Community Acceptability of the Indirect Potable Use of Purified Recycled Water in South East Queensland and Preferences for Alternative Water Sources: A Baseline Measure

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The Urban Water Security Research Alliance (UWSRA) is a $50 million partnership over five years between the Queensland Government, CSIRO's Water for a Healthy Country Flagship, Griffith University and The University of Queensland. The Alliance has been formed to address South-East Queensland's emerging urban water issues with a focus on water security and recycling. The program will bring new research capacity to South-East Queensland tailored to tackling existing and anticipated future issues to inform the implementation of the Water Strategy.

For more information about the:

UWSRA - visit http://www.urbanwateralliance.org.au/
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Water for a Healthy Country Flagship - visit www.csiro.au/org/HealthyCountry.html
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FOREWORD

Water is fundamental to our quality of life, to economic growth and to the environment. With its booming economy and growing population, Australia's South-East Queensland (SEQ) region faces increasing pressure on its water resources. These pressures are compounded by the impact of climate variability and accelerating climate change.

The Urban Water Security Research Alliance, through targeted, multidisciplinary research initiatives, has been formed to address the region's emerging urban water issues.

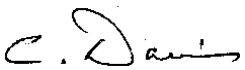
As the largest regionally focused urban water research program in Australia, the Alliance is focused on water security and recycling, but will align research where appropriate with other water research programs such as those of other SEQ water agencies, CSIRO's Water for a Healthy Country National Research Flagship, Water Quality Research Australia, eWater CRC and the Water Services Association of Australia (WSAA).

The Alliance is a partnership between the Queensland Government, CSIRO's Water for a Healthy Country National Research Flagship, The University of Queensland and Griffith University. It brings new research capacity to SEQ, tailored to tackling existing and anticipated future risks, assumptions and uncertainties facing water supply strategy. It is a $50 million partnership over five years.

Alliance research is examining fundamental issues necessary to deliver the region's water needs, including:

- ensuring the reliability and safety of recycled water systems.
- advising on infrastructure and technology for the recycling of wastewater and stormwater.
- building scientific knowledge into the management of health and safety risks in the water supply system.
- increasing community confidence in the future of water supply.

This report is part of a series summarising the output from the Urban Water Security Research Alliance. All reports and additional information about the Alliance can be found at http://www.urbanwateralliance.org.au/about.html.



Chris Davis
Chair, Urban Water Security Research Alliance

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EXECUTIVE SUMMARY

A wide range of challenges are currently evident for water management in South East Queensland (SEQ), and with this in mind, the South East Queensland Urban Water Security Research Alliance was formed. This provides the basis for the collaboration and integration of effort between scientists in Queensland Government Departments, CSIRO, The University of Queensland and Griffith University. Working in concert with the Queensland Government, the science can be tailored to meet the needs of Queensland's long term future.

A key area of the science in the Alliance is that of *Systematic Social Analysis*, as a part of the *Informed Decision Making* Program. It's primary objective is:

> *to develop a partnership between the government, scientists and the community that builds mutual trust, acknowledges a "whole of community" challenge and responsibility, and provides a basis for ongoing sustainable management and use of water resources in SEQ.*

This research which forms Milestone 1 of the Systematic Social Analysis project has as its objective:

> *to identify and provide a baseline measurement of the psychological drivers of the community's intended behaviour in relation to drinking Purified Recycled Water (PRW) to provide for the informed design of community engagement and education, and the monitoring of any shifts in community attitudes, values and intended behaviours over time and with increased experience*.

While the community cannot change the decision in relation to PRW for indirect potable use, it will be important to provide them with opportunities to be engaged with the science that is associated with the new source planning and implementation. Integration with the biophysical scientific investigations will provide opportunities to address any current or emerging concerns and issues with the intention of maximising and retaining the acceptability of the scheme.

This report describes the outcome of the baseline measure for Milestone 1. It also provides information on the strength of community support or rejection of the PRW scheme given different future circumstances, as well as an indicative measure of relative preferences for alternative water sources.

Based on previous research, a model of behavioural intention to drink PRW was hypothesised for this study and the variables measured through a questionnaire administered by personal telephone interview. A total sample of 583 householders from SEQ areas currently supplied by Wivenhoe Dam was achieved. These respondents resided in four regions and the sample was stratified socio-economically. Efforts were also made to interview equal numbers of males and females. The telephone interviews were comprehensive and took, on average, between forty-five minutes and one hour. Both quantitative and qualitative data were collected in the process. At the conclusion of the survey respondents were asked if they would be prepared to be involved in future surveys or discussion meetings that would assist in the research over the next few months. Only 23% of respondents refused.

Before being provided with any information about the proposed PRW scheme in SEQ, respondents were asked a series of general questions about wastewater and wastewater recycling to determine both their levels of self-reported knowledge, as well as levels of actual knowledge. Almost two-thirds of respondents considered they had some knowledge through to high knowledge about the recycling of wastewater and this was generally supported when asked to provide unprompted, specific answers to indicate their *actual* levels of knowledge. However, 38% of people could not name any ways that

recycled wastewater is currently being used in SEQ, and 24% could not name any future planned uses. A number of other responses also indicated a lack of specificity of knowledge, or misunderstandings.

Respondents were then read a short overview of the PRW scheme that included information about the source of the water, the treatment processes involved and the bodies responsible for the regulation, management and operation of the scheme. Interviewers were provided with additional information to assist with any questions the respondents may have asked.

Consistent with previous market research, 74% of respondents said that they would drink PRW from the scheme. The degree of support for the proposed scheme and drinking the PRW was then provided by rating their agreement or disagreement with a number of statements on a 6-point Likert scale. This provided people with an opportunity to qualify their positive or negative intentions through the use of the scale rather than a *yes*, *no*, *unsure* judgement. Just under half of respondents (43.4%) expressed agreement with the statement - *"given the choice, I would not drink water that contained purified recycled water"*. This suggests that, while support for the scheme is generally high, as consistently shown in responses to the other six statements, many respondents would prefer to not to drink PRW if given the choice.

Participants were further asked, if they would consider drinking purified recycled water in a scheme that did not pump the water into the dam first, but piped it straight from the treatment plant to your house? In contrast to the above support, only 29% of respondents would support a direct potable reuse scheme, with 23.3% being unsure, and almost half the sample (47.7%) being opposed.

Overall, respondents felt some degree of trust in the different bodies involved in the purified recycled water scheme. A very high percentage of respondents (92.1%) had at least some degree of trust in scientists to produce the best science for safe drinking water from the recycling scheme. Similarly, the majority of respondents reported at least some degree of trust in the *Department of Natural Resources and Water* (84.1%) to ensure Veolia Water meets the water quality standards, *Queensland Health* (83.1%) to set safe drinking water standards, *Veolia Water* (82.8%) to consistently produce high standards of treatment of the wastewater to a purified state and *a Queensland Government body* (75.5%) to oversee and regulate the whole recycling scheme.

On examination of the mean trust ratings, trust in scientists was found to be significantly higher than any of the other bodies. Trust in a Queensland Government body to oversee and regulate the scheme was significantly lower than all other bodies. This is perhaps not surprising given the unknown nature of this body at present.

When considering trust in information providers, in line with past research, CSIRO was rated as the most trustworthy organisation to provide information in regard to the recycling scheme, significantly more so than any other information source. Information from medical doctors, universities and the EPA was rated as next most trustworthy. Information from the Department of Natural Resources, consumer groups, environmental groups, the Queensland Water Commission and Queensland Health was rated as significantly less trustworthy than the above group, while information from Veolia Water was rated as significantly less trustworthy again. Finally, private companies were rated as significantly less trustworthy than all other information sources.

Respondents were asked to rate what they believed to be the fairness of the PRW scheme for a number of different potential "users" as well as considerations of overall fairness. Overall the scheme was rated as being reasonably fair. Only 11% rated the scheme as *unfair*. Over 50% of respondents rated

the scheme as *fair* for each of the individual "users". While there was little overall difference in how respondents rated the scheme's fairness to the range of users, two significant differences did emerge.

- The scheme was considered to be significantly less fair to *households on low incomes* than to all other users.
- The scheme was considered to be significantly less fair to *households with children* than to *households without children*.

Respondents rated four statements relating to subjective norm – the extent to which respondents thought that "important others" would support the PRW scheme. In this case, "important others" is taken to also refer to people in SEQ, as well as family and close relationships.

Almost two-thirds of participants believed that people close to them would support adding PRW to the dams, and that most of their families would drink water mixed with PRW. However, there was a more divided view about whether most people in SEQ would be happy to drink water mixed with PRW, and whether others in SEQ would disagree with adding PRW to the dams.

Respondents were asked to rate agreement with three statements designed to measure environmental risk. The ratings indicated a lack of strong opinion which suggested a lack of crystallization of these attitudes at this stage.

Respondents' ratings suggested lesser perceptions of health risk currently, but there was some conflict in the way this was being viewed. Respondents generally considered there would be little risk to their health personally, while there would be greater likelihood of health problems in the community.

It was apparent from ratings of likelihood and seriousness of possible things going wrong with the system, as well as from qualitative comments, that people were nervous about *System Risks*. While most people were indecisive about the likelihood of something going wrong with the water supply (i.e. high concentration of those thinking the possibility was *neither likely nor unlikely*), there was a strong sentiment that, if something did occur, the ramifications would be very serious.

Respondents were provided with eight potential outcomes that may result from the proposed PRW scheme, and were asked to rate the likelihood of these outcomes occurring and also the importance of each of the potential outcomes. These ratings were combined to provided a weighted importance score (higher scores being more important and more likely). More water for future generations, a long term water supply and an environmentally sustainable water supply were rated significantly higher than the other outcomes. These were followed by good tasting drinking water and economic growth which were rated significantly lower than the previous group. Significantly lower than these was affordable water. Finally, continued population growth and less need for water restrictions were rated significantly lower than all other outcomes.

The strength of respondents' support for or opposition to PRW was tested by challenging people's primary responses through the consideration of future alternatives or different situations.

Respondents who strongly agreed, agreed or somewhat agreed with the statement *I support adding purified recycled water to our water supply in Wivenhoe Dam* (80%) were asked if they would still be supportive if three future alternatives occurred:

- if it rained and filled the dams to pre-drought levels;
- if they thought there might be some negative impacts on the environment in and around the dam by adding purified recycled water to the natural dam water;

- if they thought enough water could be provided by other water management options.

It was evident that the situation that has the greatest potential to reduce support for the PRW scheme is if, by adding PRW to the natural dam water, there would be some negative impacts on the environment in and around the dam. Support would drop to about 30% of those originally supportive, and to 26% of the total sample. Support would also drop to less than half of the total sample if people thought there were viable alternative options. While the possibility of rain did not alter support to the same extent as the other two circumstances, it would still drop to less than two-thirds of the total sample. Respondents provided reasons for these decisions.

Similarly, those who disagreed with the statement *I support adding purified recycled water to our water supply in Wivenhoe Dam* (20%) were asked if they would continue to do so given three different future situations:

- if it meant not having severe water restrictions ever again;
- if the dams dropped to 5% and South-East Queensland would run out of water in the next few months;
- if, over the first 2 years, there were no ill-health incidents in South-East Queensland that were shown to have been caused by the purified recycled water.

Opposition to the PRW scheme would drop from 20% to 11% of the total sample if it meant *no severe water restrictions* in the future and *evidence of no ill-health effects in the first two years* of operation. However, the situation with greatest influence would be the risk of *running out of water*, where opposition drops to only 6% of the total sample. Again, reasons were provided.

An overall commitment score was calculated using responses to all these questions. Although the clear support for the scheme is evident, it is not absolute. Less than 12% of the total sample are totally supportive under all circumstances. At the same time, only about 3% are totally opposed. However, this is partly due to a number of people feeling that they were being forced into a situation they opposed.

To assess the raltive support for PRW, respondents were asked to consider ten possible new sources of water to meet demand in SEQ. The option of rainwater tanks was judged to be significantly more favourable than the other options. Stormwater irrigation, dual pipe system, state transfers, PRW and greywater garden irrigation were rated as next most favourable. Wastewater irrigation was rated as next most favourable, followed by more desalination plants and more dams. Bore water was rated significantly less favourably than any of the other options.

Respondents were asked to rate their levels of awareness that they lived in an area supplied by Wivenhoe Dam and so consequently would be supplied with purified recycled water. Only 60% of respondents were *very aware* that they would be supplied with PRW for drinking. This should be considered in conjunction with the unprompted knowledge question at the beginning of the questionnaire. There, only two-thirds of respondents could nominate, unprompted, that it was planned for wastewater to be recycled for drinking in SEQ.

When examining these findings together with those respondents who said they would drink PRW from the scheme, only two-thirds of them were *very aware* they would be supplied with PRW, and only two-thirds nominated unprompted that a recycling scheme was planned for drinking in SEQ. This indicates the likelihood that up to one-third of people who currently support the recycling scheme do not realise they will be drinking PRW, and it is unknown how this knowledge may influence their future support.

The predictive behavioural model was again replicated, providing considerable confidence in its validity, especially given the extremely high prediction of 86% of the variance. The different weightings of the relationships between variables in this model compared with those in previous case studies shows that the model is sensitive to different schemes and different communities. The relationships shown here can be seen as specific to SEQ and the PRW scheme that has been communicated to the community.

The three variables, *Subjective Norm, Fairness* and *Emotion* all contribute relatively evenly to the prediction of *Intended Behaviour*. *Health Risk* has a lesser contribution to the direct prediction of *Intended Behaviour*, but it is the mediated effect of the variables, *Trust*, *System Risk* and *Emotion* that need special attention, given their strong relationships. Also of note is the strong direct predictive contribution of *System Risk* to *Health Risk*. It is apparent from qualitative comments that people are nervous about *System Risks*, and unsure about *Health Risks*. While *Trust* in most of the authorities remains as high as it currently is, respondents are accepting that statements about the science, treatment and operations are correct. However, should *Emotion* be heightened, or *Trust* recede, perceptions of risks will heighten, and thus reduce support for the PRW scheme.

