochures and contact details in a dedicated 'Information Pack'.

Information packs are given to every survey participant, plus, some occupiers that refuse a survey have nevertheless accepted a pack.

2. Survey Results

Analysis of just over 5,000 completed surveys is detailed below.

2.1 Status

| | |
|--------------------------|---|
| Addresses visited | 26,837 |
| Surveys completed | 5138 (19.2% of the total survey population) |
| Refused survey | 2020 (28.2% of those who were at home) |

Of those who were at home at the time of calling, nearly 70% agreed to take part in the survey. However, 80% of the survey area's population were not at home at the time of calling.

2.2 Property Type

| Dwelling Type | No Households | % |
|---------------|---------------|-------|
| House | 4430 | 86.2% |
| Flat | 657 | 12.8% |
| Apartment | 50 | 1% |

For this survey 'Flat' is defined as one unit in a single-level multi-unit dwelling, and 'Apartment' is defined as one unit in a multi-level multi-unit dwelling.

2.3 Kitchen and Bathroom

The survey allowed responses for up to 3 kitchens and bathrooms.

| | No of Households | Total In Use |
|---------------------------|------------------|---|
| Dishwasher | 1814 (36%) | 1829 – 95% of which used economy settings |
| | | |
| | No of Households | Total No of aerators |
| Aerators on kitchen taps | 3411 (66%) | 3442 |
| Aerators on bathroom taps | 1941 (38%) | 2352 |

Prevalence of dishwashers, and aerators on kitchen and bathroom taps, is directly proportional to socio-economic level. Aerators are a form of flow restrictor, typically wire mesh, factory fitted at tap outlets. They are only present on more modern or more expensive tapware. However, there was a significantly large proportion of households where kitchen taps were installed with aerators. There were a smaller proportion of households where aerators were installed in bathroom taps compared to where they were installed in kitchens. Where there were dishwashers, 95% of them were claimed to be used with economy settings, indicating a limited opportunity to reduce water use in that appliance with a targeted campaign.

2.4 Shower Flow Rate

The average shower flow rate was 7.2 litres per minute. 64% of all showers had a flow rate between 7-9 litres per minute, 6% were 10 litres or more a minute, and 30% were less than 7 litres per minute. As a shower flow rate between 7 to 9 litres per minute is considered to be a reasonable flow rate, attention needs to be focused on the small percentage of households where the flow rate is high.

| Comparison of shower flow rates | |
|---|-----|
| % with rate of 10 litres or more per minute | 6% |
| % with rate of 7-9 litres per minute | 64% |
| % with rate less than 7 litres per minute | 30% |

2.5 Toilet

The survey allowed for responses for up to 3 toilets in the house.

| Toilet type | Total number of toilet type | % of total toilet type | % homes with at least one toilet type |
|--------------------------|-----------------------------|------------------------|---------------------------------------|
| Single flush | 1964 | 31.5% | 34% |
| Dual flush (11-9 litres) | 2676 | 42.9% | 43% |
| Dual flush (6-3 litres) | 1592 | 25.5% | 23% |
| Total Toilets | 6232 | 100% | 100% |

Toilet cistern type is also indicative of socio-economic level, with smaller dual flush cisterns present in newer or renovated homes. 1724 (34%) of homes had at least one single flush toilet, with a total of 1964 amongst all those surveyed. 2220 (43%) of homes had at least one dual flush toilet (11-9 litres), whilst there were 2676 of them throughout the whole sample. 1162 (23%) of homes had at least one smaller dual flush toilet (6-3 litre), whilst there were 1592 of them in total.

2.6 Laundry

The survey allowed for responses to up to 2 laundry rooms.

| | Total number of machine | % of total machines in use | Economy settings used |
|--------------|-------------------------|----------------------------|-----------------------|
| Top loader | 4677 | 93% | 99% |
| Front loader | 340 | 7% | 100% |

97% of those surveyed had at least one washing machine. Given that front loader washing machines use only about 60% of the water that a top loader uses, it is disappointing that very few are in use. Factors include a perception that front loaders are more expensive to purchase.

An opportunity exists to develop a relationship with a front loader washing machine supplier.

2.7 Outdoor Use

| | Number of households | % of whole sample |
|--------------------------------|----------------------|-------------------|
| Garden watering - nothing | 2688 | 52% |
| Garden watering – sprinkler | 192 | 4% |
| Garden watering – hose | 1717 | 33% |
| Garden watering – watering can | 675 | 13% |
| Rain water tank used | 254 | 5% |

Respondents were able to give multiple answers, thus allowing for a total over 100%.

Rain Water Tanks are installed in only 5% of the sample, however, there is a strong demand for information about rain water collection for garden watering purposes, as well as some interest in rain water collection for use inside the home, and water recycling techniques.

2.8 Leaks

726 households (14%) had at least one leak, indicating an area which could be targeted for water savings. In those houses where there are leaks, there is an average of 2.4% leaks per house. 147 houses (2.9%) had 3 or more leaks in the house, with 1719 leaks recorded in total (out of 5137 households).

40.3% of the total recorded leaks were found in the bathroom, 31.6% in the kitchen, 21.7% in the laundry, and 3% in the toilet. 442 of all households (8.6%) had at least one leak in the bathroom and 382 households (7.4%) had at least one leak in the kitchen. 24 houses had 3 or more leaks in the bathroom. 250 houses (5%) had leaks in their laundry with a total of 373 leaks.

