

## 12. FIELD TRIALS

### 12.1 Purpose of Trials

Many water efficiency options were investigated in this project. The benefit/cost ratio for any measure is dependent on local circumstances. The cost effectiveness of a measure is linked to three issues:

1. The **costs** of the measure. Measure costs are generally transferable from place to place and are only affected by economies of scale and variations in freight charges. Only if a measure has never been run in Australia would the estimation of costs involve significant uncertainty.
2. The **value** of the saved water. This can be determined from the local costs of the next increment of water/wastewater infrastructure and projected operation and maintenance costs. These values can be estimated, although sometimes requiring considerable effort if long range capital expansion plans are not in existence.
3. The **water savings** of the measure. This in turn is dependent on two factors which invariably must always be estimated:
  - The **unit water** savings if a measure is installed, such as replacing a 11 L toilet with a 6/3 L dual flush toilet. Sufficient research is available for the residential sector to estimate these values with some precision. Savings on the non-residential side are less well known and can only be determined after site visits and audits.
  - The **participation rate** or market penetration. Herein lies the greatest area of uncertainty. Participation rate is dependent on the customer's need, payback, and measure acceptance. Participation rates will depend on the promotional efforts of the Council and the incentives offered to improve the customer's payback. In some cases it is possible to construct a payback/acceptance rate curve. For example, the higher the incentive offered by the council, the higher the participation rate that can be expected. On the other hand, higher incentives lead to higher costs for the council, reducing the cost effectiveness of the measure.

### 12.2 Program Objectives

The objectives of a pilot program for the trialing of water efficiency in Queensland urban communities are four-fold:

1. Improvement of the knowledge base for water savings in the non-residential sector. This will enable a higher level of analysis to be undertaken to fully assess programs for this sector.



2. Determination of the market penetration for measures that appear to be cost effective, but are new to Queensland. To date, initiatives have been taken by various authorities without a rigorous assessment program being developed in conjunction with the measure to prove the effectiveness or otherwise of the action.
3. Review of the cost effectiveness estimates determined in this study based on data collected in the pilot program. This work is important to gain the support of co-sponsors such as energy companies and the Australian Greenhouse Office.
4. Identification of those measures that warrant a full scale program based on water savings, customer acceptance, and cost effectiveness.

### 12.3 Measures Targeted for Pilot Testing

Based on the results of the benefit/cost analysis a number of measures warrant pilot testing. Measures not listed below are either not cost effective or are well enough understood that full scale implementation can proceed immediately. A brief explanation of the specific areas of uncertainty that should be researched is listed with each measure.

1. **Showerhead Replacement Programs** – Information that needs to be collected includes data on customer acceptance of a water efficient showerhead that is significantly different from a traditional showerhead. Public perception is that quality low flow showerheads are not available due to inferior products being made available in the 1980s. The incentive level to achieve significant installation rates also needs to be researched. This could range from a giveaway to a \$10 to \$30 rebate redeemable at participating retailers or at the Council offices. A \$20 rebate was determined to be the most effective of those assessed during the benefit / cost analysis for the pilot communities.

To implement the trials it is necessary to identify a community that is willing to participate in such a program and provide this community with a supply of good quality low-flow showerheads. The authority would then arrange a program of distribution of showerheads (e.g. giveaways at different community events, sale at Council offices or at retail outlets etc). Such a program should be promoted through media releases, literature and displays. Several hundred showerheads should be distributed in this manner. The participants would be tracked for assessment of water savings through regular reading of water meters. After say six months, a survey would be undertaken to determine installation rates and customer satisfaction. The actual water savings can be assessed and results of the trial publicised. Assuming customers are satisfied with the product, the community can then plan an implementation program where showerheads would be promoted more actively and/or delivered in mass or rebates offered. At this stage regulations may be adopted to control new construction. The goal of the main program could be, for example, to



replace 25 percent of the showerheads in the community over a five year period.