Analyses were performed to test for any statistical significant differences between demographic groupings and the main model components of *Intended Behaviour*, *Health Risk*, *System Risk*, *Emotion*, *Trust*, *Fairness* and *Subjective Norm*. Only one significant difference was identified which was based on awareness of PRW supply.

- Participant's who were *very aware* that they would be in a location to be supplied with PRW thought the scheme was more fair than did those who were *not at all aware.*

No significant effects were evident for age, education, sector, country of origin, household unit or gender. This is of interest as, in previous research, key differences have emerged in relation to gender. Further investigation did however show significant differences for gender on two of the individual items of the *Emotion* scale. These differences did not emerge when using the scale as a whole. In this case, the possibility of gender differences should not be totally discounted. The lack of socio-demographic influences on ratings of the model variables indicate that the results can be extrapolated to the wider SEQ population.

The key outcomes of this baseline survey, as presented in detail in this report, clearly support the research plan for the first year of the Systematic Social Analysis project, as it is evident that *risk*, *trust*, *fairness* and *emotion* all need careful investigation to understand their structure and relationships, and to manage potential impacts that could adversely affect intended behaviour.

Of particular importance is the *Trust*, *System Risk*, *Emotion* triangle and its influence on *Health Risk*. In association with this is the relationship of personal and impersonal risks, personal and societal judgements, and the role that perceived *Fairness* might play in these judgements. The dimensions and relative importance of *Environmental Risk* should be included in this overall investigation.

Given the significant contribution that *Fairness* makes to *Intended Behaviour*, and the initial identification of groups in the community that it is thought the PRW scheme will be unfair to, it is important to understand the principles of people's fairness decisions. It is also essential to provide a more appropriate method and venue (than a survey questionnaire) in which community members can explore the concept. It is possible, that in these circumstances, environmental concerns may also feature.

1.0 INTRODUCTION

The planning and management of water resources in the face of uncertain futures are major issues for all concerned from the national to local scales. In South East Queensland (SEQ) the longest drought in history coupled with continued high population growth have combined to deplete dams to historically low levels.

The SEQ Regional Plan (2005-2026) outlines the future urban growth and land use planning for the region (see Figure 1 for a map of the region) and establishes a number of principles for future water management including more efficient use, diversified supplies and sustainable and equitable regional planning and water delivery. The management of water in SEQ is complex and particularly dynamic at present.

The planned investments in water in SEQ have long term environmental, social and economic implications and require scientific insight, targeted information and specific tools to reach desired and timely outcomes. Knowledge spanning the natural and built water systems, infrastructure and treatment technologies, demand management and source development is needed to ensure that policies and infrastructure investments maximise community benefits and enable the successful implementation of selected strategies.

A wide range of challenges are therefore evident for water management in SEQ, and with this in mind, the South East Queensland Urban Water Security Research Alliance was formed. This provides the basis for the collaboration and integration of effort between scientists in Queensland Government Departments, CSIRO, The University of Queensland and Griffith University. Working in concert with the Queensland Government, the science can be tailored to meet the needs of Queensland's long term future.

A key area of the science in the Alliance is that of *Systematic Social Analysis*, as a part of the *Informed Decision Making* Program. Its primary objective is:

> *to develop a partnership between the government, scientists and the community that builds mutual trust, acknowledges a "whole of community" challenge and responsibility, and provides a basis for ongoing sustainable management and use of water resources in SEQ.*

1.1 Purified Recycled Water

In January 2007, the Premier of Queensland announced that the Government made a definitive decision to develop a Purified Recycled Water (PRW) scheme without the previously announced plebiscite . It was expected that this scheme would come on line by late 2008. Market research commissioned by the Queensland Water Commission (QWC) showed that over 70% of the community in SEQ supported an indirect potable reuse scheme. The government wanted to maintain this level of support as well as the community's confidence in the planning and implementation of the scheme and the associated science.

International experiences over almost fifty years have consistently shown that what is known as the *DAD approach* (*Decide-Announce-Defend*) has consistently led to failure in successfully implementing the schemes (eg. the San Diego water purification project; San Gabriel Valley groundwater recharge project). It has also shown that social marketing and persuasion are not at all effective in gaining community support for potable reuse of water (see Po, Kaercher and Nancarrow, 2004). Queensland has also had difficulties in the past with gaining community support to augment

Source: http://www.seqcatchments.com.au/about.html#region

Figure 1: The South East Queensland Region

drinking water supplies with recycled wastewater, both on the Sunshine Coast in the 1990s and more recently in Toowoomba.

Therefore, the Systematic Social Analysis project in the Research Alliance proposed as its first objective: *to identify and provide a baseline measurement of the psychological drivers of the community's intended behaviour in relation to drinking PRW to provide for the informed design of community engagement and education, and the monitoring of any shifts in community attitudes, values and intended behaviours over time and with increased experience*.

While the community cannot change the decision in relation to PRW for indirect potable use, it will be important to provide them with opportunities to be engaged with the science that is associated with the new source planning and implementation. Integration with the biophysical scientific investigations will provide opportunities to address any current or emerging concerns and issues with the intention of maximising and retaining the acceptability of the scheme.

This report describes the outcome of the baseline measure noted above. It also provides information on the strength of community support or rejection of the PRW scheme given different future circumstances, as well as an indicative measure of relative preferences for alternative water sources.

1.2 Previous Research

A research program has been conducted by CSIRO for over five years to understand the drivers of people's behavioural decisions in regard to wastewater reuse where close personal contact is involved. The program began with international literature reviews which revealed little research specifically relating to the recycling of water (Po, Kaercher & Nancarrow 2004; Po & Nancarrow 2004). There were, though, a number of theories of behavioural intention that had been used effectively to predict behaviour in a wide variety of contexts, among the most notable of which was Ajzen's *Theory of Planned Behaviour* (Ajzen 1985). Parallel literatures in fields such as food technology and risk management provided further insights (Syme & Nancarrow 2006). Based on what was known about community preferences in relation to water supply systems and the outcomes of the literature reviews, a number of psycho-social variables that might predict reuse behaviours were identified. Potential measures of the variables were developed and tested in a community experiment where actual behaviours were observed (see Po et. al 2005).

Following this, a model of intended behaviour was hypothesised. The variables in the model were hypothesised to have significant influence over people's decisions to act favourably or otherwise towards recycled water schemes. This was tested in two case studies, one involving treated wastewater fit for horticultural irrigation in Melbourne, and one involving indirect potable reuse through aquifer replenishment in Perth. While not including all the hypothesised variables, a similar predictive behavioural model emerged for both case studies (Po et. al 2005). A number of recommendations for refinement of the model were also evident from this stage of the research program.

In 2006, Leviston et al. tested a refined predictive behavioural model on a similar indirect potable reuse scheme involving the injection of treated wastewater into the drinking water aquifer. The final model replicated the key variables from the previous case studies. Emotion and subjective norms were found to have the strongest direct influence on intended behaviour. Fairness, trust, and perceived health and system risks also had significant influences. Knowledge again failed to contribute significantly to the prediction of intended behaviour. The model was found to be extremely strong in its predictive power, able to account for 82% of the variance in intended behaviour.

1.3 Hypothesised Model of Intended Behaviour in Relation to PRW

From Leviston et al. (2006), the following model of behavioural intention in Figure 2 is hypothesised for the current study, with the variables being described in Table 1 below..

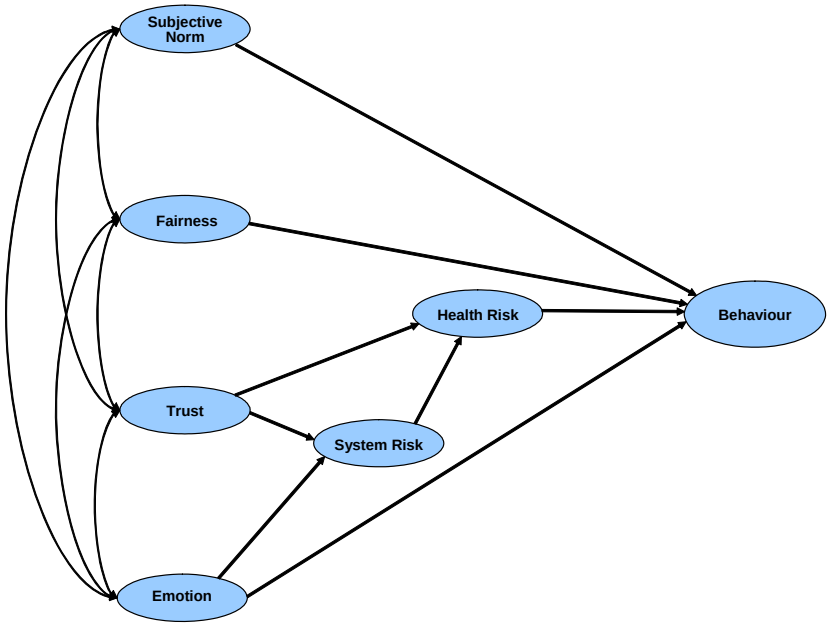


Figure 2. Hypothesised model of intended behaviour in relation to PRW

Table 1. Descriptions of the variables in the hypothesised model

Variable	Description
Subjective Norm	The amount of pressure and influence a person feels from other important people to support the recycled water scheme
Fairness	The person's evaluation of whether the recycled water scheme is fair, both overall and to a variety of users
Trust	The extent to which a person trusts the authorities involved in implementing and managing the recycled water scheme
Health Risk Perceptions	The level of risk to human health a person perceives as posed by the recycled water scheme
System Risk Perceptions	The perceived likelihood a person has that something will go wrong with the recycled water scheme, the perceived seriousness of system failure, and how much control they perceive authorities having over system failure
Emotion	The extent to which a person feels negative or positive emotions towards the recycled water scheme
Intended Behaviour	The intention to behave in a way that supports or protests against the recycled water scheme (eg. the intention to drink the water; the intention to complain to authorities)

2.0 METHODOLOGY

The model shown in Figure 2 was tested in regard to the PRW scheme intended for SEQ by administering a questionnaire by personal interview. A community telephone survey was conducted to collect data from an intended sample of 600 householders.

Respondents were read the overview below (Table 2) of the PRW scheme that included information about the source of the water, the treatment processes involved and the bodies responsible for the regulation, management and operation of the scheme. Interviewers were provided with additional information to assist with any questions the respondents may have asked (Appendix 1).

Table 2. Information read to respondents during the survey

South-East Queensland has experienced a significant reduction in rainfall over the past 30 years, with a record drought over the last five years or so. The reduced rainfall may continue with the onset of climate change. With the increasing population, there is a need to provide reliable sources of water for the future of the region. Most of the water supply for South-East Queensland is from dams, such as Wivenhoe Dam, North Pine Dam and Somerset Dam. Due to the length of the drought, most of the dams' levels are now around 20% despite the recent heavy rains.

The South-East Queensland community has been working to reduce water use, and the Queensland Government is investing in new sources of water. A desalination plant is being built on the Gold Coast to provide water from the sea. Another major source is to use water more than once. Currently, the water used inside our homes in the kitchen, laundry, bathroom and toilet, goes to wastewater treatment plants, where it is treated and disposed into rivers and Moreton Bay. The government has now decided to treat this water to a very high standard and use it in power-stations and to replenish Wivenhoe dam. From the dam, the purified recycled water will be supplied to homes and businesses for drinking, washing, cooking and all other uses.

The treatment plants at Luggage Point, Gibson Island and Bundamba will be part of a seven barrier process to treat the wastewater to drinking-quality using the best available science. The process will remove solids, chemicals from industry and households (including oils and greases, cleaning products, pesticides and pharmaceuticals), as well as bacteria and pathogens. The scientists believe that everything that could possibly be harmful to health will be removed in this process. The treated water will be piped to Wivenhoe Dam where it will mix with normal fresh water. It will later be taken out, treated again in the normal drinking water treatment processes, and piped to industry, houses and businesses. Some people and businesses could still provide their own water by installing a rainwater tank and buying bottled water.

The Queensland Government will appoint a special body to oversee the whole scheme and the government will receive ongoing advice from the Queensland Water Commission, assisted by an independent Expert Advisory Panel. Veolia Water, a private company with world-wide experience, will be responsible for operating the scheme and treating the wastewater to stringent water quality standards. Queensland Health will be responsible for setting the standards guided by the Australian Guidelines for Drinking Water and for Recycled Water. The Department of Natural Resources and Water will be the regulator to ensure Veolia Water meets these standards.

We would now like to know what your thoughts are about using purified recycled water to top up Wivenhoe Dam and then be supplied to your household for all uses, including for drinking.

2.1 Study Area and Respondents

For the purposes of the study, four 'sectors' of SEQ were identified for study. These sectors, comprising of one or a number of adjacent Local Government Areas (LGA) were selected on the basis of receiving current supply from Wivenhoe dam.[1] Target respondent numbers from each of these sectors were determined roughly in relation to relative population, while ensuring sufficient numbers to allow valid statistical comparisons.

Table 3 shows the LGA's each sector encompassed, the target sample numbers, and final sample numbers achieved.

Table 3. Sector LGA, target and number of participants

	Sector 1	Sector 2	Sector 3	Sector 4	
LGA's	Brisbane; Logan	Ipswich	Gatton; Laidley; Esk	Redcliffe; Pine Rivers; Caboolture	**Total Sample**
Target sample numbers	300	90	60	150	**600**
Achieved sample numbers	288	89	57	149	**583**

Suburbs in each of these sectors were stratified socio-economically (lower, medium and higher socio-economic groups) based on average weekly family income figures.[2] Fifteen suburbs were then randomly selected from each of the lower and higher socio-economic groups and thirty suburbs were selected from the medium socio-economic group.

