EXECUTIVE SUMMARY

Objectives of Study

The aim of *Least Cost Planning* or *Integrated Resource Planning* is to identify an appropriate balance between system operation / capacity expansion costs and the savings associated with programs aimed at increasing the efficiency of water use.

The objective of this study is to determine the potential for water use efficiency improvements in the Queensland urban water sector using a Least Cost Planning approach, to develop options to increase the efficiency of water use and to estimate the costs and benefits of implementing such options. The study aims to:

- Develop a computer based Decision Support System (DSS) to enable benefit cost analysis of various conservation measures and initiatives.
- Review the current situation with respect to water efficiency within five pilot towns, by undertaking a detailed regression based demand analysis.
- Identify and undertake both qualitative and quantitative analysis of water efficient technologies which have application in the state.
- Outline the benefits and costs of water audits and retrofits for the non-residential sector including schools.
- Review common regulatory approaches for the implementation of measures.
- Outline the costs and benefits of various pricing policies for water.
- Review the costs and benefits of undertaking field work to verify assumptions made during the study of the pilot towns.

Pilot Communities

Five pilot communities were chosen for the study. The selection of the pilots was undertaken to ensure that a range of situations were tested during the study. The criteria considered when selecting the communities were geographic location, size of the community, availability of data, range of future capital works budgets and the cooperation level of the local council. The communities chosen for the pilot study were as follows:

- Toowoomba
- Maroochy
- Emerald
- Mackay
- Ingham

Data was collected from each community through a single visit to the representative Councils in September 1999. Where data gaps and deficiencies existed assumptions were made based on data from similar communities and other studies.

Decision Support System

A *Decision Support System* (DSS) was designed and developed to provide a detailed least cost planning evaluation framework for water demand management programs. In evaluating potential demand management programs, a considerable volume of data including demand, unit costs and benefits of a range of alternative measures must be assessed. The DSS provides a framework for consideration of these benefits and costs.

Demand Analysis

The development of a water efficiency plan requires the accurate and reliable forecasting of water demand, as well as a detailed understanding of internal and external water usage. As part of this project a detailed analysis of historic demand was undertaken to:

- Determine the underlying per capita water consumption and the factors that have affected the usage patterns. Factors such as climate, conservation, water-use restriction and demographic issues all affect the use of water.
- Define the internal and external usage on a per capita basis.
- Develop an initial demand forecast for water demand for the next 30 years (extent of economic analysis).

The following conclusions were gained from the demand analysis undertaken for this study:

- Seasonal indices (monthly) developed for each community indicate that a maximum variation from average monthly demand of 1.2 to 1.25 was found in Mackay, Ingham and Maroochy. The high season index for Maroochy is believed to be partially the result of the peak tourist season. For Mackay and Ingham, the variation is due to the pronounced wet and dry seasons in tropical areas of Queensland. The minimum seasonal variation is found in Toowoomba which has a peak month of only 1.07 times the average month.
- Analysis of the historical demand for the five communities indicate that:
  - the departure from normal of the number of raindays per month was found to be the most statistically significant climate variable affecting water demand in the coastal communities of Maroochy, Mackay and Ingham.
  - the departure from normal monthly rainfall and from average monthly temperature, was identified as the statistically significant variables affecting water demand in the inland communities of Toowoomba and Emerald.
- Demand reduction since the adoption of user pays pricing was evaluated and it was found that the responses were as follows:
  - Maroochy (1992) 18% (reduction sustained)
  - Emerald (1998) 16% (demand falling)
  - Toowoomba (1995) 12% (demand increasing)
  - Ingham (1995) 0% (demand constant)
  - Mackay (1994) 7% (demand decreasing)

Maroochy's introduction of user pays pricing coincided with the introduction of universal metering. The Toowoomba policy coincided with the introduction of sprinkler hours regulations.

Assessment of the performance of user pays pricing in Ingham was complicated by the lack of monthly demand data. Data provided following the completion of the analysis indicates that a reduction of up to 20% may have been achieved during the implementation period.