Only 3.4% of the total leaks (58 houses) were from outside taps. 20 houses had a hot water overflow.

| Location of leaks | % of total recorded leaks |
|--------------------|---------------------------|
| Bathroom | 40.3% |
| Kitchen | 31.6% |
| Laundry | 21.7% |
| Outside tap | 3.4% |
| Toilet | 3.0% |
| Hot water overflow | 1.2% |

| Number of leaks | % of total households surveyed |
|-----------------------------------|--------------------------------|
| At least one leak | 14% (726) |
| 3 or more leaks | 2.9% (147) |
| At least one leak in the bathroom | 8.6% (442) |
| 3 or more leaks in the bathroom | 0.5% (24) |
| At least one leak in the kitchen | 7.4% (382) |

The bathroom stands out as the area with most leaks.

2.9 Water Saving Devices

Gizmos were successfully fitted to a wide range of toilet cisterns, except for a handful (<1%) of very old cisterns that utilise a lever-type flush mechanism. 3,365 gizmos have been fitted in 2,860 homes (56% of those surveyed), potentially producing the largest and most immediate benefit in the survey programme so far. 12.5% homes had existing gizmos.

Tap washers were offered wherever a leaking tap was found, to a total of 1983 (this includes 100 given out to households where surveys were not undertaken).²⁴

Gizmos

| | Total no of households | % of those surveyed | |
|---|------------------------|---------------------|---|
| Where at least one gizmo in use | 641 | 12.5% | Total number of gizmos in use = 707 |
| Where at least one gizmo fitted by team | 2860 | 56% | Total number of gizmos installed by team = 3365 (plus extra 54 given to others who did not complete survey) |

Quite a number of households did not want the team to install gizmos.

²⁴ *During the collection of the first 2,500 surveys only 96 tap washers were recorded as having been given out.*

2.10 Water Consumption Per Person Per Day

The average consumption of water per person per day was 175 (175.1) litres, with the median figure of 151 litres. 9.2% of people (519)²⁵ used 300 litres or more per person per day, and 19% used less than 100 litres. There were 6 houses where the personal consumption was over 900 litres per day.

High Users of Water

Data regarding those 465 households where each person used 300 litres of water or more per day on average, and where surveys were completed, were examined more closely (see footnote 2). Their average shower flow rate was 7.1 litres per minutes, slightly less than for the whole sample. Nothing really stood out as being any different in the way gardens were watered, in fact, they used sprinklers less, with 2% using sprinklers compared with 4% for the whole sample.

There was no real difference in the types of toilets in the household compared to the whole sample, but there was a significantly smaller proportion of households where gizmos were already in use (8.6% compared with 12.5% for the whole sample).

A greater proportion of them had a second kitchen (12.9% compared with 7.8% for the whole sample). There also were more likely to have 2nd and 3rd bathrooms, (15.7% compared with 13.5% for 2nd bathrooms, and 2.2% compared with 1.3% for 3rd bathrooms).

The average number of people per household was 1.9, rather smaller than the whole sample of 3.2. Overall this may reflect a higher proportion of older, better-off childless couples? Is it more likely that these households may also own a swimming pool?

2.11 HNZC

There was higher consumption amongst the 116 Housing New Zealand households surveyed. Average consumption per person per day was 213 litres, with a median of 171 litres per day. 21 (18%) households use 300 litres or more a day per person, and a further 7 (6%) use over 500 litres per day.

Whilst it is acknowledged that a higher consumption may be explained because HNZ tenants do not pay for water, and therefore may be less concerned, there were a couple of differences amongst the survey data which may also help to explain the difference in consumption. There was a much higher incidence of single flush toilets in HNZ households (43.5% of households surveyed) than the whole sample (34%), with only 10 households where gizmos were already (8.7%) in use before the arrival of the water survey team, less than for the whole sample

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²⁵ *The sample size for water use was larger than that for completed surveys, as the team were sometimes able to gain information about the number of residents despite not undertaking a survey.*

(12.5%). The team subsequently installed 96 gizmos, thereby ensuring gizmos were in use in 89% of these households. This is an area for attention.

The average shower flow rate was marginally less at 7.1 litres per minute, compared to the whole sample average of 7.2%.

95% use top loading washing machines, slightly more than the sample average of 93%. Water use in the garden by HNZC tenants revealed much less consumption and activity generally. There was a higher incidence of leaks in HNZC houses, with 19% (22 houses) having at least one leak, more than the whole sample (14%). A greater proportion had multiple leaks than the whole sample, with 4 houses (3.5%) having 3 or more leaks, compared to the whole sample (2.9%).

| Water consumption per person per day (litres) | | | |
|--|---------|--------|--------------------------------|
| | Average | median | Use 300 litres or more per day |
| All surveyed households | 175 | 151 | 465 (9.1%) |
| HNZC households | 213 | 171 | 21 (18%) |

Summary

Overall water consumption of this sample of Waitakere households (nearly 10% of all households) demonstrates there is a good daily average rate per person of 175 litres per day and a median of 151 litres per day. This is supported by the average shower flow rate of 7.2 litres per minute and that at least 66% of households use dual flush toilets.