Table 4 lists the suburbs selected across the Sectors under their corresponding socio-economic group. Respondents were randomly selected from the suburbs. A sample of ten respondents aged eighteen years or older from separate households was required for each suburb. An effort was made to recruit an equal number of males and females. Interviewers were instructed to call each household a minimum of five times (at different times of the day and on different days) before they could dismiss it as a "no contact" household. A total of 583 respondents were surveyed, and each interview averaged between 45 minutes to an hour. Table 5 provides a summary of respondent composition.
The refusal rate for the questionnaire was 61.2% [3]. Table 6 below provides a summary of the reasons for refusal.

[1] While Redcliffe, Pine Rivers and Caboolture Shires are normally supplied by North Pine Dam, at the time of the survey, North Pine Dam levels had dropped below 20% - at which point supply to these areas defaults to Wivenhoe Dam.
[2] Source: Australian Bureau of Statistics, 2006 Census
[3] This compares with refusal rates of 72% and 67% in similar surveys conducted by CSIRO in Australian capital cities in recent years. It is similar to the refusal rate for a survey conducted in Brisbane in 2006, and to the survey on indirect potable reuse of wastewater in Perth in 2006.

Table 4. Suburbs by socio-economic category

Lower Socio-Economic	Medium Socio-Economic		Higher Socio-Economic
Banyo	Algester	Lawnton	Bardon
Beachmere	Bellbird Park	Loganholme	Bulimba
Booval	Camira	Lowood	Cornubia a
Boronia Heights	Carina	Narangba	Eatons Hill
Brendale	Churchill	Newmarket	Flinders View
Crestmead	Clayfield	Ningi	Forestdale
Inala	Elimbah	Plainland	Graceville
Kingston	Gatton	Raceview	Griffin
Kippa-ring	Greenbank	Redbank Plains	Gumdale
Laidley	Helidon	Rochedale South	Kenmore
Leichhardt	Heritage park	Rothwell	Minden
Logan Central	Highgate Hill	Scarborough	Morayfield
Margate	Hillcrest	Shailer Park	Paddington
Sandgate	Joyner	St Lucia	Warner
Stafford	Kedron	Tanah Merah	Yamanto

Table 5. Number of respondents surveyed in each socio-economic category by gender

	Male	Female	**TOTAL**
Lower	67	79	**146**
Medium	136	156	**292**
Higher	64	81	**145**
TOTAL	**267**	**316**	**583**

Table 6. Reasons for refusal

Reason	n
Not Interested	616
Too Busy	449
Survey Too Long	191
Hung Up	103
Elderly	73
Limited English	33
Unwell	28
Aborted	9
TOTAL	**1502**

2.2 Estimating Error

If one assumes that a random sample had been drawn, the error on the key question of whether people would drink PRW would be +/- 3.33% at the 95% confidence level. That is, between 70.6% and 77.2% of the population would agree to drink PRW at the 95% confidence level. Since the sample was stratified however, this estimate is likely to be larger than the actual error.

2.3 Ongoing Participation

Respondents were asked at the conclusion of the survey if they would be prepared to be involved in future surveys or discussion meetings that would help us in the research over the next few months. Only 23% of respondents refused.

Those who answered yes (67%) or maybe (10%), were asked what they'd be prepared to participate in. Half (n=227) said they'd be involved in both surveys and discussion meetings, with a further 47% (n=212) saying they'd be involved in surveys. Eleven respondents nominated discussion meetings only. This will provide a good basis to form panels over the duration of the first year's research.

3.0 RESULTS

3.1 Socio-Demographics

A number of socio-demographic questions were asked of respondents at the end of the questionnaire.

3.1.1 Age

The following table provides a breakdown of respondents' age groups.

Table 7. Number of respondents in each age group

Age Group	n (583)	%
18 to 24 years	21	3.6
25 to 39 years	132	22.6
40 to 55 years	205	35.2
56 to 65 years	131	22.5
66 to 75 years	75	12.9
More than 75 years	19	3.3

3.1.2 Income

The following table provides a breakdown of respondents' gross household income.

Table 8. Details of respondents' gross household income

Gross Household Income	n (582)	%
Less than $22,000	83	14.3
$22,001 to $50,000	136	23.4
$50,001 to $75,000	125	21.5
$75,001 to $100,000	76	13.1
$100,001 to $125,000	57	9.8
More than $125,000	60	10.3
Don't know	16	2.7
Refused	29	5.0

3.1.3 Education

The following table provides a breakdown of respondents' highest completed levels of education.

Table 9. Details of respondents' highest levels of formal education

Education	n (582)	%
All or some of primary school	16	2.7
All or some of secondary school	178	30.6
Partial trade or technical qualification	28	4.8
Trade or technical qualification	153	26.3
Partial university qualification	40	6.9
University qualification	167	28.7

3.1.4 Household Unit

The following table provides a breakdown of the unit of people living in the respondents' households.

Table 10. Household Unit

Household Unit	n (581)	%
Single adult < 65 years	42	7.2
Single adult > 65 years	34	5.9
Two adults - older person < 65	121	20.8
Two adults - older person > 65	73	12.6
Single adult - eldest child < 18	24	4.1
Single adult - eldest child > 18	11	1.9
Two adults - eldest child < 18	143	24.6
Two adults - eldest child > 18	77	13.3
Two adults - no children	27	4.6
More than two adults - eldest child < 18	21	3.6
More than two adults - eldest child > 18	8	1.4

3.1.5 Country of Birth

Respondents were asked their country of birth. Approximately three-quarters of respondents were born in Australia (73.4%). A further 10% were born in the United Kingdom, while 5% were born in New Zealand.

3.1.6 Representivity of the Sample

To assess the representivity of the sample, a comparison was made with ABS 2006 Census data for age, given that the sample had been stratified by income and gender. See Table 11 for this comparison.

Table 11: Comparison of survey respondents' ages with those of the population

Sector			Less than 24yrs	24 to 39yrs	40 to 55yrs	56 to 65yrs	66 to 75yrs	More than 75yrs	Total
Brisbane; Logan LGA	Survey	Count	15	75	105	54	31	8	288
		%	5.2	26.0	36.5	18.8	10.8	2.8	100.0
	ABS	Count	373,306	285,903	244,602	108,228	60,060	57,293	1,129,392
		%	33.1	25.3	21.7	9.6	5.3	5.1	100.0
Ipswich LGA	Survey	Count	1	20	20	30	15	3	89
		%	1.1	22.5	22.5	33.7	16.9	3.4	100.0
	ABS	Count	52,146	31,938	30,450	12,754	7,350	5,543	140,181
		%	37.2	22.8	21.7	9.1	5.2	4.0	100.0
Gatton; Laidley; Esk LGA	Survey	Count	1	12	21	14	6	3	57
		%	1.8	21.1	36.8	24.6	10.5	5.3	100.0
	ABS	Count	15,081	7,998	10,846	5,991	3,365	2,006	45,287
		%	33.3	17.7	23.9	13.2	7.4	4.4	100.0
Redcliffe; Pine-Rivers; Caboolture LGA	Survey	Count	4	25	59	33	23	5	149
		%	2.7	16.8	39.6	22.1	15.4	3.4	100.0
	ABS	Count	111,140	67,610	73,334	36,496	20,461	15,747	324,788
		%	34.2	20.8	22.6	11.2	6.3	4.8	100.0
Total	Survey	Count	21	132	205	131	75	19	583
		%	3.6	22.6	35.2	22.5	12.9	3.3	100.0
	ABS	Count	551,673	393,449	359,232	163,469	91,236	80,589	1,639,648
		%	33.6	24.0	21.9	10.0	5.6	4.9	100.0

It is apparent that the survey sample is older than the general population of SEQ which is not unusual for surveys of this length. However, as age does not influence any of the model variables (see Section 3.3.1), the older survey sample is not of concern.

3.2 Preliminary Analysis

Examination of the variables was undertaken using correlation analysis, analysis of variance (ANOVA), factor analysis and reliability analysis. This was followed by an investigation of the causal relationships between the components of the model using structural equation modelling.

For the preliminary analysis, a significance level of $p<.01$ was applied to ensure that the findings reported are appropriately conservative. Differences referred to as "significant" denote statistical significance at this level. The number of valid responses to a question is signified by "n" and/or as a percentage of the whole sample.

3.2.1 Knowledge about Wastewater Recycling

Before being provided with any information about the proposed PRW scheme in SEQ, respondents were asked a series of general questions about wastewater and wastewater recycling to determine both their levels of self-reported knowledge, as well as levels of actual knowledge.

First, respondents were asked to rate what they considered their levels of knowledge to be about the recycling of wastewater in general. Their responses are shown in Table 12 below.

Table 12. Knowledge about the recycling of wastewater

Option	n (582)	%
1 – No knowledge at all	54	9.3
2	155	26.6
3 – Some knowledge	259	44.5
4	78	13.4
5 – High level of knowledge	36	6.2
Mean = 2.81 Median = 3		

Slightly less than half the sample (44.5%) thought they had *some knowledge* about the recycling of wastewater, while about one-fifth thought they had higher levels of knowledge. Just over one-third of respondents considered they had lower levels to no knowledge.

Respondents were then asked, unprompted, where they thought wastewater came from and were allowed more than one answer. Most people were able to provide at least one correct answer with the most common responses being that wastewater comes from *sewage* (55.3%), followed by *bathrooms* (50.8%), *laundries* (49.9%), *kitchens* (49.4%) and *toilets* (45.3%). A small number of people (7.5%) could not offer a response, while others provided additional incorrect or non-specific answers. A full list of responses can be seen in Appendix 2.

3.2.2 Knowledge about Wastewater Recycling in SEQ

Respondents were further asked if there was anything for which they thought recycled wastewater was ***currently*** being used in SEQ. The most common responses were: *industries* (41.2%); *watering parks or reserves* (33.1%); and *power stations* (27.2%). Consistent with respondents' ratings of levels of knowledge above, just over one-third of respondents (38.1%) stated that they did not know any current uses of wastewater in SEQ. A full list of responses can be found in Appendix 2.

Respondents were also asked whether they knew of any planned future uses for recycled wastewater in SEQ. The most common responses provided by respondents were *drinking water* (66.1%), followed by *power stations* (35.0%), *industrial use* (33.6%), and *replenishing dams* (31.7%). Almost a quarter of respondents (23.5%) did not know of any planned uses.

Respondents who cited *drinking water* (66.1%, n=297) were prompted to nominate the geographic location where this would occur. Around half of these respondents (48.1%, n=140) proposed *all suburbs in South East Queensland*. A full list of responses to this question is included in Appendix 2.

3.2.3 Summary – Knowledge

Almost two-thirds of respondents considered they had some knowledge through to high knowledge about the recycling of wastewater and this was generally supported when asked to provide unprompted, specific answers to indicate their *actual* levels of knowledge. However, 38% of people could not name any ways that recycled wastewater is currently being used in SEQ, and 24% could not name any future planned uses. A number of other responses also indicated a lack of specificity of knowledge, or misunderstandings of recycled water issues. While the different terminology (PRW and recycled wastewater) could be considered a factor in people's apparent lack of knowledge, it is consistent with the PRW awareness question at the end of the survey (see Section 3.1.16). This then provides the QWC communication team with a challenge for future community education.

3.2.4 Intended Behaviour

Having had the proposed PRW scheme described to them (see Section 2), respondents were asked whether they would drink water from such a scheme. The responses to the question are shown in the following table.

Table 13. Would you drink the purified recycled water …?

Response	n (583)	%
Yes	431	73.9
Not sure	79	13.6
No	73	12.5

The majority of respondents (73.9%) said that they would drink the PRW from the scheme. Few respondents (12.5%) said they would not be prepared to drink the water. This support is consistent with previous market research commissioned by the Queensland Water Commission. Respondents were also asked to provide reasons for their responses. A wide range of reasons for their behavioural

decisions were provided and those most frequently offered are shown in the following tables.

Table 14. Reasons for agreement with drinking PRW

Response	n (427)	%
Necessity/ We're running out of water- (drought and population demands)	91	21.3
PRW schemes are undertaken or have been experienced elsewhere	63	14.8
Confidence in the PRW process- science & technology; or treatment	60	14.1
PRW is a good idea/ no problems with the scheme	59	13.8
Used to poor water quality already/ it can't be worse- dams; country water; or bores	51	11.9
PRW is safe/ not risky/ risks distorted	38	8.9
I have no other choice	34	8.0
PRW will be better than current water available	27	6.3

NB: %s do not add to 100 as more than one response was allowed.

Table 15. Reasons for refusal to drink PRW

Response	n (72)	%
Not all contaminates can be detected or removed- hormones; viruses; chemicals; or pharmaceuticals	22	30.6
Will rely on other drinking water options- rainwater; bottled; or bore	16	22.2
Concerns re. health impacts/ safety- long-term; cumulative	13	18.1
Lack of trust in process/ science & technology- human error; system failure; or scientific uncertainties	13	18.1
Affective reasons- the thought of it is disgusting; yuck; or unappealing	10	13.9
PRW is more appropriate for other uses- industry; green-space; or other household	10	13.9
Disapproval/ lack of trust & confidence in government- untimely action; incompetent; or deceptive	9	12.5

NB: %s do not add to 100 as more than one response was allowed.

Table 16. Reasons for not being sure about drinking PRW

Response	n (79)	%
I have no other choice	21	26.6
PRW is more appropriate for other uses- industry; green-space; or other household	14	17.7
Affective reasons- the thought of it is disgusting; yuck; or unappealing	13	16.5
Not all contaminates can be detected or removed- hormones; viruses; chemicals; or pharmaceuticals	12	15.2
Concerns re. health impacts/ safety- long-term; cumulative	10	12.7

NB: %s do not add to 100 as more than one response was allowed.

The degree of support for the proposed water supply system and drinking PRW was provided by rating their agreement or disagreement with a number of statements on a 6-point Likert scale. The scale ranged from 1 (*strongly disagree*) through to 6 (*strongly agree*). A 6-point scale was used deliberately to prevent people from "sitting on the fence" and required an agree or disagree response. It also provided people with an opportunity to qualify their positive or negative intentions through the use of the scale rather than a *yes*, *no*, *unsure* judgement. Details are shown in Table 17 below.