Based on the distribution of 300 showerheads the cost of the trial would be of the order of \$10,000 to \$20,000 dependent on the level of rebate offered.

2. **Residential Water Audit & Retrofit** – This initiative is normally attractive to councils if the costs can be minimised. The trial would involve auditing the top 10% of residential users and undertaking a retrofit program to upgrade any fittings and fixtures such as showers, toilets and taps. Generally this measure is more cost effective if part-time students are used as auditors instead of contractors. Students however need more training and supervision so the logistics for the council are more difficult. Plumbers would be required to undertake retrofit activities. Acceptance rates depend on targeting high water users, effective public relations and persistence. Priorities for the research are the determination of program costs and measure acceptance rates. Water savings achieved are of secondary research priority because published studies are available. The data should however be collected and analysed to confirm cost effectiveness.

DNR should target a community that is interested in trialing this program. The community should meet the following criteria:

- Have at least several thousand residential single-family homes with water meters.
- Have a source of low cost labour for training as auditors, such as a college/university nearby.
- Have a local Council staff person available to supervise an audit crew of 3-6 auditors working part-time.
- Are interested in trialing the program.

Drawing on the experience of US utilities that have completed residential audit programs, the selected authority would organise the trial. Written procedures, audit data collection forms, and training materials need to be developed for the trial, as well as a method of monitoring water consumption after the retrofit. The goal should be to complete audits of at least 300 homes over a 4-6 month period. This would involve hiring part-time auditors, assigning a supervisor, and providing training and necessary materials. The retrofit costs would be of the order of \$110 per property assuming the installation of AAA showerheads, a toilet flush arrestor device and flow control less on taps. A budget of \$25,000 should be adequate to run the trial in each community chosen. Once completed the results of the trial should be evaluated and publicised so that other communities could benefit and consider implementing a program of their own.

3. **Washing Machine Rebate Programs** – These programs are simple to implement, however need to be co-sponsored by the energy companies to improve cost effectiveness. These companies can often administer the program on behalf of the council, billing the council for the rebates



processed. Alternatively an annual level of subsidy may be negotiated. Rebate levels generally have to be in the range of \$100-200 to attract the attention of the consumer. To achieve a reasonable B/C ratio for sponsoring would need to be around 70/30 by the electricity company/water authority. The pilot approach would be to develop a small program (limited number of rebates offered the first year) with an energy company. Tracking of total sales and the replaced type of machine as well as the approximate usage rate is needed to assess the program's effectiveness. Assessment would not normally include assessment of the water savings using meter readings due to the low level of savings compared to overall household usage.

DNR or the EPA should approach utilities serving electricity in Queensland. The idea of a trial of a joint rebate program should be discussed. Cost sharing, program administration, rebate amount, location of the trial should be determined. A budget for a one-year program should be established so that 200-300 rebates could be given to purchasers of new AAA rated machines. The cost of this program would be of the order of \$15,000 to \$30,000 depending upon the number of rebates offered and the extent of the promotion and evaluation. If the electricity companies do not cooperate then this program should be put on hold and pilot money spent elsewhere.

- 4. Non-residential Sector Water Audits and Implementation** – Non-residential audits are now commonplace but finding trained individuals to conduct the audits may not be so easy. Plumbers and small businesses can be trained in the techniques needed so that a resource pool is available. Attracting non-residential consumers to cooperate in a water audit is often a challenge. A discount on the water bill of say \$100 improves the uptake rate. The aim of the program is to initially assess the uptake rate of the audits as a function of the incentive offered (ranging from only the free audit to a discount on the water bill), and then to trial initiatives aimed at assessing the rate of implementation of recommended measures. Water savings achieved through audits alone are generally difficult to measure and should not be the focus. Training qualified auditors using available guidebooks should be tested, and the quality of their audits assessed.