However, these results only reflect the situation and behaviour of those who are normally at home during the week day. It is possible that those who work outside the home during the work day use less water. It is also possible that those who are at home are more likely to be less well off and therefore their water use may be more conservative than the whole population.

The Water Wise Up Team were effective in reducing water consumption by fitting gizmos in toilets to 56% of households bringing the total proportion of households with gizmos to 68.5%. Leaks were detected in 14% of households and the distribution of free tap washers may have reduced overall water loss due to leaks.

A significant proportion of households (9.2%) were identified where personal consumption of water was 300 litres or more a day. This is double the median rate. In addition HNZC households have a much higher average and median consumption per person rate than the whole sample. These groups would be worth targeting.

Sigrid Shayer and Therese Mangos *Past and present project managers (respectively)*

APPENDIX 2: Results from the Sydney Water Demand Management Programme

2.2.1 Water savings

Table 2: Cumulative water savings^f (ML/year)

| Program | 99/00 | 00/01 | 01/02 | 02/03 | 03/04 | 04/05 | 05/06 |
|--|--------------|--------------|---------------|---------------|---------------|---------------|---------------|
| Residential | | | | | | | |
| WaterFix (residential) | 765 | 2,525 | 3,569 | 4,285 | 4,889 | 5,734 | 6,643 |
| WaterFix (Department of Housing) | | | | | | 167 | 627 |
| DIY water saving kits | | | | | | 40 | 250 |
| 2003 Washing Machine Rebate (pilot) | | | | 10 | 118 | 118 | 118 |
| 2006 Washing Machine Rebate | | | | | | | 142 |
| Rainwater Tank Rebate | | | | 32 | 161 | 504 | 986 |
| Landscape Assessment | | | | | 6 | 184 | 234 |
| Outdoor Education, water saving measures and pricing ^{##} | | | | | | | |
| Business | | | | | | | |
| Business programs ^{###} | | | 680 | 2,298 | 4,307 | 5,767 | 7,953 |
| Pilot Water Saving Fund | | | | | | | 163 |
| Every Drop Counts in Schools | | | | | 9 | 18 | 27 |
| Rainwater Tanks in Schools | | | | | | 3 | 21 |
| Leakage reduction | | | | | | | |
| Active Leak Detection | 949 | 5,439 | 9,089 | 12,374 | 15,148 | 16,790 | 18,506 |
| Pressure Management | | | | | | | 99 |
| Recycled water | | | | | | | |
| Operational schemes | | | | | | | |
| Existing STP reuse and minor recycling ^{####} | 5 | 5 | 5 | 5 | 626 | 671 | 1,197 |
| North Head STP | | | | | | | 641 |
| Rouse Hill – stage 1 (releases 1 and 2) | | | | 313 | 1,337 | 1,370 | 1,698 |
| SOPA (non Sydney Water scheme) | | | | 850 | 778 | 588 | 599 |
| Schemes in delivery phase | | | | | | | |
| Wollongong – stage 1 (BlueScope Steel) | | | | | | | |
| Rouse Hill – stage 2 (releases 3 and 4) | | | | | | | |
| Hoxton Park | | | | | | | |
| Ropes Crossing | | | | | | | |
| Savings for these programs will be achieved after 2005-06. | | | | | | | |
| Schemes in planning phase | | | | | | | |
| Camellia | | | | | | | |
| Local schemes ^{#####} | | | | | | | |
| Regulatory measures | | | | | | | |
| BASIX | | | | | | | 231 |
| Total cumulative savings | 1,719 | 7,969 | 13,333 | 20,167 | 27,379 | 31,954 | 40,135 |

- Only water savings achieved since 1999 are included.

- These savings take into account the effect of the current restrictions. Also, some savings from education campaigns are captured in other residential programs.

- This includes savings from the Every Drop Counts Business Program, Water Savings Fund and Water Saving Action Plans.

- Based on the 1998-99 potable water use at STPs as baseline (2,555 ML/year).

- This includes Penrith, Quakers Hill, Wollongong (stage 2) and Botanical Gardens.