Just under half of respondents (43.4%) expressed agreement with the statement - *"given the choice, I would not drink water that contained purified recycled water"*. This suggests that, while support for the scheme is generally high, as consistently shown in responses to the other six statements, many respondents would prefer not to drink PRW if given the choice.

Responses to the statements are presented again as mean ratings in Figure 3.

Table 17. Agreement ratings of statements indicating support for and intended behaviour in relation to the PRW scheme

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Somewhat Disagree (%)	4 Somewhat Agree (%)	5 Agree (%)	6 Strongly agree (%)	**Mean**
I support adding purified recycled water to our water supply in Wivenhoe Dam (n=583)	9.6	5.5	4.8	7.7	26.6	45.8	**4.74**
I would drink the water that was provided by this recycling scheme (n=581)	10.8	4.5	4.0	6.9	31.8	42.0	**4.70**
I believe that this recycling scheme will be safe to use (n=583)	8.2	6.0	6.2	10.3	32.6	36.7	**4.63**
Given the choice, I would not drink water that contained purified recycled water (n=581)	26.5	23.2	6.9	11.4	14.8	17.2	**3.16**
I do not want purified recycled water to be mixed with my drinking water (n=583)	39.6	30.4	6.2	5.7	5.5	12.7	**2.45**
I would protest purified recycled water being added to my drinking water (n=581)	45.1	33.7	4.8	3.3	4.8	8.3	**2.14**
I would complain to the government if purified recycled water was added to our drinking water in Wivenhoe dam (n=583)	45.5	34.5	5.0	3.1	4.5	7.5	**2.09**

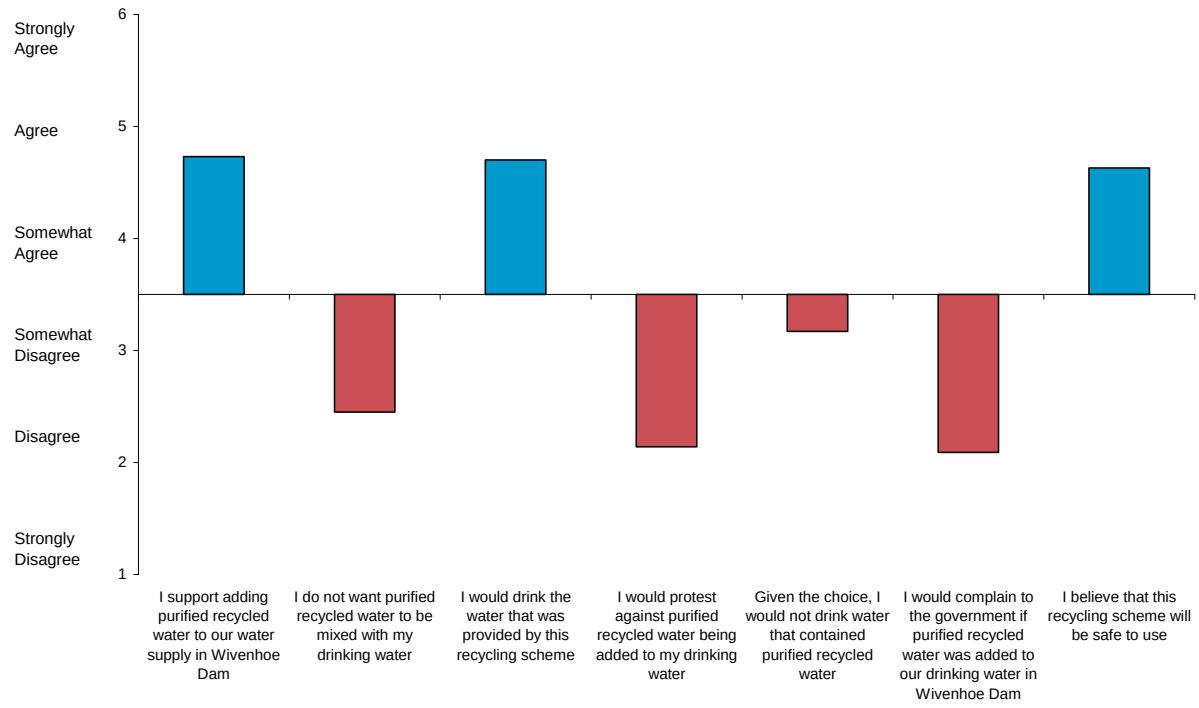


Figure 3. Mean scores on statements indicating support for and intended behaviour in relation to the PRW scheme

3.2.5 Direct Potable Recycled Water Supply

Participants were asked, would you consider drinking purified recycled water in a scheme that did not pump the water into the dam first, but piped it straight from the treatment plant to your house?

In contrast to support for the proposed indirect potable reuse scheme, only 29% of respondents would support a direct potable reuse scheme, with 23.3% being unsure, and almost half the sample (47.7%) being opposed. These results are different from recent market research in SEQ (UMR 2007) where similar support was shown for direct potable reuse (71%) as for indirect potable reuse (74%). However, much of the difference may be explained through the wording of the two questions. The wording of the question in this current survey was very explicit as shown above. The question in the market research asked, would you be comfortable drinking pure recycled water? The difference between **purified** recycled water and **pure** recycled water may not have been evident to respondents.

Respondents were asked to give the reasons for their answers. Those who reported they would drink from a direct potable reuse scheme (n=168), gave as their major reasons: *it would still be treated to highest standards* (27.5%); *would still be safe* (13.8%); and *no problems/no reason not to* (12.0%).

Those who were unsure if they would drink from a direct potable reuse scheme (n=135) gave as their main reasons, *additional treatment in the dam/second treatment/naturally treated* (27.4%); *prefer it to be mixed/diluted* (17.8%); *need more information/comparative treatments* (11.9%).

Those who refused to drink from a direct potable scheme (n=276) gave as their main reasons: *additional treatment in the dam/second treatment/naturally treated* (35.5%); *prefer it to be mixed/diluted* (20.7%); *prefer water to go into the dam first* (10.7%); and *just don't want to drink it/against the idea* (9.8%).

3.2.6 Trust

Respondents were asked how much they would trust:

- a *Queensland Government body* to oversee and regulate the whole recycling scheme?
- *Veolia Water* to consistently provide high standards of treatment of the wastewater to a purified state?
- the *Department of Natural Resources and Water* to ensure that Veolia water meets the water quality standards?
- *Queensland Health* to set safe drinking water standards and
- *scientists* to provide the best science for safe drinking water from this recycling scheme?

They were asked to rate their levels of trust on a 5-point scale ranging from 1 (*no trust at all*) to 5 (*complete trust*). Table 18 details the responses.

Table 18. Levels of trust in the specific bodies to peform different roles or responsibilities

	1 No trust at all (%)	2 (%)	3 Some trust (%)	4 (%)	5 Complete trust (%)	**Mean**
Scientists (n=582)	4.8	3.1	12.2	34.0	45.9	**4.13**
Queensland Health (n=583)	9.3	7.5	21.3	31.6	30.4	**3.66**
Department of Natural Resources and Water (n=579)	7.6	8.3	23.0	34.7	26.4	**3.64**
Veolia Water (n=539)*	9.3	8.0	29.1	33.2	20.4	**3.47**
Queensland Government body (n=583)	13.4	11.1	29.5	28.0	18.0	**3.26**

* 44 respondents could not provide an answer as they did not know Veolia Water

Overall, respondents felt some degree of trust in the different bodies involved in the purified recycled water scheme. A very high percentage of respondents (92.1%) had at least some degree of trust in scientists to produce the best science for safe drinking water from the recycling scheme. Similarly, the majority of respondents reported at least some degree of trust in the *Department of Natural Resources and Water* (84.1%) to ensure Veolia Water meets the water quality standards, *Queensland Health* (83.1%) to set safe drinking water standards, *Veolia Water* (82.8%) to consistently produce high standards of treatment of the wastewater to a purified state and *a Queensland Government body* (75.5%) to oversee and regulate the whole recycling scheme.

When considering the ratings of trust in Queensland Health, it should be noted that people were responding to trust in setting standards, and not to performing ongoing management or implementation roles.

The mean trust ratings displayed in Figure 4 show similar results. Consistent with previous research (e.g. Leviston et al., 2006; Po et al., 2005), the trust rating for scientists was found to be significantly higher than for any of the other bodies. Trust in a Queensland Government body to oversee and regulate the scheme was significantly lower than all other bodies. This is perhaps not surprising given the unknown nature of this body at present.

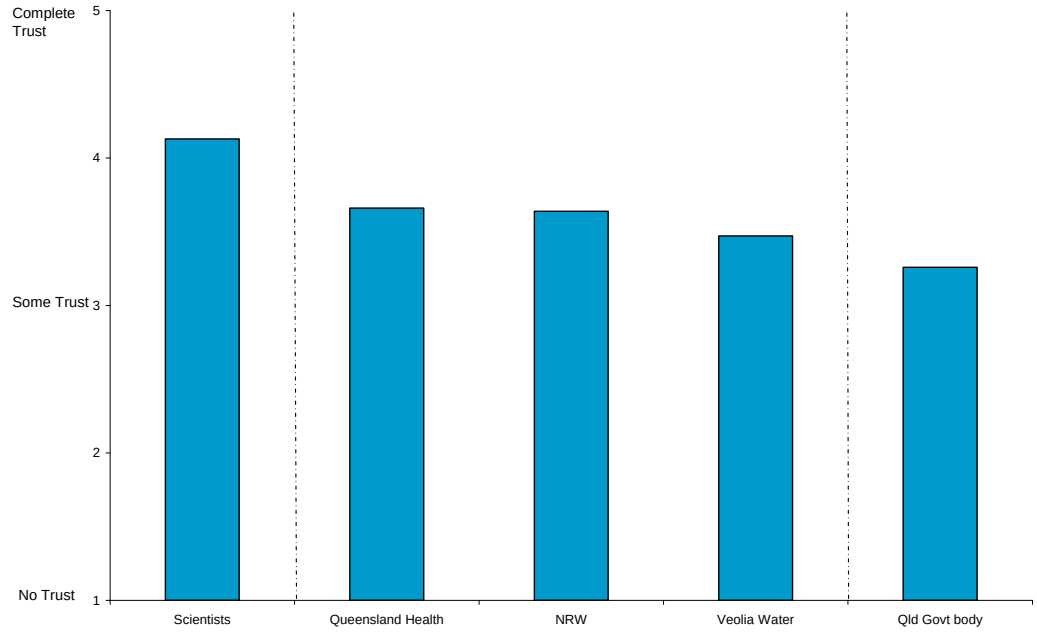


Figure 4. Mean ratings of trust in specific bodies to responsibly manage and operate the scheme

Respondents were then asked how much they would trust a range of bodies *to provide reliable information on issues associated with the scheme*. Again, responses were on a 5-point scale ranging from 1 (*no trust at all*) to 5 (*complete trust*). Results are listed in Table 19.

Overall, there was some degree of trust in all bodies to provide reliable information. The majority of respondents rated having some degree of trust in CSIRO (96.7%), universities (91.8%) and medical doctors (91.2%). Similarly, a high proportion of respondents said they would have at least some degree of trust in the Department of Natural Resources and Water (87.0%), the Environmental Protection Agency (88.2%), environmental groups (84.8%), consumer groups (85.5%), the Queensland Water Commission (84.4%), and Queensland Health (81.3%). About one-third of respondents (34.2%) said they would not trust information provided by private companies.

Table 19. Level of trust in specific bodies to provide reliable information about issues associated with the PRW scheme

Information sources	1 No trust at all (%)	2 (%)	3 Some trust (%)	4 (%)	5 Complete trust (%)	**Mean**
CSIRO (n=581)	1.2	2.1	12.6	36.1	48.0	**4.28**
Medical Doctors (n=579)	2.2	6.6	24.2	36.8	30.2	**3.86**
Universities (n=578)	2.9	5.2	24.9	38.2	28.7	**3.85**
Environmental Protection Agency (n=581)	4.3	7.4	22.0	37.3	28.9	**3.79**
Department of Natural Resources and Water (n=578)	5.2	7.8	26.3	38.4	22.3	**3.65**
Consumer groups (n=581)	3.6	10.8	28.2	34.1	23.2	**3.63**
Environmental groups (n=581)	5.5	9.6	30.6	32.0	22.2	**3.56**
Queensland Water Commission (n=577)	7.5	8.1	30.0	35.0	19.4	**3.51**
Queensland Health (n=581)	8.1	10.7	25.5	35.3	20.5	**3.49**
Veolia Water* (n=525)	10.3	10.9	37.1	30.7	11.0	**3.21**
Private companies (n=576)	13.5	20.7	43.8	17.5	4.5	**2.79**

* 56 respondents felt they could not respond as they did not know Veolia Water.

Figure 5 provides a summary of mean scores of trust in information providers. In line with past research, CSIRO was rated as the most trustworthy organisation to provide information in regard to the recycling scheme, significantly more so than any other information source. Information from medical doctors, universities and the EPA was rated as next most trustworthy. Information from the Department of Natural Resources, consumer groups, environmental groups, the Queensland Water Commission and Queensland Health was rated as significantly less trustworthy than the above group, while information from Veolia Water was rated as significantly less trustworthy again. Finally, private companies were rated as significantly less trustworthy than all other information sources.