- Mackay City has achieved a sustained 7.2% reduction in water demand since 1994, when the fixed charge was increased by 116%. Full user pays has not been implemented to date and therefore additional demand reduction may occur following the introduction of a new pricing policy.
- All of the pilot communities have engaged in demand management initiatives since at least 1995. Water demand reductions achieved since the introduction of user pays water pricing are therefore the result of all actions including public education, demand management measures, pricing policy media releases, general environmental awareness campaigns and the like. It may be assumed, however that the majority of the demand reductions (possibly up to 90%) result from the introduction of user pays pricing or a significant price increase (as in Mackay).
- Demand analysis of residential accounts shows that the total average water consumption of a household ranges from approximately 574 L/d to 1147 L/d for the communities studied.
- External usage ranges from 164 L/d to 665 L/d. The highest levels of external usage were determined for Ingham and Emerald, whilst Toowoomba, Mackay and Maroochy exhibited relatively low levels of external water use.

Recommendations relating to the demand analysis phase of Least Cost Planning are as follows:

- The use of a demand analysis and forecasting model should be adopted for Queensland local government water supply planning. A demand model similar to that adopted in this study, provides the following benefits:
  - a clear understanding of the impact of climate on water demand is achieved
  - information for the development of pricing policies, which ultimately rely on the accurate forecast of demand, is available from the model
  - more accurate forecasts result in the cost effective programming of major water supply projects
  - the performance of pricing policies and water efficiency measures can be reliably evaluated.
- Data collection, verification and archiving procedures should be improved in Queensland local governments to provide the information required for detailed demand analysis to be undertaken in future.
- Planning of the implementation of water efficiency initiatives needs to be improved to include detailed design and assessment aspects such as full cost tracking, performance evaluation and feedback to the community.

Demand Monitoring and Metering

Review of the current systems for monitoring water demand in the pilot communities indicate that:

- Monitoring Data – Billing Systems
  - Water meter billing data linked to land use data is difficult to access in most local authorities.
  - Land use categorisation in many existing water billing databases does not allow for use of consumption data in water efficiency modelling and general system planning.
  - Land use categorisation is best achieved through field entering of codes during meter reading.
- Monitoring Data – Bulk Systems
  - Daily total production or demand is needed to undertake overall system performance assessment.
  - The accuracy of bulk flowmeters needs to be the focus of managed calibration programs in all areas.
- Water Meter Fleet Management
  - Fleet management is currently an ad-hoc process, which may affect the equity aspects of user pays pricing strategies.
  - Asset management plans are required for the maintenance of meter fleets. These plans should include an annual bench-testing program to develop a full understanding of the accuracy of the meter fleet.

The following recommendations are made regarding demand monitoring and metering systems:

- A standard land use classification system should be adopted for Queensland Local Governments to enable demand analysis and standard reporting and performance comparison.
- Management Plans be developed and implemented for water meter fleet management.

Water Pricing

Each of the communities studied has introduced some form of user pays during the 1990s. The impact of historic changes in pricing policy on consumption blocks for residential customers was also analysed to determine the effect on water bills. In summary, the following conclusions are drawn with respect to pricing policy and related issues in the communities studied:

- Pricing Structures – Current Approaches
  - The use of a fixed charge and a single block usage rate has been adopted in Maroochy, Emerald and Ingham. Mackay has adopted an allowance of 300kL and a usage rate for higher consumption.
  - An inclining two block structure is in use in a Toowoomba with the second tier being some 250% higher than the first tier.
  - The highest standing charges are in Toowoomba and Ingham where the charge represents approximately 65% of the average annual bill.

- Emerald and Maroochy have the lowest standing charges of around 30-40% of the average water bill.

➢ Billing Practices
- Billing systems in all areas provided only basic billing information.
- Billing frequency is quarterly in Emerald and Ingham and bi-annually in the other areas.