Table 1: Highlights of Sydney Water programs

| Program | Description | Program highlights |
|--------------------------------------|--|--|
| 1. WaterFix (residential) | WaterFix formally commenced in 2000. The program offers the installation of water efficient 3 star rated showerheads, tap flow regulators, toilet cistern flush arrestors and repair of minor leaks to residential households. The service is offered to residents from \$22 and low income concession cardholders for free. Each WaterFix reduces household water use by an average of 20,900 litres a year. | <ul style="list-style-type: none"> As at 30 June 2006, 317,848 homes had participated in the program Water savings of 8,843 ML/year Reduced greenhouse emissions by approximately 1.2 million tonnes a year, due to lower customer energy use Typical saving of \$30 - \$100 a year in energy and water bills for each household. |
| 2. WaterFix (Department of Housing) | Launched in November 2004, the Department of Housing WaterFix Program is similar to the main WaterFix Program. It is available at no charge to the residents and is jointly funded by Sydney Water and Department of Housing. | <ul style="list-style-type: none"> 22,027 Department of Housing homes received a WaterFix service in 2005-06 As at 30 June 2006, a total of 29,999 Department of Housing homes had received a WaterFix service. This equates to total water savings of approximately 627 ML/year. |
| 3. Do It Yourself water saving kits | Developed as an alternative to the full service WaterFix, the free kits contain two flow regulators for showers, two flow regulating aerators for bathroom basin taps and one flow regulating aerator for kitchen taps. | <ul style="list-style-type: none"> More than 37,000 kits have been distributed to date Water savings of 250 ML/year. |
| 4. Washing Machine Rebate | From 1 March 2006, rebates of \$150 have been available to residential customers and tenants who purchase washing machines with a 4 star or 5A water efficiency rating. | <ul style="list-style-type: none"> As at 30 June 2006, 7,132 rebates have been paid Water savings of 142 ML/year. |
| 5. Rainwater Tank Rebate | Launched in 2002, the program offers residential customers a rebate to install a new rainwater tank. Rebates range from \$150 for a 2,000 litre capacity tank to \$500 for tanks with capacity equal to or greater than 7,000 litres. Customers qualify for an additional \$150 rebate if a licensed plumber connects the tank for indoor use. | <ul style="list-style-type: none"> As at 30 June 2006, a total of 24,449 rebates, worth \$7.73 million, had been paid. Water savings of 988 ML/year. |
| 6. Residential Landscape Assessment | The program aims to determine irrigation demands of individual landscapes and identify the gap between how much water is typically applied for irrigation and how much is actually required. | <ul style="list-style-type: none"> As at 30 June 2006, 1,868 properties have participated in the program, with 224 properties revisited in 2005-06 Development of a web-based plant selector to help customers to identify water efficient plants |
| 7. Outdoor Water Conservation | This program involves an ongoing campaign of community education combined with regulatory measures such as pricing reform and water saving measures. | <ul style="list-style-type: none"> Restrictions have achieved significant reductions in demand and demonstrate the savings that can be achieved through reducing outdoor demand. |
| 8. Every Drop Counts Business | Commencing in 2001, the program involves working with business to: establish cooperative partnerships, identify management barriers, identify technical solutions to water management problems, educate managers and employees, and encourage corporate citizenship. | <ul style="list-style-type: none"> The program received the 2006 Stockholm Industry Water Award in recognition of its work with business, industry and Government to reduce water usage and ensure the long-term sustainability of Sydney's water supply A total of 335 business customers have signed up to Every Drop Counts Business Program As at 30 June 2006, water savings of 7,953 ML/year had been achieved. |
| 9. Pilot Water Savings Fund | The \$2.5 million pilot fund was implemented to provide NSW Government organisations with grants for projects using proven technologies to achieve sustainable water savings of more than 20 kilolitres a day. | <ul style="list-style-type: none"> As at 30 June 2006, eight projects had been completed Water savings of 183 ML/year. |
| 10. Every Drop Counts in Schools | This program targets reducing water use in primary schools by increasing awareness of water conservation through a series of lessons involving students in a water audit and development of a water saving plan. | <ul style="list-style-type: none"> 54 schools completed the program in 2005-06 Water savings of 27 ML/year. |
| 11. Rainwater Tank in Schools Rebate | This program offers schools a rebate of up to \$2,500 towards the cost of purchasing and installing a rainwater tank. To receive a rebate each school must complete a water conservation education program. | <ul style="list-style-type: none"> As at 30 June 2006, 145 schools had received a rebate Water savings of 21 ML/year. |
| 12. Leakage Reduction | This program contributes to reducing leakage from Sydney's water distribution system by: <ul style="list-style-type: none"> active leak detection and repair pressure management to reduce high pressure areas improving the response time to main breaks improving flow metering. | <ul style="list-style-type: none"> In 2005-06 detection and repair work was completed in 104 supply zones covering 18,011 kilometres of mains. Since the program began in 1999, more than 41,500 kilometres of mains have been inspected and repaired Savings of 18,506 ML/year have been achieved Construction has been completed on four pressure management schemes. |

| Program | Description | Program highlights |
|------------------------------|--|--|
| 13. Water Recycling | Water recycling projects are being delivered as part of the Metropolitan Water Plan. Recycling projects implemented to date include recycling at Sydney Water STPs, urban and agricultural irrigation projects and residential dual reticulation. Further opportunities are being pursued including industrial and commercial projects, Hawkesbury-Nepean Replacement Flows Project through the Western Sydney Recycled Water Initiative, and irrigation and residential dual reticulation projects. | <ul style="list-style-type: none"> ▪ The Rouse Hill Recycled Water Scheme provides highly treated wastewater to more than 16,000 homes. The scheme is currently reducing demand by 1,698 ML/year ▪ Commissioning of a recycling facility at North Head STP in 2005 has reduced potable water use at the STP by 641 ML/year in 2005-06 ▪ Sydney Water released a Sewer Mining Policy and guidelines to assist in the establishment of sewer mining schemes ▪ Total savings from STP recycling of more than 1,700 ML/year have been achieved since 1999. |
| 14. Community Education | The community and industry groups are being actively engaged via demand management programs, such as Every Drop Counts Business, and community events. | <ul style="list-style-type: none"> ▪ During 2005-06, the Saving Water part of Sydney Water's website was accessed by 540,000 visitors. |
| 15. Research and Development | Sydney Water has an active ongoing research program that focuses on demand management and sustainable water service provision. | <p>Research projects undertaken in 2005-06 include:</p> <ul style="list-style-type: none"> ▪ End Use Model review ▪ reviews of water conservation programs ▪ customer research ▪ multi-unit metering trial ▪ development of pilot water conservation programs ▪ climate change. |