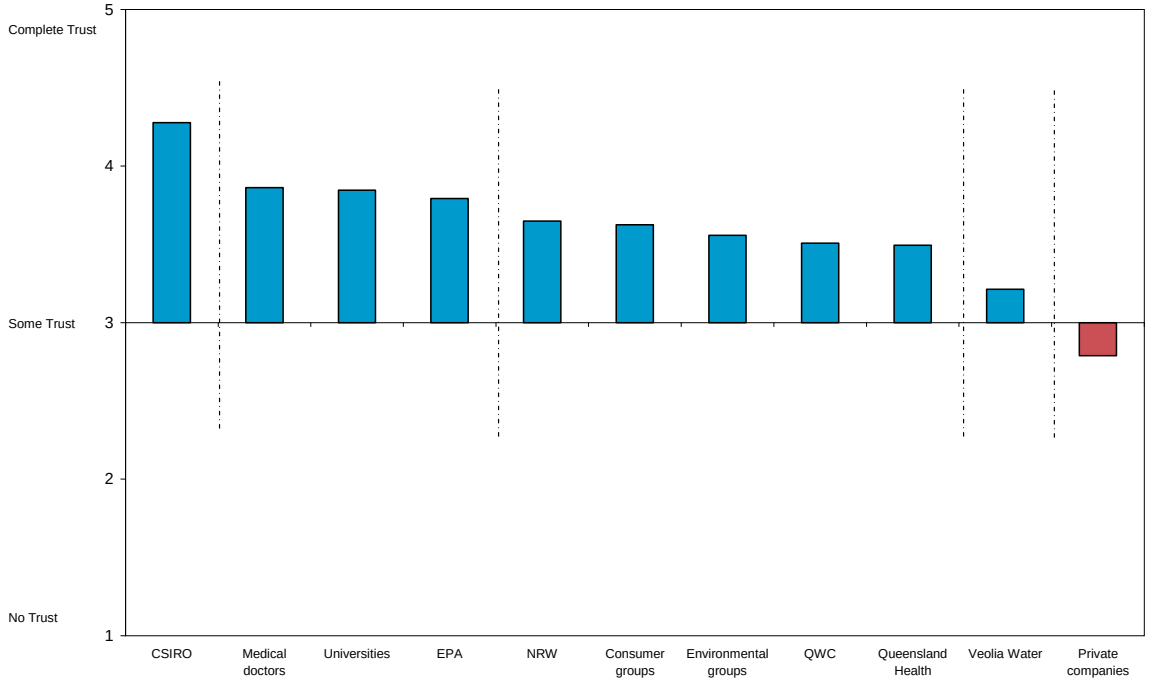


Figure 5: Mean ratings of trust in specific bodies to provide reliable information about the scheme

Respondents were further asked a number of attitudinal statements concerning trust in authorities in general, on a 5-point scale from 1 (*strongly disagree*) through to 5 (*strongly agree*). Results are detailed in Table 20.

Table 20. Trust in authorities in general to ensure quality, safety and responsible water management

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Neither (%)	4 Agree (%)	5 Strongly agree (%)	**Mean**
I have complete trust in the government authorities to ensure I have healthy and safe water (n=582)	10.8	15.1	21.5	38.7	13.9	**3.30**
I have complete trust in any information about the safety of our water given to me by the various government authorities (n=582)	11.7	14.6	24.7	38.0	11.0	**3.22**
I have complete trust in the government authorities to manage our water supply responsibly (n=582)	12.9	16.3	25.6	34.5	10.7	**3.14**
I have complete trust in private companies to ensure I have safe and healthy water (n=582)	14.1	25.9	31.3	25.3	3.4	**2.78**

About one-quarter of respondents disagreed with statements that indicated trust in the authorities to perform different water supply functions. This increased substantially to 40% when considering private companies.

3.2.7 Fairness

Respondents were asked to rate what they believed to be the fairness of the PRW scheme for a number of different potential "users" as well as considerations of overall fairness, responding on a scale from 1 (*unfair*) through to 4 (*fair*). Details are listed in Table 21.

Overall the scheme was rated as being reasonably fair, with a mean fairness rating of 3.31. Only 11% rated the scheme as *unfair*. Over 50% of respondents rated the scheme as *fair* for each of the "users". Although there was little overall difference in how respondents rated the scheme's fairness to the range of users, two significant differences did emerge.

- The scheme was considered to be significantly less fair to *households on low incomes* than to all other users.

- The scheme was considered to be significantly less fair to *households with children* than to *households without children*.

Table 21. Fairness of the recycled water scheme to a variety of users

"Users"	1 Unfair (%)	2 (%)	3 (%)	4 Fair (%)	**Mean**
Households on high income (n=576)	7.5	7.8	16.5	68.2	**3.45**
The natural environment in South-East Queensland (n=569)	6.2	9.1	21.8	62.9	**3.41**
Households with no children (n=579)	8.8	7.6	19.2	64.4	**3.39**
The natural environment in and around the dam (n=569)	7.6	10.2	20.4	61.9	**3.37**
The households in the supply area (n=580)	11.0	8.3	19.8	60.9	**3.31**
Overall, for South-East Queensland (n=580)	10.5	8.3	20.7	60.5	**3.31**
Households with children (n=580)	12.2	9.0	19.5	59.3	**3.26**
The households outside the supply area (n=569)	8.8	13.9	22.5	54.8	**3.23**
Elderly people (n=580)	12.9	9.5	19.0	58.6	**3.23**
Households on low income (n=571)	14.2	11.2	17.9	56.7	**3.17**

3.2.8 Perceived Personal Control

Respondents were asked to rate four statements relating to how much personal control they felt they had over their personal water sources, on a 5-point scale from 1 (*strongly disagree*) through to 5 (*strongly agree*). Details are listed in Table 22.

There was some disparity in these results about perceived personal control over drinking water sources. On average people agreed that there would be no choice but to drink purified recycled water with continued low rainfall, and that they have little say over where drinking water comes from. On the other hand, participants also believed that they could afford to drink water other than from the tap, and that they could source drinking water from elsewhere if they did not like the tap water.

On closer examination however, the former two statements could be seen as addressing perceived personal control at a system level, where people may see little ability to influence what happens. The latter two statements are more about personal control at a household level where there is greater influence. As would be expected, those respondents with the highest level of household income were significantly more likely to consider they could afford to drink water other than tap water, and those with the lowest level of income were least likely to do so.

Table 22. Frequencies and means for *Perceived Personal Control* items

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Neither (%)	4 Agree (%)	5 Strongly agree (%)	**Mean**
If it doesn't rain, I won't have a choice about drinking purified recycled water (n=581)	3.8	12.2	5.9	37.3	40.8	**3.99**
If I don't like my tap water, I can get drinking water from somewhere else (n=580)	2.8	11.7	7.4	50.7	27.4	**3.88**
I have little say over where the water I drink comes from (n=582)	4.8	12.5	12.0	43.1	27.5	**3.76**
I can't afford to drink anything else except tap water (n=576)	14.6	39.9	18.6	20.8	6.1	**2.64**

3.2.9 Subjective Norm

Respondents rated four statements relating to subjective norm – the extent to which respondents thought that "important others" would support the PRW scheme – on a 5-point scale from 1 (*strongly disagree*) through to 5 (*strongly agree*). In this case, "important others" is taken to also refer to people in SEQ, as well as family and close relationships.

Almost two-thirds of participants believed that people close to them would support adding PRW to the dams (64.4%), and that most of their families would drink water mixed with PRW (63.4%). However, there was a more divided view about whether most people in SEQ would be happy to drink water mixed with PRW, and whether others in SEQ would disagree with adding PRW to the dams. Details are shown in Table 23.

Table 23. Frequencies and means for *Subjective Norm* items

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Neither (%)	4 Agree (%)	5 Strongly agree (%)	**Mean**
South-East Queensland people would generally disagree with adding purified recycled water to our dams (n=581)	4.8	24.1	34.1	28.7	8.3	**3.12**
Most of my family would be happy to drink water mixed with purified recycled water (n=582)	11.3	10.5	14.8	40.0	23.4	**3.54**
Those people close to me would support putting purified recycled water in our dams (n=582)	8.6	11.2	16.8	40.9	22.5	**3.58**
I think most people in South-East Queensland would be happy to drink water that has been mixed with purified recycled water (n=582)	8.1	20.1	32.6	30.8	8.4	**3.11**

3.2.10 Alternative Future

Respondents were asked to rate their agreement with the statement *"drinking purified recycled water is better than having no water to drink"*. Only 2.1% of respondents disagreed with this statement as shown in the following table.

Table 24. Frequency and mean for *Alternative Futures* statement

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Neither (%)	4 Agree (%)	5 Strongly agree (%)	**Mean**
Drinking purified recycled water is better than having no water to drink (n=582)	0.9	1.2	3.3	30.6	64.1	**4.56**

3.2.11 Population

Respondents were asked to rate their agreement with the statement, *"if we stopped so many people coming into Queensland, we wouldn't need to drink purified recycled water".* As shown in Table 25, more than half the sample (59.6%) disagreed with this statement.

Table 25. Frequency and mean for *Population* statement

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Neither (%)	4 Agree (%)	5 Strongly agree (%)	**Mean**
If we stopped so many people coming into Queensland, we wouldn't need to drink purified recycled water (n=582)	25.4	34.2	11.9	16.3	12.2	**2.56**

3.2.12 Risk

3.2.12.1 Environmental Risk

Respondents' perceptions of environmental risk were measured through ratings of agreement with three statements as shown in Table 26.

Table 26. Frequencies and means for *Environmental Risk* items

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Neither (%)	4 Agree (%)	5 Strongly agree (%)	**Mean**
Our dams and waterways are too important to risk upsetting the natural balance (n=581)	7.4	21.7	23.6	31.0	16.4	**3.27**
Adding purified recycled water to dams will not harm plants and animals (n=576)	3.1	7.5	21.5	46.5	21.4	**3.76**
There is no risk to our natural environment from adding purified recycled water to Wivenhoe Dam (n=579)	3.8	7.9	23.5	41.8	23.0	**3.72**

Almost half of all respondents believed that dams and waterways were too sensitive to risk upsetting the natural balance (47.4%), while about two-thirds of the respondents thought that the PRW would not harm plants or animals (67.9%), and that there was no risk to the natural environment from the addition of purified recycled water to Wivenhoe Dam (64.8%). However, the means for all three statements indicated a lack of strong opinion. The absence of any reference to environmental management in the information provided to respondents would have made it more difficult for people to answer this.

3.2.12.2 Health Risk

Respondents rated four statements relating to potential health risks associated with the recycled water scheme, on the same 5-point agree/disagree scale.

Table 27. Frequencies and means for *Health Risk* items

Statement	1 Strongly disagree (%)	2 Disagree (%)	3 Neither (%)	4 Agree (%)	5 Strongly agree (%)	**Mean**
There will be no health risk to me from drinking water from this scheme (n=577)	6.6	10.2	21.0	44.4	17.9	**3.57**
Drinking water from this scheme will not lead to health problems in the community (n=581)	5.5	12.9	26.3	39.9	15.3	**3.47**
This scheme poses a health risk to young children (n=581)	23.2	39.4	20.3	11.9	5.2	**2.36**
Drinking water from this scheme will pose a health risk to me (n=582)	31.1	38.3	13.6	10.5	6.5	**2.23**

The apparent inconsistency of responses to these statements indicate a level of uncertainty in the community about health risks. While 69.4% of people disagreed that *drinking water from this scheme will pose a health risk to me*, this dropped to 62.3% in agreement that *there would be no health risk to me from drinking water from this scheme*. A similar proportion (62.6%) disagreed that the scheme would *pose a health risk to young children*. However, only 55.2% agreed that there will be *no health problems in the community*.

While it may be tempting to suggest that the difference in ratings to the two similar statements about personal health risks may be attributed to the reversal of the wording, the difference in the ratings is principally in the percentages of people who were ambivalent about the statements (rated 3 – neither agree nor disagree), rather than rating of overall agreement or disagreement (ie. about 17% rated

agreement or disagreement). What this may indicate is that people were more concerned about the risks to *the community* rather than the risks to themselves. This is consistent with the literature that suggests that people consider themselves to be less likely than the general community to be the subject of health risks (Weinstein 1989; Weinstein and Lyon 1999).

Overall, these findings indicate a need to explore the issue of perceived health risks in greater depth with community representatives.

3.2.12.3 System Risk

Respondents were asked three questions relating to potential system risks associated with the PRW scheme, on three 5-point scales. First, they were asked to rate what they thought the likelihood was of something going wrong with the operation of the water supply scheme. The results showed a spread of opinion with about a third of people considering it to be unlikely, a third considering it to be likely, and about a third thinking it to be neither likely nor unlikely.

Table 28. Perceived likelihood of something going wrong with the water supply system

Option	n (580)	%
1 – Highly Unlikely	73	12.6
2	122	21.0
3 – Neither likely nor unlikely	185	31.9
4	107	18.4
5 – Highly likely	93	16.0
Mean = 3.04		

Respondents were then asked to rate how serious they thought it would be if something went wrong with the water supply scheme. Table 29 shows that most participants thought that any potential problems would be serious to some degree (88.7%), with over half considering that potential problems would be *extremely serious* (52.9%).

Table 29. Perceived seriousness of potential problems with the water supply system

Option	n (578)	%
1 – Not at all Serious	14	2.4
2	51	8.8
3 – Serious	111	19.2
4	96	16.6
5 – Extremely serious	306	52.9
Mean = 4.09		

Respondents were then asked to rate what level of control they thought that the government authorities would have to stop something going wrong. The majority of the sample thought that authorities would have some level of control (84.7%), with about a third believing that authorities would have a high level of control (35.6%). See Table 30.

Table 30. Perceived level of control that authorities would have over something going wrong

Option	n (579)	%
1 – No control at all	38	6.6
2	51	8.8
3 – Some control	163	28.2
4	121	20.9
5 – High level of control	206	35.6
Mean = 3.70		

3.2.13 Attitudes to Potential Outcomes of PRW

Respondents were provided with eight potential outcomes that may result from the proposed PRW scheme, and were asked to rate the likelihood of these outcomes occurring on a 5-point scale, ranging from 1 (*highly unlikely*) through to 5 (*highly likely*). They were then asked to rate the importance of each of the potential outcomes, on another 5-point scale ranging from 1 (*not at all important*) through to 5 (*extremely important)*. The mean responses to both likelihood and importance ratings are displayed in Figure 6.