Queensland WaterWise has experience in conducting non-residential water audits. This trial would expand on the previous efforts and involve training local councils to implement audits in their area. The focus should be on one or two sectors. Tourist accommodation (hotels/motels/caravan parks) and schools/parks are two examples that could be pursued. This could be done in two or three communities simultaneously, e.g. where one focuses on schools, the second on motels and the third on caravan parks. Sufficient audits should be done to develop success stories that could be used to convince other communities to do the same program. Success could be defined as participation in a water audit, completion of the analysis and audit report to identify water and money saving projects for the owner, or implementation by the owner with water and energy savings documented. Sufficient work should be done to develop say 10 success stories in each pilot community.



Following this effort, a technical report and material would be prepared to promote the idea to the balance of the customers other communities.

Queensland WaterWise has undertaken such programs for caravan parks and tourist accommodation and results have been published. The aim would be to undertake similar work in the pilot communities and then to take the program to the next level involving trials of various initiatives aimed at encouraging the sector to implement recommended measures. Such initiatives may include incentives, low interest loans, payback through water bills and certification/awards. The design of the initiatives would vary for each community and would depend on the funding available.

The cost of this trial is difficult to assess as it will depend on the premises audited and the subsequent implementation initiatives trialed. It is suggested that a budget of \$150,000 be allowed until the scope is confirmed through detailed trial design.

5. **Waterless Urinals** – These urinals offer an attractive alternative in new construction and for refurbishment's since the capital cost is the same as conventional water based models. The aim of the trial is to identify the type of commercial/institutional facilities where the use of these fixtures is most effective. These units require careful, but not complicated maintenance, which is different from conventional units. Schools, office buildings, and government departments should be approached to secure trial installations. This requires education, documentation of successful installations elsewhere, and persistence on the part of the council staff.

The State Government should purchase say 10 of these units and strategically place them (paying for installation) in locations where they will be properly maintained and given a fair trial. A good location would be in a council office, but other public buildings would suffice. It is known that these devices save water, therefore the issue of their effectiveness relates more to the maintenance aspects since the maintenance requirements are unique. If a small number of these devices are successfully installed then a case can be made for installing them routinely in certain situations. The units should be left in place for approximately twelve months to enable assessment to be carried out. Assuming the experience is favourable, the units can be promoted through education and incentives to other communities and facilities.

The estimated cost of such a program is \$20,000 based on the costs presented in Section 8 of this report.

6. **Rainwater Tank Program** – The issue of the cost effectiveness and reliability of rainwater tanks for urban use has not been comprehensively addressed in any trial undertaken in Australia to date. From a community perspective the tanks do not appear to be cost effective in areas served by a potable water supply. To confirm these results it is suggested that a trial be undertaken to ascertain the performance of rainwater tanks in various



climatic regions of Queensland. The aim of the trial would be to determine the benefit/cost of various sizes of tanks in urban areas. Due to the high cost of installation of tanks, a sample of say 12 tanks (10 kL capacity) would be installed in 4 areas (Toowoomba, Emerald, Mackay and Ingham). Local weather conditions, such as rainfall, temperature and evaporation as well as weekly tank levels and usage of tank water/potable water would be logged for assessment. This data would enable the assessment of average annual water savings and costs as well as providing information to allow the sizing of tanks in various areas. In addition the data may be used to validate the AquaCycle approach to sizing of water tanks. Such a program is estimated to cost of the order of \$40,000 to \$50,000 based on costs presented in Section 8 of this report and assuming that data collection costs are absorbed by the participating community.

7. **Irrigation Advisory Service** – The percentage of customers in the target area that will pay attention to the advisory service and actually change their garden watering habits should be researched through evaluation of external usage through statistical analysis and surveys. The best way to trial this program is to expand an existing public education program to include this service.

A community with an existing or planned public education program that meets the following criteria should be used to trial the program:

- Has significant landscape irrigation by homeowners
- Has a local newspaper and/or radio or television station that is willing to publicise the need for irrigation
- Has access to real-time evapo-transpiration data or can develop such information from local climate data
- Has an interest in trialing this program.