The following recommendations are made with respect to water pricing and billing practices:

➢ Pricing Structures
- Consideration needs to be given to setting the fixed charge at the lowest level consistent with achieving revenue stability. This would provide the water consumer with the maximum discretion with respect to reward for water conservation.
- Inclining block (or two tiered) structures should be investigated for residential consumers to encourage conservation and reduce the demand of higher users in areas where water shortages exist or major works are being proposed.
- The frequency of billing needs to be at least quarterly to provide feedback to consumers. A longer billing cycle results in the reduction of price related conservation over time.
- The development of a water pricing model is recommended to assist in the preliminary assessment of user pays options for smaller communities.

➢ Billing Practices
- Billing systems need to be upgraded to enable the production of water bills which provide more comprehensive water usage information to consumers.
- The ability to extract data from billing databases needs to be enhanced to enable financial modellers and planners to effectively utilise data.
- Water bills should be enhanced to provide data in a similar way to the approach adopted by the energy industry. Bills should be capable of displaying:
  - Graphical and numerical representation of past accounts
  - Comparisons with average demand to provide performance feedback
  - Full cost of water, fixed plus usage charge
  - Conservation messages relating to the particular customer category.

Regulatory Approaches

A review of regulations was undertaken to assess a range of possible regulations and to recommend approaches which are applicable to Queensland. A summary of the outcomes is as follows:

- The following are shortlisted for further consideration by communities:
  - Plumbing Fixtures (Showerheads, toilets, tap flow control and urinals - controlled flush and waterless)
  - Prohibited uses of water (wasteful garden irrigation – "gutter flooding")
  - Inefficient water use (Car washes)
  - Landscaping (Public areas, Non-residential development)
  - Water Reuse (Reclaimed Water / Stormwater Reuse)
  - Property Retrofit (Public buildings, Sub-metering)
  - Discretionary Use of Water (Restrictions)
- Assessment of the alternatives for implementation of regulations concluded that:
  - Local Regulations are best aimed at uses of water such as landscaping, retrofitting and restrictions. Toilet and urinal flush settings could also be controlled at a local level.
  - National Regulations are preferable for plumbing fixtures such as showerheads. The time taken to develop and implement national regulations is up to five years.
  - Implementation of plumbing fixture regulations can be successfully implemented at a local level through working with local retailers and promoting the use of AAA units.
  - With respect to the implementation of regulations the following comments relating to the National Competition Policy should be considered:
    - If local regulations are to be implemented at a local level for plumbing fixtures, it is necessary to be able to clearly demonstrate the public benefit and to ensure that the action is not anti-competitive.
    - The advice of a Trade Practices / Competition Policy lawyer should be sought prior to adopting such a regulation.

Recommendations relating to the implementation of regulations as part of water efficiency in Queensland are as follow:

- The state government continue to pursue National Standards with respect to the regulation of plumbing fixtures. Particular attention should be given to the national regulation of showerheads.
- In the interim period, regulation of showerheads and other devices should be adopted at a local level. Local governments that adopt such regulations should:
  - undertake analysis to determine the public benefit.
  - co-ordinate such regulations with the local retailers.
  - educate the community on the benefits of the regulation, through a planned promotional campaign.

- Water reuse opportunities should be considered in all communities, particularly those with reasonable benefits through the possible delay of capital works.

Unaccounted For Water and Leakage Reduction

As part of the assessment of the water efficiency initiatives the aspects of Unaccounted For Water (UFW) and associated leakage reduction were assessed. The findings of this analysis are summarised as follows:

- Active leakage management programs have not been implemented in any of the pilot communities.
- All authorities were capable of determining total Unaccounted For Water (UFW) using the Integrated Flow Method however the accuracy or split between leakage and other sources of UFW could not be defined.
- The estimated level of UFW calculated using the Integrated Flow Method should range from 12 to 20% of total production. It is possible that the Mackay level was even higher due to an aged meter fleet. Leakage was estimated at 75% of UFW levels for the purposes of the analysis.
- Analysis showed that it is feasible to implement leakage reduction programs at Emerald and Mackay. Due to the limited benefits in Ingham, a leakage reduction program is not cost effective.
- Leakage levels at Toowoomba and Maroochy were shown to be low (3.0 L/conn/hr), however it is economical to undertake a leakage assessment on a zonal basis to determine whether a program should be implemented in prioritised parts of the system.