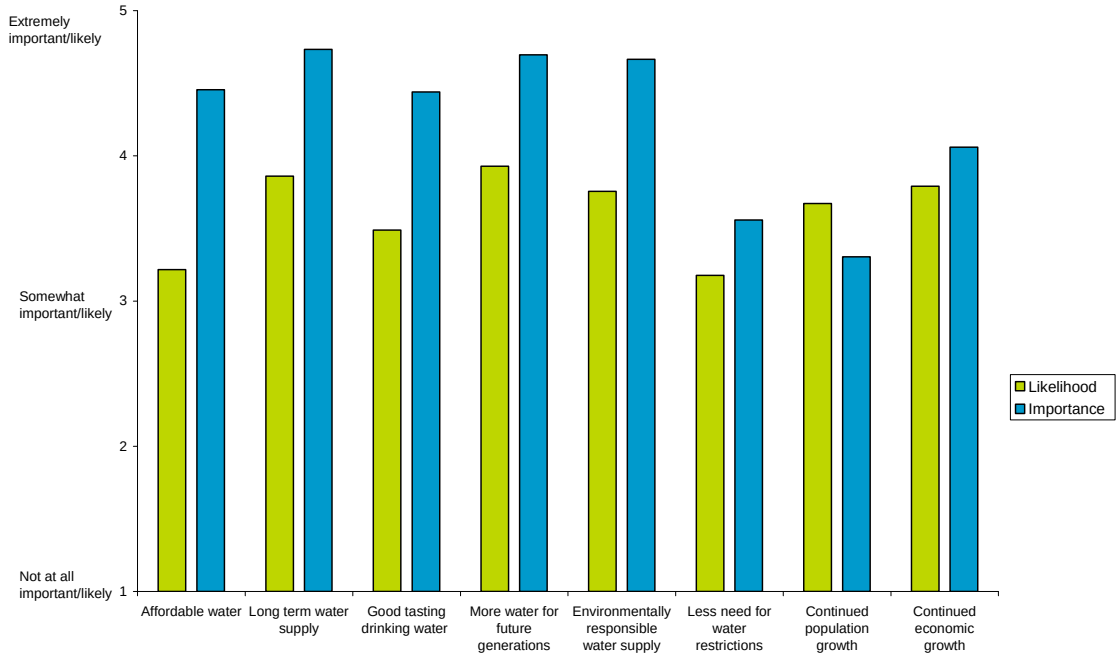
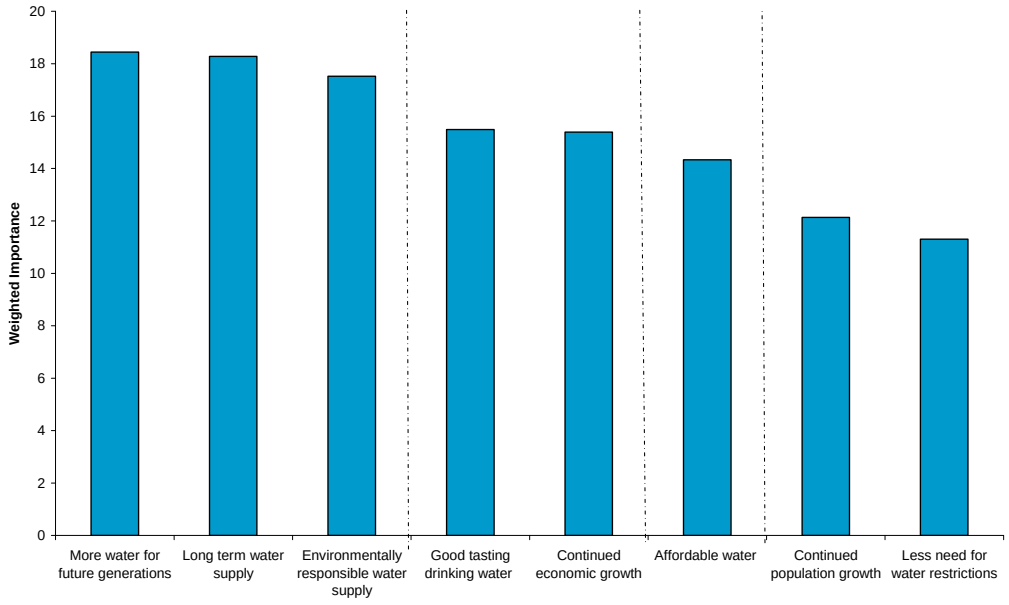


Figure 6: Mean likelihood and importance of ratings of potential outcomes from the PRW scheme

For all potential outcomes, importance ratings were higher than likelihood with the exception of *continued population growth* for which people believed was more likely than important.
By multiplying the likelihood and importance ratings, outcome weightings were produced. *More water for future generations* and *a long term water supply* were the highest weighted potential outcomes of the PRW scheme, with *less need for water restrictions* being the lowest. Results are shown in Figure 7.



Indicates significant differences between groups

Figure 7: Weighted potential outcomes of the PRW scheme

More water for future generations, a long term water supply and an environmentally sustainable water supply were rated significantly higher than the other outcomes. These were followed by good tasting drinking water and economic growth which were rated significantly lower than the previous group. Significantly lower than these was affordable water. Finally, continued population growth and less need for water restrictions were rated significantly lower than all other outcomes.

3.2.14 Strength of Support for or Opposition to PRW

A methodology adapted from Connerley (1986) was used to test the strength of respondents' support for or opposition to PRW. People's primary responses were challenged through the consideration of future alternatives or different situations.

3.2.14.1 Support for PRW

Respondents who strongly agreed, agreed or somewhat agreed with the statement *I support adding purified recycled water to our water supply in Wivenhoe Dam* (80%) (see Section 3.1.4) were asked if they would still be supportive if three future alternatives occurred:

- if it rained and filled the dams to pre-drought levels;
- if they thought there might be some negative impacts on the environment in and around the dam by adding purified recycled water to the natural dam water;
- if they thought enough water could be provided by other water management options.

Figure 8 shows the results of those who continued to be supportive of PRW, those who were unsure and those who changed their minds and withdrew support.

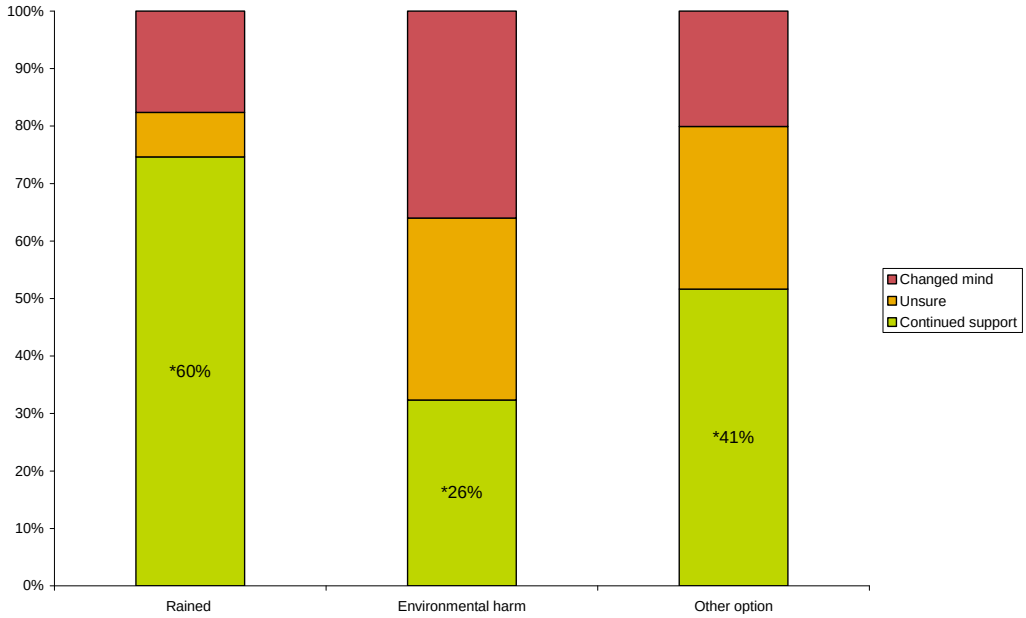
It is evident from Figure 8 that the situation that has the greatest potential to reduce support for the PRW scheme is if, by adding PRW to the natural dam water, there would be some negative impacts on the environment in and around the dam. Support would drop to about 30% of those originally supportive, and to 26% of the total sample.

Support would also drop to less than half of the total sample if people thought there were viable alternative options. While the possibility of rain did not alter support to the same extent as the other two circumstances, it would still drop to less than two-thirds of the total sample.

Respondents were asked to provide reasons for their responses. A wide variety of responses were received with the main reasons outlined below.

The major reasons for continuing support for the PRW scheme even if it rained and filled the dams to pre-drought levels (n=347) were: *concerned about climate change and uncertainty of weather patterns* (35.4%); *need a plentiful supply of water* (19.3%); *concerned about the future/intergenerational equity* (14.1%); *need the system to be at optimal level (*10.1%); and *have a conservation ethic* (9.5%).

The major reasons for changing their minds due to rain (n=82) were: *it would be unnecessary* (52.4%) and *prefer natural/pure water* (20.7%).



* indicates the percentage of the total sample who would continue support (n=583)

Figure 8: Strength of support for PRW given different future alternatives (n=465)

Respondents were asked how full the dams would need to be to change their minds. A quarter (24.9%) of supporters for the PRW scheme responded that it *didn't matter how full the dams were,* while 35% of supporters stated that dams would need to be *100% full*. Only 8 people nominated percentages less than 50% full, while a further 93 respondents (20% of supporters) nominated fill levels from 50% to 80%.

The major reasons for continuing support for the PRW scheme, despite negative environmental impacts, were (n=146): *dependent on the level/scale /degree of environmental impact* (25.3%); *anticipated nil to minimal impact on the environment* (20.5%); *there is no choice/water is a necessity* (20.5%).

Those who were unsure said (n=142): dependent on the level/scale /degree of environmental impact (47.2%)

The major reason for respondents' change of minds due to negative environmental impacts (n=157) were: we need to take care of the environment/conservation ethic (42%); if people or environment negatively affected (15.9%); if it impacts the environment it will also impact me (9.6%).
The major reasons provided for continuing support for the PRW scheme even if enough water could be provided by other options (n=230) were: *would still need more water/need this water as well* (20.9%); *this is a sensible/best idea* (13.5%); and *need to consider all options* (13.5%).

Those who were unsure (n=129) responded that it depends what the other options are (39.5%); don't know the other options (27.1%) and if affordable (17.8%).

Those who changed their minds and withdrew support for PRW (n=90) mainly said that they would *prefer other options/less "yucky" options* (57.8%).

Finally, when asked if there was anything else that might change their minds in support of the PRW scheme, 70.4% of respondents said "no". Those who replied "yes" or "not sure" (n=131) provided a

range of issues with the main ones being: *if tests or trials show it to not be safe* (n=21); *if people get sick* (n=19); and *medical or scientific proof of danger* (n=11).

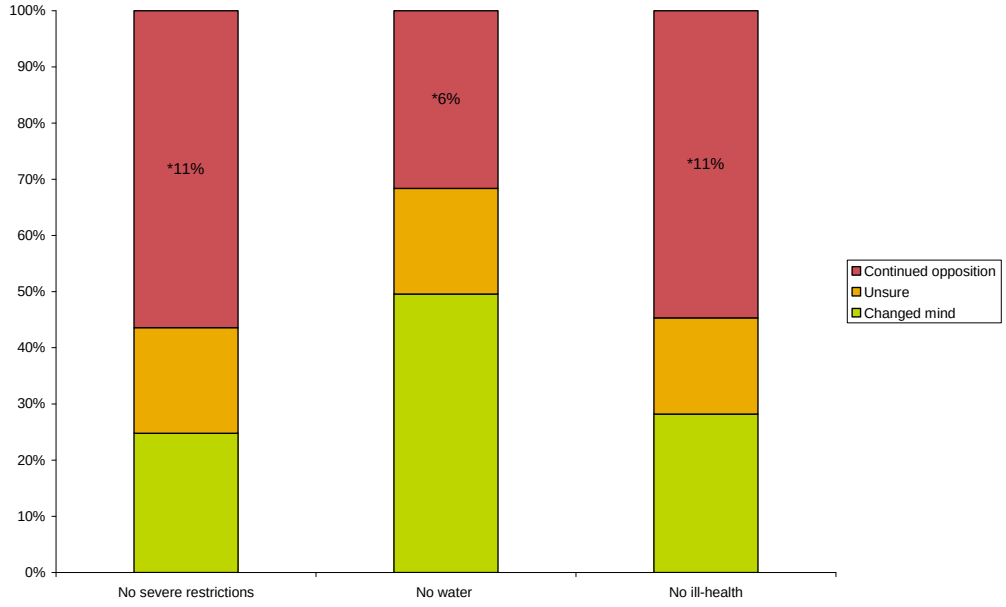
3.2.14.2 Opposition to PRW

Similarly, those who disagreed with the statement *I support adding purified recycled water to our water supply in Wivenhoe Dam* (20%) were asked if they would continue to do so given three different future situations:

- if it meant not having severe water restrictions ever again;
- if the dams dropped to 5% and South-East Queensland would run out of water in the next few months;
- if, over the first 2 years, there were no ill-health incidents in South-East Queensland that were shown to have been caused by the purified recycled water.

Figure 9 shows those who continued to oppose PRW, those who changed their minds to support for the scheme and those who were unsure given the three different circumstances.

Opposition to the PRW scheme would drop from 20% to 11% of the total sample if it meant *no severe water restrictions* in the future and if there was *evidence of no ill-health effects in the first two years* of operation. However, the situation with greatest influence would be the risk of *running out of water*, where opposition drops to only 6% of the total sample.



* indicates the percentage of the total sample who would continue to oppose (N=583)

Figure 9: Strength of opposition to PRW given different situations (N=117)

The major reasons provided for continued opposition to the scheme even though severity of restrictions would be less (n=66) were: *happy to live with restrictions* (n=22); *prefer water restrictions to this option* (n=6); *prefer to drink pure water* (n=6).