2.2.2 Investment

Table 3: Sydney Water program investment (\$'000/year)

| Program | 98/99 | 99/00 | 00/01 | 01/02 | 02/03 | 03/04 | 04/05 | 05/06 |
|---|-----------|--------------|---------------|--------------|---------------|---------------|---------------|---------------|
| Residential | | | | | | | | |
| WaterFix (residential) | | 4,000 | 12,068 | 6,508 | 4,609 | 4,133 | 5,264 | 5,965 |
| WaterFix (Department of Housing and expanded DoH) | | | | | | | 1,204 | 2,973 |
| DIY water saving kits | | | | | | | 1,296 | 2,926 |
| 2003 Washing Machine Rebate (pilot) | | | | | 474 | 796 | 18 | |
| 2006 Washing Machine Rebate | | | | | | | | 1,237 |
| Rainwater Tank Rebate | | | | | 374 | 1,386 | 3,687 | 3,926 |
| Landscape Assessment | | | | | 249 | 181 | 865 | 954 |
| Outdoor Education, water saving measures and pricing | | 230 | 750 | 185 | 2,047 | 818 | 1,621 | 174 |
| Smart Showerhead | 45 | | | | | | | |
| Business | | | | | | | | |
| Business programs [#] | | 841 | 1,000 | 393 | 1,884 | 2,142 | 2,491 | 2,639 |
| Recycled water program development ^{##} | | | | | | | | 450 |
| Pilot Water Saving Fund | | | | | | | 1,235 | 638 |
| Every Drop Counts in Schools | | | | | | | 10 | 127 |
| Rainwater Tanks in Schools | | | | | | | 153 | 448 |
| Leak Reduction in Schools (pilot) | | | | | | | | 20 |
| NSW Government Water Efficiency | | | | | | | | 16 |
| Business DIY kits (pilot) | | | | | | | | 5 |
| Leakage reduction | | | | | | | | |
| Active Leak Detection | | 500 | 1,400 | 1,100 | 1,681 | 2,482 | 2,455 | 4,838 |
| Pressure Management (capex) | | | | 135 | 258 | | | 1,600 |
| Recycled water | | | | | | | | |
| Operational schemes | | | | | | | | |
| Existing STP reuse and minor recycling (capex) ^{###} | | | | | 231 | 342 | 1,763 | 450 |
| North Head STP (opex) | | | | | | | | 83 |
| North Head STP (capex) | | | | | | | 2,964 | 488 |
| Rouse Hill – stage 1 (opex) ^{####} | | | | | | | | 2,000 |
| Schemes in delivery phase | | | | | | | | |
| Wollongong – stage 1 (BlueScope Steel) (capex) | | | | 260 | 7,507 | 10,968 | 5,148 | 1,000 |
| Rouse Hill – stage 2 (capex) | | | | | | | | 1,600 |
| Hoxton Park (capex) | | | | | | | 266 | 240 |
| Ropes Crossing | | | | | | | | - |
| Schemes in planning phase | | | | | | | | |
| Camellia (opex) | | | | | | | | 640 |
| Local schemes (opex) ^{#####} | | | | | | | | 359 |
| Research and development | | | | | | | | |
| Multi Unit Metering | | | | | | | | 111 |
| Program management | | | | | | | | |
| Program management | | 516 | 796 | 1,315 | 893 | 1,130 | 992 | 883 |
| Totals | | | | | | | | |
| Total OPEX | 45 | 6,087 | 16,014 | 9,501 | 12,211 | 13,068 | 21,291 | 31,408 |
| Total CAPEX | 0 | 0 | 0 | 395 | 7,994 | 11,310 | 10,141 | 5,378 |
| Total investment | 45 | 6,087 | 16,014 | 9,896 | 20,205 | 24,378 | 31,432 | 36,786 |

- This includes Sydney Water's investment in the Every Drop Counts Business Program and costs incurred helping to support the Water Savings Fund and Water Saving Action Plans.

- This is the costs to Sydney Water for developing recycled water programs within the business sector.

- This includes Dunheved Golf Course and Liverpool Golf Course recycling.

- Costs for Rouse Hill – stage 1 was not captured prior to 2005-06.

- This includes Sydney Water's planning costs for Penrith, Quakers Hill, Wollongong (stage 2) and Botanical Gardens.

APPENDIX 3: Privatisation and Conservation in New Zealand

It has been widely documented that the 1990's in New Zealand saw an era of privatisation of management structures for many key publicly owned resources of which water was no exception. A number of councils privatised or contracted out their water supply services while others moved to a CCO type structure, usually with a directive to turn a profit for their shareholder(s). A critique of which management structure for water delivery is best or most efficient is well outside the scope of TE106b, but the question of profit vs water sustainability does however at least need to be flagged due to its relevance to water efficiency programmes and targets. Pragmatically many CCO's and Public Private Partnerships (PPP's) have a vested interest in sustaining water throughput at current levels as it is essential for overall profitability. Auckland, for example, is the largest region in the country, and nearly all of its councils have to some degree outsourced or contracted their water supply services. Most of these organisations attempt to be profitable by the end of each financial year. At the same time the principal water wholesaler, Watercare Services Limited, has set a very unambitious demand management target over the next 20 odd years, a minimal 5% per capita saving over that time period²⁶. As stated earlier, our much larger neighbouring cities Sydney and Melbourne have both set water saving targets per capita of between 35 – 40% over the same time period. Why is there such a disparity between our targets?