Based on the analysis of system leakage undertaken for this report the following recommendations are made:

- The practice of reporting leakage levels based on the Integrated Flow Method, be discontinued, as misleading performance data is provided by this approach.
- Leakage should be calculated and reported on a per connection per hour (or day) basis. Such calculations need to be undertaken using the night flow analysis approach, based on reservoir drop tests. A standard procedure should be developed for Queensland local governments.
- Active leakage programs, where proven to be beneficial through a rigorous benefit/cost analysis, should be commenced in Queensland and supported by the State Government loans program.

Residential Measure Evaluation

Following a short-listing process for each community a shortlist of measures were adopted for detailed Benefit/Cost (B/C) analysis using the DSS. The results of the analysis are summarised as follows:

- Benefit/cost analysis showed that the following measures provided B/C ratios of greater than 1.0 for both the utility and community:
  - Showerhead Replacement Program with rebates of $10 and $20 (except Ingham)

- Residential Audit & Retrofit Program with a customer contribution of between $30 and $50 (Emerald, Toowoomba and Mackay only). If co-sponsoring occurred Maroochy and Ingham may qualify.
- School WaterWise Program with literature (except Ingham)
- Irrigation Advisory Service (except Ingham)
- Outdoor Audit and Tap Timer Information Kit (Emerald, Maroochy and Toowoomba).
- Washing Machine Labelling (Toowoomba only)
- Toilet Displacement/Flush Arrester Devices (except Ingham)

➢ Benefit/cost analysis of rainwater tank rebates shows that:
- the authority B/C ratio for Maroochy was above 1.0 for all levels of rebate (10-30%) for 5 and 10kL tanks.
- the authority B/C ratio is generally high for low levels of rebate (10% of total cost), as most of the cost is borne by the customer.
- community B/C ratios are generally lower than 0.5.

➢ Analysis of rainwater tanks is difficult due to the unknown reliability and expected yield in Queensland. Benefits of rainwater tanks are therefore difficult to estimate.

➢ The benefit/cost analysis of outdoor tap timers showed that the measure would not be cost effective in most of the pilot areas. Toowoomba and Emerald were the exceptions, with a B/C ratios higher than 1.0 for a rebate of $10. An increase in the savings to 10% or greater of external usage would result in cost effective results in most communities.

➢ The analysis of toilet displacement/flush arrester devices indicated that such measures are cost effective assuming that installation is undertaken by the customer.

Based on the results of the analysis it is recommended that:

➢ In general the following measures are cost effective in Queensland, and should be implemented as base measures where possible:
- Showerhead replacement (with co-sponsoring)
- Residential audit and retrofit (with co-sponsoring)
- School WaterWise

➢ The implementation of $20 rebates for AAA showerheads should be adopted as a state wide policy to reduce water usage. Such a measure has the potential for significant water savings and benefits to authorities as well as to the community as a whole. Co-sponsoring by the electricity companies would increase the authority benefits and provide substantial power savings to customers.

➢ Rainwater tank yield requires research in Queensland to confirm the results of this study.

Non-Residential Measures

Review of water efficiency in the non-residential sector was limited due to the lack of demand and end use data which are the necessary base components of a B/C analysis. Such data can only be provided through individual property audits which were beyond

the scope of the primarily desk top study. The review of non-residential water efficiency in the non-residential sector indicates that:

- The potential for water efficiency improvements in the Commercial and Public sectors is significant as these sectors represent the majority of the non-residential demand in Queensland's urban communities.
- There is minor potential for demand reduction in the industrial sector as water usage by this sector represents a small proportion of the overall demand. Known high users in this sector should however be targeted.
- Auditing of the non-residential users based on ranking of water demand is essential to understanding the end uses and potential water saving opportunities. Auditing as a stand alone measure is not highly cost effective and should be considered as part of an overall program.
- Priority targets for the Commercial sector are hotels/motels, caravan parks and resorts.
- Priorities for the Public Sector are council and community buildings and facilities and schools.
- Analysis indicated that on a sector basis, the installation of waterless urinals and infrared flush controllers was not cost effective to the community. On the other hand, experience shows that such upgrading is beneficial to the customer as the water savings are significant and short pay backs can result from retrofitting these devices.