Those who changed their minds to support (n=29) gave many individual reasons with four people saying: *rather not have water restrictions* (n=4).

The reasons given for continued opposition in spite of imminent threat of running out of water (n=37) were: there are alternative water supply sources (n=10); concerned about health risks/contamination (n=7); recycled water concentration will be too high (n=4); and don't trust the authorities/private companies (n=3).

When asked where they would get their water from (n=74), the main sources were: *rainwater tanks* (n=25); *bottled water* (n=22); and *bore water* (n=6). A further five said they'd *move from the area*.

Those who changed their minds to support (n=58) said that there would be no choice/no alternatives/forced to drink it/need water to drink (n=40).

The respondents who continued to oppose the scheme even if no ill health incidents occurred in the first two years (n=64) questioned the time period saying *two years not long enough* (n=33); *takes a long time for problems to show up* (n=8); and *need 5 to 10 years minimum trial* (n=3). These were also the main reasons for those who were unsure (n=20) about their opposition in this situation.

Many of the respondents who changed from opposition to support (n=33) still questioned the validity of the length of time in being able to show any health risks.

3.2.14.3 Overview of Support and Opposition

To provide an overview of respondents' commitment to support for or opposition to PRW, scores to the original support statement and the responses to the different circumstances were summed. To do this, responses were recoded so that opposing responses were given negative scores, and supportive responses were given positive scores. Final commitment scores could range from -6 being *totally opposed* through to +6 being *totally supportive*. Figure 10 shows the results of this analysis.

Although the clear support for the scheme is evident in this figure, it also shows that it is not absolute. Less than 12% of the total sample is totally supportive under all circumstances. At the same time, only about 3% are totally opposed. However, this is partly due to a number of people feeling that they would be forced into a situation they opposed.

Environmental concerns, health concerns and the possibility of alternative water management options all have the potential to erode support for PRW.

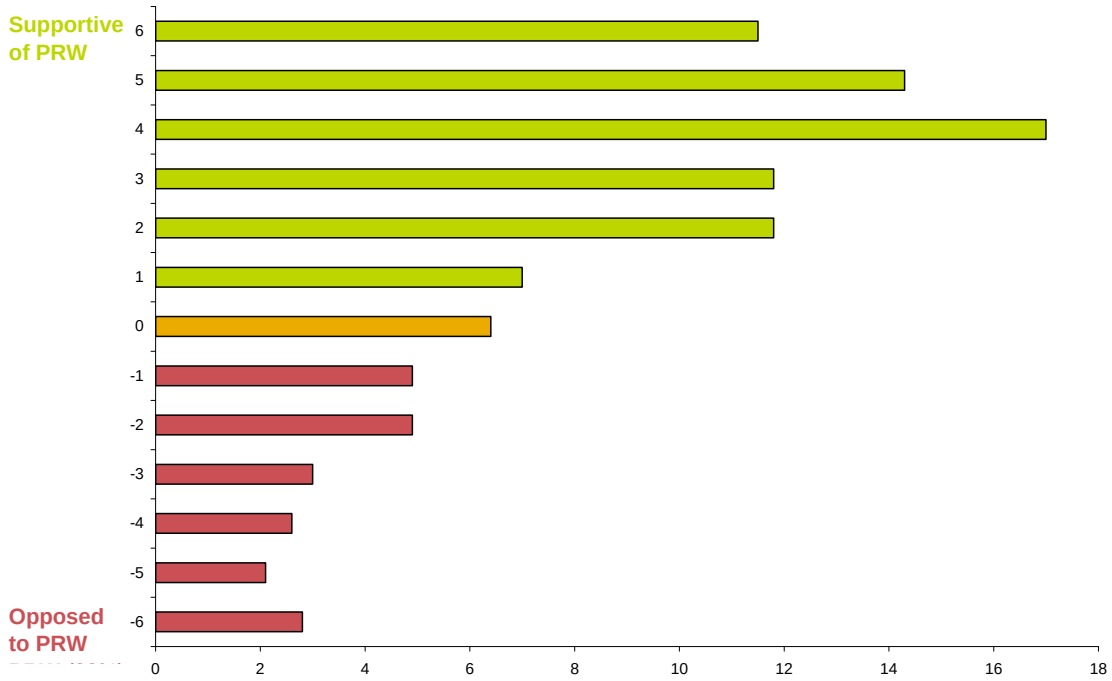


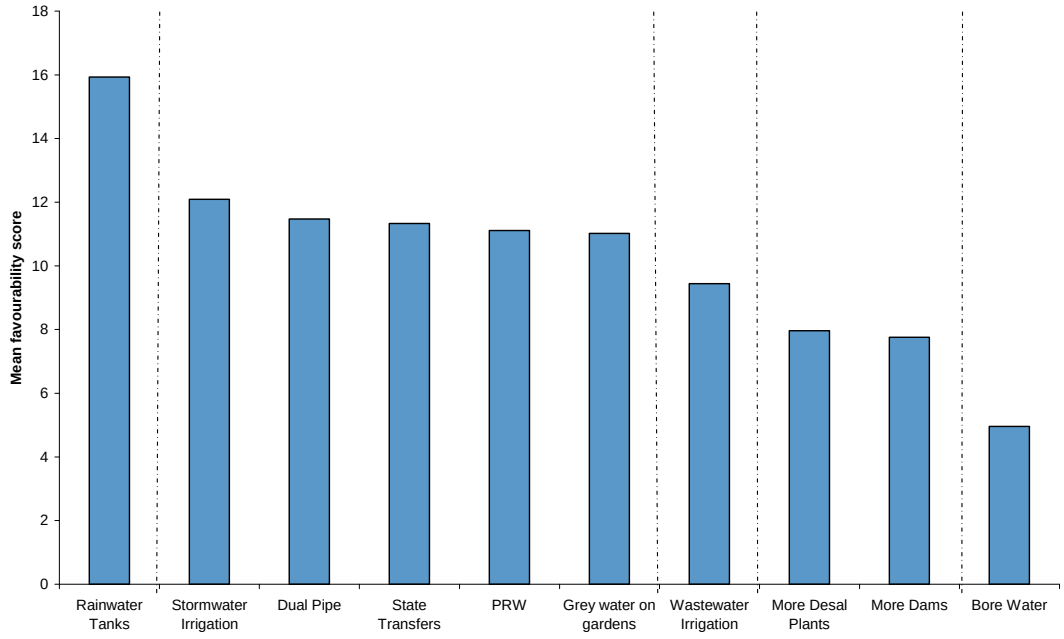
Figure 10: Overview of the strength of commitment for and against PRW (mean = 2.13)

3.2.15 Alternative Water Supply Schemes

To assess the relative support for PRW, respondents were asked to consider a range of possible new sources of water to meet demand in South-East Queensland. These were:

- developing bore water sources
- adding purified recycled water to the dams
- using grey water for gardens
- using treated stormwater to water neighbourhood parks and gardens
- using treated wastewater to water neighbourhood parks and gardens
- building more desalination plants
- building more dams
- everyone having their own rainwater tanks
- new suburbs with two sets of pipes – one for household inside use and one for lesser-treated water for outside use
- piping water from other parts of the state where they have an excess of water.

For each of these sources, respondents were asked to rate them on a 5-point scale, ranging from 1 (*extremely unfavourable*) through to 5 (*extremely favourable*). They were then asked to rank their five most favourable options from 1 being their first choice to 5 being fifth choice. These rankings were recoded where "not ranked" was given a score of 1, fifth choice was recoded to 2, and so on through to first choice being 6. The favourability ratings were then multiplied by the rankings to provide a final favourability judgement score. The results are shown in Figure 11 below.



Indicates significant differences between groups

Figure 11: Mean favourability judgements of alternative water sources

The option of rainwater tanks was judged to be significantly more favourable than the other options. Stormwater irrigation, dual pipe system, state transfers, PRW and greywater garden irrigation were rated as next most favourable. Wastewater irrigation was rated as next most favourable, followed by more desalination plants and more dams. Bore water was rated significantly less favourably than any of the other options.

3.2.16 Awareness of Purified Recycled Water Scheme

Respondents were asked to rate their awareness that they lived in an area supplied by Wivenhoe Dam and so consequently would be supplied with purified recycled water. Results are shown in Table 31 below.

Table 31. Awareness of receiving purified recycled water in future

Option	n (581)	%
1 – Not at all aware	42	7.2
2	22	3.8
3 – Somewhat aware	87	15.0
4	81	13.9
5 – Very aware	349	60.1
Mean = 4.16		

Only 60% of respondents were *very aware* that they would be supplied with PRW for drinking[4]. This should be considered in conjunction with the unprompted knowledge question at the beginning of the questionnaire. There, only two-thirds of respondents could nominate, unprompted, that it was planned for wastewater to be recycled for drinking in SEQ.

When examining these findings together with those respondents who said they would drink PRW from the scheme, only two-thirds of them were *very aware* they would be supplied with it, and only two-thirds nominated *unprompted* that a recycling scheme was planned for drinking in SEQ. This indicates the likelihood that up to one-third of people who currently support the recycling scheme do not realise they will be drinking PRW, and it is unknown how this knowledge may influence their future support.

3.2.17 Further Comments

Before the survey concluded, respondents were asked whether they had any more comments about PRW or the water future of SEQ. Half the respondents provided comments and up to three were recorded for each person. A wide variety of comments were received and are presented as broad categories in Table 32.

Table 32. Themes of additional comments

Comments	% (n=293)
Alternative sources/smaller scale schemes	25.3
Poor planning/do things earlier/neglect	22.9
Need to do something/get on with it	15.0
System issues/monitoring & management/science/public & private	10.6
Support for PRW/recycling	8.5
Not for drinking/use alternatives for drinking/alternative uses for using PRW	8.5
Long term effects/health concerns/proof of safety/waste & chemicals	7.8
Need more information/examples	7.5
Negative comments on government	4.8
Environmental issues (trees/fish/climate change/water quality etc.)	4.1
Positive comments on government	2.4

[4] It is not uneasonable to assume that respondents who knew they were in the supply area would answer *very aware*. Further, after spending considerable time answering questions about the PRW scheme, there is likely that a degree of social desirability would be involved in ratings of 3 or 4 in awareness even if the respondent had no awareness.

3.2.18 Attitudinal Scales

Following is a summary of the attitudinal scales developed for the structural equation modelling component of the study (see Section 3.3). Scale reliability analyses were performed to explore the robustness and appropriateness of measurement items (observed items) for each particular variable (latent constructs). High scale reliability suggests that each measurement item on the scale is measuring the same underlying construct. The most common indicator used to test scale reliability is the Cronbach's alpha coefficient. This coefficient should ideally be above 0.7, although it is very common for scales with a small number of items (such as the scales used for this study) to have quite low Cronbach's values (Pallant, 2005).

Five scales were identified with sufficient reliability for the structural equation modelling. Each scale had a minimum score of one and a maximum score of five.

3.2.18.1 Trust in the Authorities

The Trust in the Authorities scale had a Cronbach's alpha coefficient of 0.90 and consisted of four items. A scale score was calculated by averaging the four attitudinal statements. Higher scores indicate higher levels of community trust in the authorities to provide them with safe, good-quality, well-managed water. The mean indicates about neutral levels of trust in the authorities. The scale is summarised in Table 33.

Table 33. Summary for Trust in the Authorities Scale

	n (582)
Mean Score	3.11
Number of Items	4
Cronbach's α Coefficient	0.90
Mean Inter-Item Correlation	0.68

3.2.18.2 Health Risk

The Health Risk scale, composed of four statements, had a Cronbach's alpha coefficient of 0.91. Higher scores indicate a higher perceived health risk, and the mean score indicates lower levels of perceived health risks.

Table 34. Summary for Health Risk Scale

	n (577)
Mean Score	2.39
Number of Items	4
Cronbach's α Coefficient	0.91
Mean Inter-Item Correlation	0.72

3.2.18.3 Subjective Norm

The Subjective Norm scale, composed of four statements, had a Cronbach's alpha coefficient of 0.84. Higher scores indicate a greater belief that other people would support the scheme's elements, with the mean score indicating slightly higher than a neutral belief in this.

Table 35. Summary for Subjective Norm Scale

	n (582)
Mean Score	3.28
Number of Items	4
Cronbach's α Coefficient	0.84
Mean Inter-Item Correlation	0.56

3.2.18.4 Environmental Risk

The Environmental Risk scale, composed of three statements, had a Cronbach's alpha coefficient of 0.64. Higher scores indicate a greater perception of environmental risk associated with the scheme and the mean indicates perceptions of lesser environmental risk.

Table 36. Summary for Environmental Risk Scale

	n (575)
Mean Score	2.60
Number of Items	3
Cronbach's α Coefficient	0.64
Mean Inter-Item Correlation	0.39

3.2.18.5 Emotion

The Emotion scale, composed of five statements, had a Cronbach's alpha coefficient of 0.96. Higher scores indicate greater negative emotions[5] associated with drinking PRW with the mean shower slightly more negative than neutral emotion.

Table 37. Summary for Perceived Control Scale

	n (577)
Mean Score	3.28
Number of Items	5
Cronbach's α Coefficient	0.96
Mean Inter-Item Correlation	0.86

[5] Related to the "yuck factor"

3.3 Predicting Intended Behaviour

LISREL 8.72 software (Joreskog, Sorbom, du Toit & du Toit, 2000) and Robust Maximum Likelihood Estimation were used to create a structural equation model containing all of the hypothesised variables. All pathways in the initial model were significant and as such, no latent variables were removed from the model.

The model can be seen in Figure 12. This shows the relationships between the latent variables (shown in the model as ellipses) and their respective indicators (shown in the model as rectangles). This reveals how well the indicators (eg. an emotion item: *EMOT1*) measure the latent variables of interest (eg. Emotion). Coefficients on these paths can range from -1.0 (ie. a strong *negative* relationship between the latent variable and the indicator) to +1.0 (ie. a strong *positive* relationship between the latent variable and the indicator).

Figure 12 shows that all indicators in the model have strong positive relationships with the latent variables they were hypothesised to measure.