Beacon Pathway has been involved in a project with several councils around New Zealand in an attempt to identify barriers and incentives to sustainable building design and development within a local council environment. Case studies from Auckland, Kapiti, Hamilton and Christchurch have been undertaken.

This work identified that one of the barriers within Auckland City lay with its own council controlled water retailer, Metrowater, which the report found has a statement of intent that is focused on sustainable profitability rather than sustainable water management. It also seems that, despite Metrowater being one of the largest water retailers in the country, it offers very limited by way of water saving initiative and has no key performance measures around demand management or encouraging sustainable three waters design within development (Metrowater says they are presently developing these). The Auckland report also profiles an Auckland couple who had wanted to implement a number of water sustainability measures during their housing renovation and retrofit, only to find that Metrowater actively discouraged them from taking steps that would promote greater water conservation on site.²⁷

²⁶ *Watercare Services Limited, 2004. "From the Sky to the Sea – the Auckland Water Management Plan"*.

²⁷ *When contacted for this report Metrowater staff say that the organisation is currently going through a process to identify what DM programmes it will implement. It says it will be ready to discuss these further within the next 6 months to a year.*

Work from Australia shows again that, for demand management programmes to work, a key to success is for water planners to see themselves as water service providers and not just sellers of a commodity. That means seeing a kilolitre saved as equivalent to a kilolitre provided and understanding that those savings represent significant benefits for ratepayers. This is because lowering water throughput makes it possible for councils to defer some of the big ticket capital expenditure by reducing water and wastewater operating and treatment costs, and energy costs (for both the water service provider and customer). There is also a reduction in greenhouse gases.²⁸

Turner and White (2006) emphasise that the first step to tapping into, and uncovering the benefits of, demand management is for the water service provider and/or government to commit to a transparent decision making process that facilitates effective water planning for a specific area.

This present research also found finding information about some of the water companies' targets and activities, as well as their main intent and ownership structures, quite difficult and probably well beyond the efforts of most "average" consumers. This raises important questions as to whether we are on the right path for achieving a more sustainable, cost effective water supply structure for New Zealanders through private sector business models or profitable government-owned entities or whether other ownership models need to be considered. Whatever the outcome of those considerations developing a system that is accountable and efficient for end users whilst being far kinder to the environment is paramount.

■ ²⁸ Turner A., White S. 2006. *“Does Demand Management Work Over The Long Term? What are the Critical Success Factors?”*

APPENDIX 4: Least Cost Planning and Integrated Resource Planning

The principles of Least Cost Planning and Integrated Resource Planning were developed for the electricity industry in the United States in the 1980's to compare energy conservation programmes to increase generation as sources of supply. These principles are increasingly now being used in other large infrastructures systems including water²⁹, wastewater³⁰ and gas³¹. As such the concepts of LCP and IRP are central to demand side management. White and Fane (2001) suggest that “demand management is any programme that modifies (decreases) the level and/or timing of demand for a particular resource. They do this by promoting conservation either through changes in consumer behaviour or changes to the stock of resource using equipment”³².

Least cost planning involves several steps, including: end-use analysis, demand forecasting, the design and modelling of demand management programmes, estimating conservation from programmes, evaluation of costs of conservation, estimating conventional supply costs, developing and costing alternative supply options if applicable, cost benefit analysis of all options, consideration of environmental externalities, sensitivity analysis, and reporting. Detailed end-use modelling of how a supplied resource (energy or water) is actually used by customers, provides a much more rigorous basis for demand forecasting, and allows for both development and evaluation of demand management programme, in particular end-use efficiency.

IRP provides a broader framework into which LCP fits. Over time an IRP process should see the iterative reapplication of LCP as part of the cycle of evaluating and assessing options, investing in selected options, assessing conservation results and demand forecasts and then re-evaluating options (see below for a model).³³

²⁹ Beecher, 1996; Dziegielewski et al. 1993, quoted in White, S. and Fane, S.

³⁰ Howe and White, 1999, quoted in White, S. and Fane, S.

³¹ Greenberger and Harshbarger, 1993, quoted in White, S. and Fane, S.

³² Greenberg and Harshbarger, 1993, quoted in White and Fane, 2001).

³³ From White, S. and Fane, S. “Cost Effective Water Demand Management Programmes in Australia, 2001.