Based on the analysis, the following recommendations are made:

- Water efficiency in the non-residential sector should focus on high water users particularly in the commercial and public/industrial categories.
- The recommended priorities for non-residential water efficiency are
  - Public Buildings
  - Hotels/Motels
  - Caravan Parks
  - Resorts
  - Schools
  - Hospitals
  - Other high water users such as individual industries, office buildings
- The implementation of non-residential sector programs is generally resource and funding intensive, and therefore any measures need to be reviewed for their effectiveness versus resourcing prior to commencement.
- Water audits need to be undertaken as an integral component of any non-residential sector program.
- Programs need to be designed based on sound economic evaluation and must meet the customers decision making and budgeting process.
- School retrofit programs similar to the Merrimac School program are beneficial, however a staged process is recommended to overcome budgeting difficulties experienced by these organisations. Alternatively rebates or low interest loans may be considered.

- Co-sponsoring of programs in the non-residential sector has significant application and should be adopted whenever possible.
- A holistic approach to efficiency and sustainability is required in this sector. Therefore programs need to include consideration of efficiencies in all consumables including water, sewerage, waste and electricity.

Water Efficiency Plans

After analysing the measures in each of the pilot communities, localised Water Efficiency Plans were formulated. A range of water efficiency plans is usually developed taking into account the interaction of selected measures with each other. For this study two plans were developed for each authority. These are referred to as a *passive* and an *active* program. The passive program includes initiatives which may be implemented using a low resource approach with measures not involving field work, e.g. public education and shower rebates. The active program is a more proactive approach and includes leakage reduction and property retrofits.

The criteria adopted for the selection of measures for inclusion in Water Efficiency Plans for this study were primarily:

- Benefit/Cost Ratio
- Reasonable Cost
- Significant Water Savings

A summary of the conclusions drawn for the formulation of water efficiency or demand management plans for the five pilot communities is as follows:

- The effects of *natural conservation* over the next 30 years will realise reductions in overall demand of between 6.5 and 11.1 % over the currently projected demands. For this analysis, natural conservation is assumed to result from the increased market share of low flow showerheads, 6/3L toilets, tap flow control, washing machines and urinal flush control.

  A summary of the natural conservation determined for each pilot community to 2030 is detailed in the table below.

Impact of Natural Conservation on Demand Estimates to 2030

Community	% Natural Conservation	Water Saving (ML/d)
Emerald	8.8%	1.1
Ingham	6.5%	0.2
Mackay	10.0%	5.2
Maroochy	11.1%	11.5
Toowoomba	9.3%	3.1

- *Passive water efficiency plans* have the potential to save between 1.6 and 9.1% of water usage. Programs would include measures such as public education and showerhead rebate programs. *Active water efficiency plans* have the potential to save between 5 and 12 % of the overall demand at 2030. Such programs require community support and cooperation to ensure high participation rates. The selected measures for the passive and active plans are summarised in the table below.

Summary of Passive and Active Program Savings to 2030

Community	Passive Plan		Active Plan	
	% Saving	ML/d	% Saving	ML/d
Emerald	3.7%	0.4	10.5%	1.1
Ingham	1.6%	0.1	5.3%	0.2
Mackay	9.1%	4.3	11.2%	5.3
Maroochy	5.5%	5.1	10.6%	10.1
Toowoomba	5.8%	1.7	11.1%	3.3

- The selected measures for the passive and active plans are summarised in the table below.