The program could be modelled on a similar program run by the City of Colorado Springs, Colorado, USA. The trial should last three years and involve publishing weekly irrigation guides for grass in the local media. The need for irrigation, expressed in mm/week should be based on real time evapo-transpiration of locally grown grass less the effective rainfall. The trial would evaluate the overall effectiveness of the program through surveying the usage and understanding of the consumers regarding garden irrigation. Quantitative assessment could also be included using detailed assessment of demands as demonstrated in this report.

The cost of such a program relates to the education of customers and the assessment of results. It is estimated that such a program could be implemented for a cost of \$10,000 to \$15,000.

In summary, the market penetration of some of the more attractive measures should be researched to confirm the cost-effectiveness before proceeding with full-scale implementation. The pilot program should be designed as a scientific experiment with attention paid to the type of data that will need to be collected to judge success after the program has been completed. The

market penetration question can be formulated as a goal, with adjustments made along the way to raise the participation rate to the desired level.

## 12.4 Cost and Scheduling

The cost of the proposed trials is largely dependent on the sample size as necessary for the pilot. Statisticians familiar with the local water use patterns can derive the sample size dependent on the size of the community. Sample sizes for residential pilot programs are generally in the range of several hundred homes. Sample sizes for non-residential programs are generally smaller because of their cost. For example, a non-residential audit program involving 10 to 20 customers is usually sufficient to gather needed data. Costs for measures were estimated in this project and generally apply to full scale implementation. They can be used as a guide but the per site cost will be higher for a pilot program. To this must be added the program evaluation cost which can add 25 percent or more to the implementation cost. Typical residential pilot programs cost in the range of \$15,000 to over \$100,000. Non-residential pilot programs such as audits can be done for say \$25,000, unless they involve the purchase of expensive equipment or substantial financial incentives. For example, the cost of industrial recycling projects may be in the order of several hundred thousand dollars.

Residential and non-residential pilot programs usually need at least 3 to 6 months for the implementation phase. To this must be added the time for program planning, procurement of services or equipment and follow-up evaluation. Most pilot programs take up to a year to complete. If the goal is to measure water savings, at least one year of water use data after the installation is generally required.

## 12.5 Summary of Recommendations

The following recommendations are made with respect to field trials in Queensland, which aim at proving the benefits of implementing water efficiency:

- A field trial program should focus on:
  - Improvement of the knowledge base for water savings in the non-residential sector.
  - Determination of the participation rate for measures that appear to be cost effective, but are relatively new to Queensland.
  - Review of the cost effectiveness estimates determined in this study based on data collected in the pilot program. This would include a detailed review of the assumptions in the DSS.
  - Identification of those measures that warrant a full scale program based on water savings, customer acceptance, and cost effectiveness.
- Field trials focussed on the definition of end use in Queensland's residential sector are not a priority as there is sufficient data available in Australia to define usage at this level.
- The following field trials are recommended based on the analysis of options:
  - Showerhead Replacement (Estimated cost - \$10,000 to \$20,000)



- Residential Audit and Retrofit (Estimated cost - \$25,000)
  - Washing Machine Rebate (Estimated cost - \$15,000 to \$30,000)
  - Commercial and Public Sector Audits (Estimated cost - \$150,000)
  - Waterless Urinals (Estimated cost - \$20,000)
  - Rainwater Tanks (Estimated cost - \$40,000 to \$50,000)
  - Irrigation Advisory Service (Estimated cost - \$10,000 to \$15,000)
- The cost of the field trials will depend on the detailed design of the trials including the determination of the statistically significant sample size and the level of incentive provided for any measure.
- The field trials program should preferably be undertaken in the communities used as pilots for this study. This would be an advantage due to the availability of the demand models and DSS evaluation purposes.
- Field trials should be planned for completion within twelve months of the commencing the planning stage, except for the irrigation advisory service, which may run over two to three years.