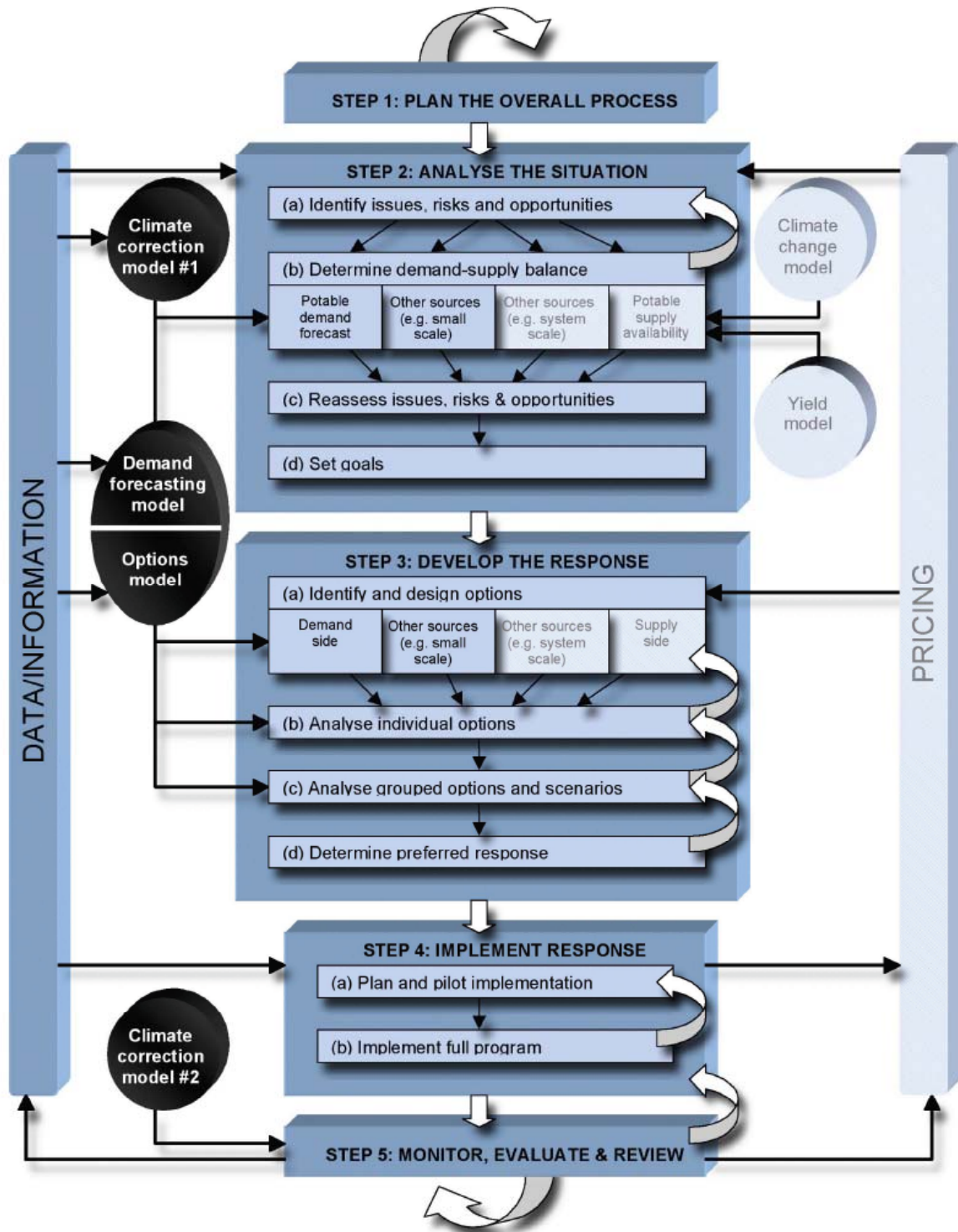


Figure 2 – The Australian Integrated Resource Planning Framework (Turner et al, 2005b)

APPENDIX 5: Demand Management Measures

What Water Works?

A paper that briefly overviews the efficacy of demand management work over the long-term has been written by the Institute for Sustainable Futures at the University of Technology in Sydney. Its findings state that: “there is a large menu of demand options available to water planners, which if tapped can provide significant long-term savings.” The following list, while certainly not exhaustive, identifies a range of demand management measures that can effectively reduce water consumption at a household level and which if effected would save a considerable volume of water (and money) across the entire country. They are:

- residential audit and retrofit programmes
- mail order retrofit programmes
- education programmes
- universal metering
- conservation-orientated water rate programmes
- water-saving plumbing code standards for new construction/low-flow plumbing standards
- drought contingency plans
- landscape requirements particularly for larger developments;
- restrictions on discretionary water use
- distribution system leak detection and repair

The paper identifies some of the keys to long-term success as being:

- overall planning and commitment to demand management by water planners
- water planners becoming water service providers
- considering water conservation potential of a specific region by disaggregating demand into sectors and end uses to clarify how water is being used and might be saved
- the use of both structural and behavioural changes when designing DM options as well as combining measures (what to change) and instruments (how to change them)
- control and influence issues and how water planners need to develop a broad spectrum of options that show other stakeholders the importance of their involvement
- careful implementation planning, development of a DM team and the importance of pilots/phasing of programmes prior to full implementation to fine tune programme design;
- the need for ongoing review and evaluation of implemented programmes including the use of best practice statistical analysis methods to facilitate ongoing improvement. Maximize savings and reduce costs.

The paper finds that “DM programmes are amongst the cheapest, least resource intensive, long lasting and beneficial options to society and the environment that can be chosen by any regional water planner.”

From: “Does demand management work over the long term? What are the critical success factors?”, by Turner, A. and White, S. 2006.