Passive and Active Program Components

Community	Emerald		Ingham		Mackay		Maroochy		Toowoomba	
Measure	**P**	**A**	**P**	**A**	**P**	**A**	**P**	**A**	**P**	**A**
School WaterWise – Literature	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Public Education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Showerhead Replacement ($20 Rebate)										
• **Houses**	×	✓	×	✓	✓	✓	✓	✓	✓	✓
• **Flats**	×	✓	×	✓	✓	✓	✓	✓	✓	✓
Residential Audit & Retrofit ($30 Cost to Customer)	×	×	×	×	×	✓	×	✓	×	✓
Washing Machine Labelling	×	×	×	×	×	×	✓	✓	×	×
Outdoor Audit & Tap Timer Kit ($30 Cost to Customer)	✓	✓	✓	✓	×	×	✓	✓	✓	✓
Toilet Flush Arrestor	×	×	×	×	×	×	✓	✓	×	×
Leakage Reduction	×	✓	×	×	×	✓	×	✓	×	✓
P – Passive; A – Active										

- Overall, the levels of demand currently being planned for in all communities may be reduced by at least 10 % and up to 25 % taking into account natural conservation and savings resulting from the implementation of an active water efficiency plan. A summary of the potential reduction to currently planned capacity at 2030, for the communities analysed is detailed in the table below.

Reduction in Planned Capacity at 2030

Community	Planned Demand (ML/d)	Demand With Active Program (ML/d)	% Reduction
Emerald	11.9	9.7	18.5%
Ingham	3.5	3.1	11.4%
Mackay	52.4	41.9	20.0%
Maroochy	103.8	82.1	20.9%
Toowoomba	32.9	26.6	19.1%

- Demand reduction of a further 3 to 10% may be achieved through additional actions summarised as follows:
  - Implementation of water audits and efficiency improvements in the non-residential sector with the following priority:
    - Public buildings
    - Hotels/motels/clubs, resorts and tourist accommodation
    - Schools
    - Major industry
    - Shopping centres
    - Hospitals
  - Introduction of two tiered pricing structures for the residential sector.
  - Reduction of high fixed charges for water to provide the maximum benefit/reward to those who conserve.
  - Adoption of regulations aimed at the installation of water efficient plumbing fixtures in new development, and the control of urinal flushing.

Based on the development of Water Efficiency Plans for the five communities involved in this study it is recommended that:

- Demand projections for all Queensland local governments take into account the effect of natural conservation.
- As shown in this report, the development and implementation of Water Efficiency Plans is cost effective and needs to be considered during the planning of any water supply system.
- Amendments should be made to the QDNR *Guidelines for Planning and Design of Urban Water Supply Systems* to incorporate the requirement to

consider both natural conservation and water efficiency, in water supply planning.

Field Trial Program

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.

Key Recommendations

Based on the results of the investigation and analysis of water efficiency initiatives undertaken for five pilot communities, the following key recommendations are made:

1. The rigorous application of *Least Cost Planning* should be implemented in Queensland as the basis for water supply planning. Such an approach has the potential to achieve significant savings to the water industry, the electricity industry and to the community as a whole.

2. A reliable and standardised demand analysis and forecasting methodology should be implemented as part of the Least Cost Planning approach. Calculation of the impact of natural conservation is a important component of demand forecasting and as such needs to be taken into account in water supply planning.

3. Development of water efficiency initiatives should be fully planned and implemented as a partnership between the local government and community. Such projects need to include assessment of the success of any measure and the program as a whole, with results being provided back to the community.

4. The implementation of a showerhead replacement program on a state-wide basis should be undertaken as a priority. Significant benefits are possible for the water and electricity industries and the community through the adoption of this initiative, even taking into account a rebate of $20 for each unit. Implementation of this initiative should be through local regulations until such time as national regulations are adopted. It is suggested that the state government take a lead role in securing funding for the initiative from the electricity industry and the Australian Greenhouse Office.

5. Field trials should be undertaken to implement various measures that have not been fully evaluated in Queensland. The trials would be aimed at determining the participation rate, community acceptance and cost effectiveness of measures recommended in this report. Trials should include the evaluation of the benefits of the use of rainwater tanks in urban areas.

6. A pricing evaluation guideline should be developed for use by Queensland local governments in the preliminary assessment of alternative pricing policies.

7. The Queensland Guidelines for Planning and Design of Urban Water Supply Schemes be revised to implement the recommendations of this report.