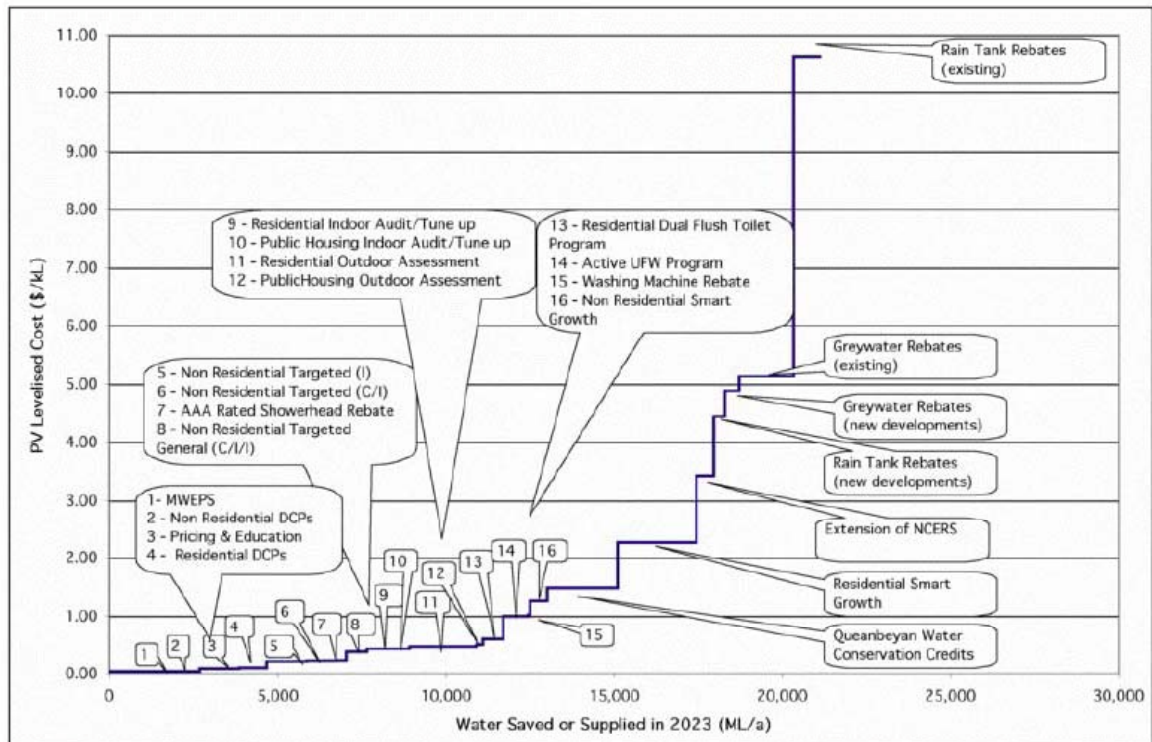


Figure 4 – Typical range and cost comparison of options (Turner and White, 2003c)

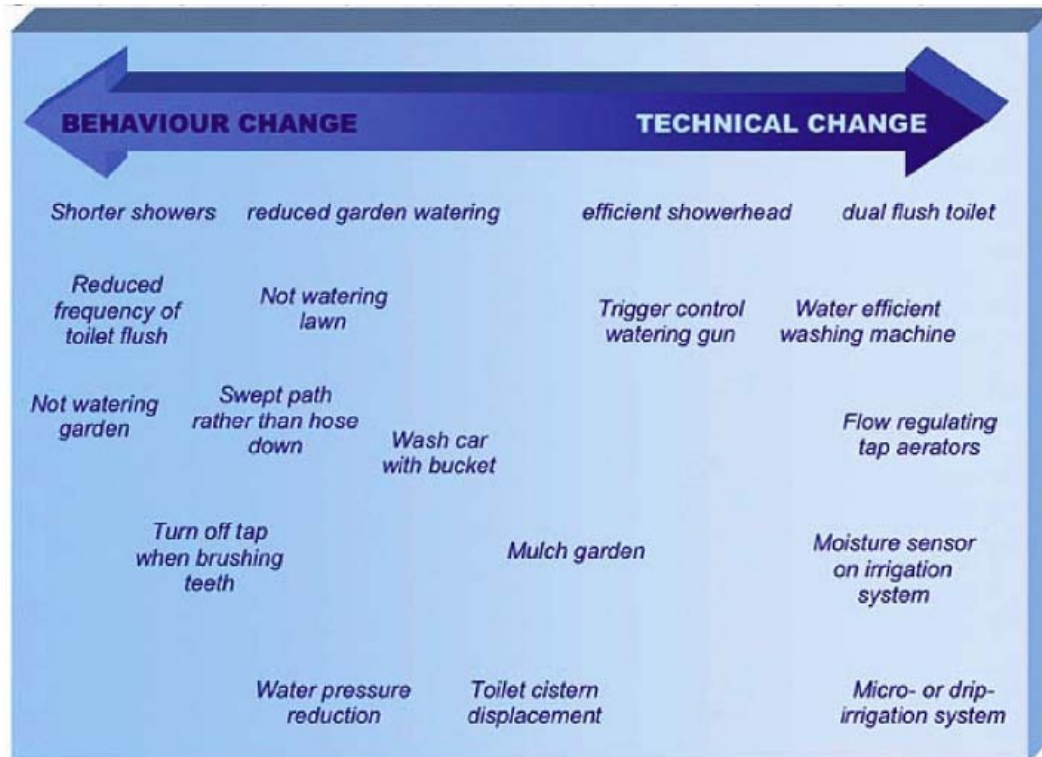


Figure 3 – Structural/technical and behavioural changes (White et al, 2003)

APPENDIX 6: Water Savings from Seattle

Growth in Population and Water Consumption Seattle Regional Water System: 1975-2005