Figure 12 also shows the relationships between the independent variables and the dependent variable (ie. Intended Behaviour, here *BEHAV*). The coefficients on these paths can also range from -1.0 (ie. a strong *negative* relationship between the predictor and Intended Behaviour) to +1.0 (ie. a strong *positive* relationship between the predictor and Intended Behaviour).

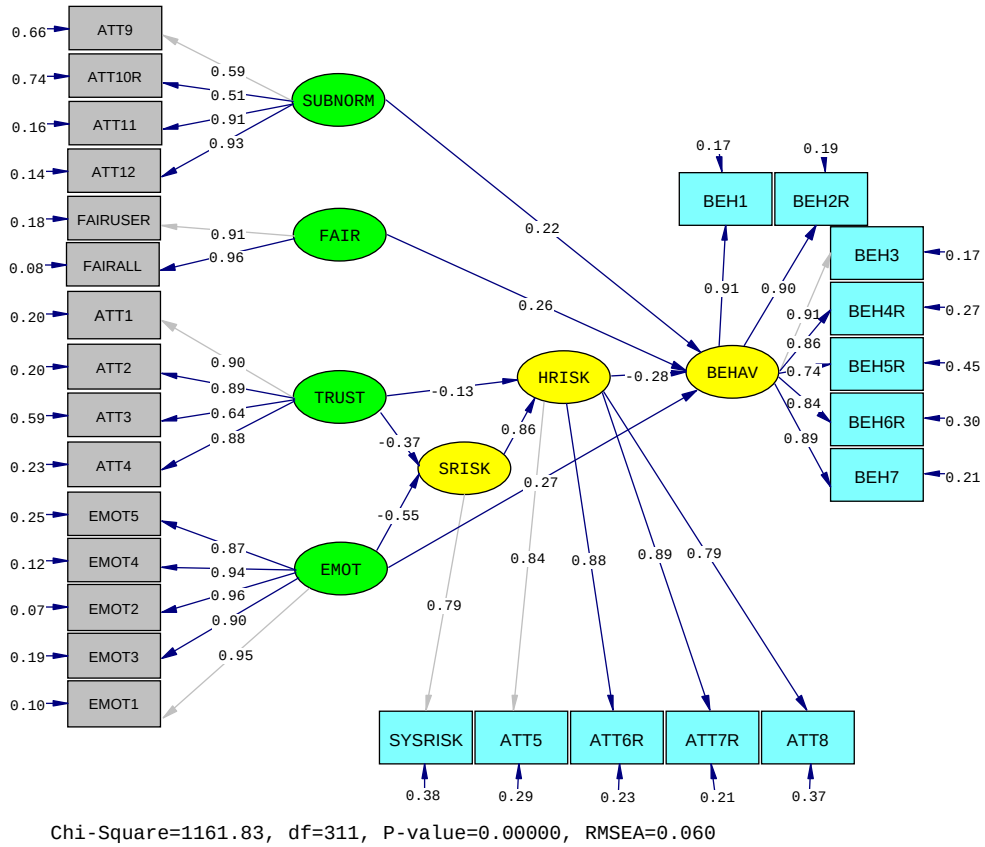


Figure 12. Overall structural equation model

Figure 13 is a simplified version of the structural equation model, and displays the relative strength and significance of pathways. Here, all the pathways shown are statistically significant, with relatively larger effects shown as thick red arrows, relatively moderate effects as thinner purple arrows, and relatively weaker effects as thin green arrows.

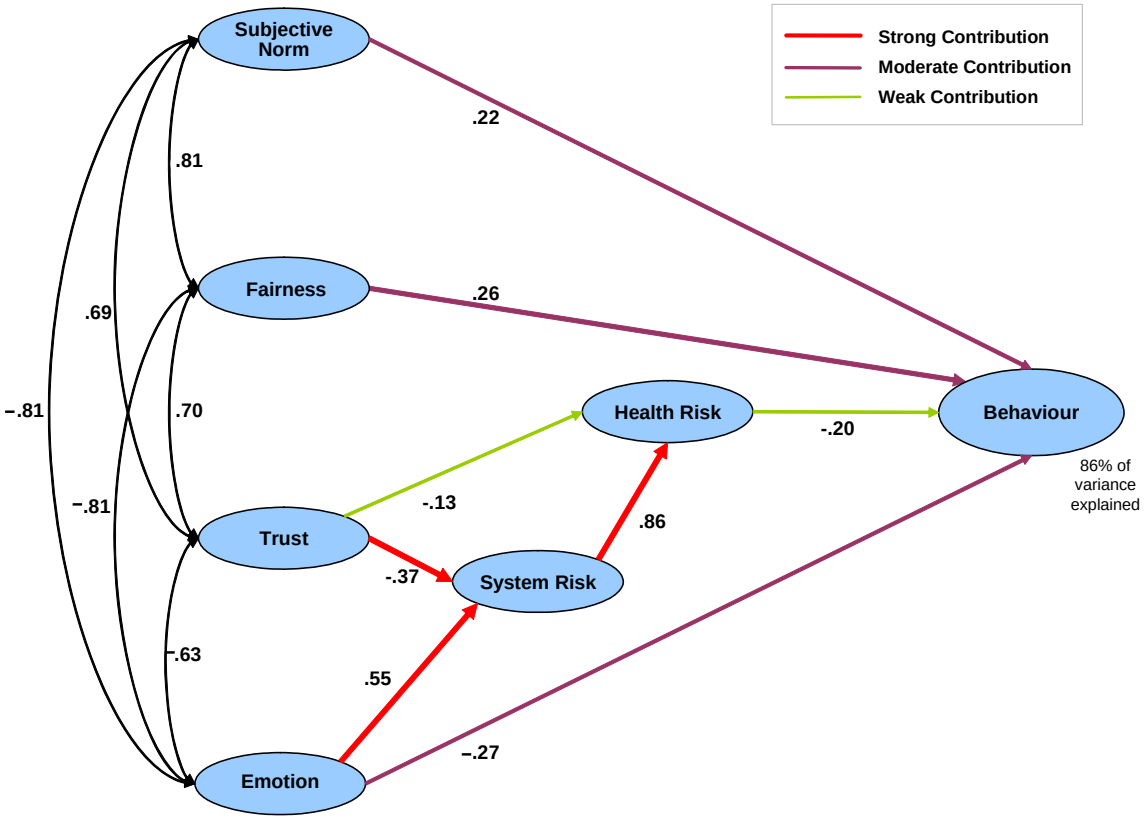


Figure 13. Simplified overall structural equation model

Figure 13 shows that four latent variables had significant direct relationships with Intended Behaviour: Emotion, Subjective Norm, Fairness and Health Risk. Although neither Trust nor System Risk have *direct* relationships with Behaviour, they both have a mediated influence on Behaviour through their *direct* relationships with Health Risk. Figures 12 and 13 indicate that Subjective Norm and Fairness influence behaviour to a very similar degree, and are moderate contributors to the model's predictive capability. Trust and System Risk are both strong contributors to the model, although the impact on Behaviour is indirect, and works through Health Risk, which itself has a relatively weak impact on behaviour. The model indicates that Emotion is likely the strongest contributor to the model, having a moderate direct influence on Behaviour as well as a strong influence through mediated variables.

The relationships between the variables in the model can be summarised as follows.

Intended Behaviour

The following conditions lead directly to an increased likelihood of behavioural intention to support the recycled water scheme:

- lesser negative emotions towards the recycled water scheme;
- a greater perception that important others will support the recycled water scheme;
- a greater belief that the recycled water scheme is fair; and

- perception of low health risk associated with the recycled water scheme.

Emotion
More negative emotions about the recycled water scheme leads directly to:
- greater perception of the threat of system failure associated with the recycled water scheme.

System Risk
Greater levels of perceived threat of system failure lead directly to:
- greater levels of perceived health risk associated with the recycled water scheme.

Trust
Greater levels of trust in authorities involved with the recycled water scheme lead directly to:
- lower perceived health risks associated with the recycled water scheme; and
- lower perceptions of the threat of system failure.

Subjective Norm, Fairness, Trust and Emotion
These four factors are strongly interrelated in the model as indicated by the double-headed correlation arrows running between the four variables. These relationships can be described as follows:

- *Subjective Norm and Fairness*
    - A greater belief that important others will support the recycled water scheme is associated with a greater belief that the scheme is fair.

- *Subjective Norm and Trust*
    - A greater belief that important others will support the recycled water scheme is associated with greater levels of trust in authorities involved with the recycled water scheme.

- *Subjective Norm and Emotion*
    - A greater belief that important others will support the recycled water scheme is associated with lesser negative emotions towards the recycled water scheme.

- *Fairness and Emotion*
    - Greater belief that the scheme is fair is associated with less negative emotions towards the recycled water scheme.

- *Fairness and Trust*
    - A greater belief that the scheme is fair is associated with greater levels of trust in the authorities involved with the recycled water scheme.

- *Trust and Emotion*
    - Greater levels of trust in authorities involved with the recycled water scheme is associated with lesser negative emotions.

The model accounted for 86% of the variance in intended behaviour relating to the proposed recycled water scheme, and its overall goodness-of-fit indices were satisfactory (see Table 38).

The Satorra-Bentler Chi-Square was significant at the .05 level indicating that the model could not reproduce the relationships among the indicators observed in the sample within a .05 level of significance. As the chi-square statistic is known to be upwardly biased in samples of 200 cases or

more (Hair et al., 1995) a number of other goodness-of-fit measures to test the overall fit of the model were applied. As can be seen in Table 38, these additional measures were well within recommended values (Kline, 2005).

Table 38. Model fit indices for initial structural equation model

Fit Statistics	Obtained Value	Recommended Value
Chi-square (df)	954.90 (311), $p<.05$	$p > .05$
SRMR	.049	$\leq .08$
CFI	.99	$\geq .90$
GFI	.99	$\geq .90$
RMSEA	.060	$\leq .08$

3.3.1 Demographic Differences

A series of one-way between-groups analysis of variance were performed to explore the impact of socio-demographic variables on key model components. Respondents were grouped according to a number of demographic criteria: income, age, household unit, education, sector, country of origin, gender and awareness that PRW would be supplied to their suburb. These groups were then tested for significant variations in the way that they rated the main model components of *Intended Behaviour*, *Health Risk*, *System Risk*, *Emotion*, *Trust*, *Fairness* and *Subjective Norm*.

Only one significant difference was identified ($p <.01$), which was based on awareness of PRW supply.

- Participant's who were *very aware* that they would be in a location to be supplied with PRW thought the scheme was more fair than did those who were *not at all aware.*

No significant effects were evident for age, education, sector, country of origin, household unit or gender. This is of interest as, in previous research, key differences have emerged in relation to gender. Further investigation did however show significant differences for gender on two of the individual items of the *Emotion* scale. These differences did not emerge when using the scale as a whole. In this case, the possibility of gender differences should not be totally discounted.

The lack of socio-demographic influences on ratings of the model variables indicate that the results can be extrapolated to the wider SEQ population.

4.0 DISCUSSION AND CONCLUSIONS

4.1 General Community Attitudes towards PRW

The results of the questionnaire revealed considerable support for the purified recycled water scheme, with 74% stating their positive intention to drink PRW. This is consistent with recent results from research commissioned by the Queensland Water Commission, where 74% of people in a survey of 1000 people living in South East Queensland expressed support for the scheme (UMR 2007). Support appears to be independent of sector, with no significant differences in support for the scheme based on the region in which respondents reside. There were also no significant differences in terms of any demographic variables.

However, this support should be viewed with some caution. First, support for the scheme drops markedly if there is any possibility of environmental harm to the dam or surrounds. Support also lessens if people thought enough water could be provided by other management options. There is also some lessening of support if rains filled dams to pre-drought levels, although most are cautious given considerations of future climate uncertainty.

Of particular interest is that up to one-third of those supporting the scheme may not be aware they will be supplied with PRW. This is indicated by their lack of unprompted nomination of a future recycling scheme for drinking, and also not being *very aware* they reside in a PRW supply area. It will be important to address this in future communication initiatives as the support expressed by this group of people may therefore be more sentiment than intended behaviour.

4.2 Predicting Behavioural Intention towards PRW

The predictive behavioural model was again replicated, providing considerable confidence in its validity, especially given the extremely high prediction of 86% of the variance. The different weightings of the relationships between variables in this model compared with those in previous case studies shows that the model is sensitive to different schemes and different communities. The relationships shown here can be seen as specific to SEQ and the PRW scheme that has been communicated to the community.

The three variables, *Subjective Norm, Fairness* and *Emotion* all contribute relatively evenly to the prediction of *Intended Behaviour*. *Health Risk* has a lesser contribution to the direct prediction of *Intended Behaviour*, but it is the mediated effect of the variables, *Trust*, *System Risk* and *Emotion* that need special attention, given their strong relationships. Also of note is the strong direct predictive contribution of *System Risk* to *Health Risk*. It is apparent from qualitative comments that people are nervous about *System Risks*, and unsure about *Health Risks*. While *Trust* in most of the authorities remains as high as it currently is, respondents are accepting that statements about the science, treatment and operations are correct. However, should *Emotion* be heightened, or *Trust* recede, perceptions of risks will heighten, and thus reduce support for the PRW scheme.

4.3 Evaluations of Trust

While levels of trust were generally high, there were a few areas of note. First, scientists (CSIRO and Universities), medical doctors and the Environmental Protection Agency (EPA) were more highly

trusted than were other government departments. It is consistent with previous research that the EPA is seen to be more trustworthy than other government agencies (including environmental/conservation departments), and can therefore be a useful asset to the government.

Although Veolia Water is more trusted than *private companies,* there is definitely an element of the unknown associated with this organisation. A number of respondents felt they couldn't rate their trust as they did not know anything about them. So this needs to be considered, particularly given the lack of trust in *private companies*.

4.4 The Role of Risk Perceptions

As noted above, it is apparent from ratings of likelihood and seriousness of possible things going wrong with the system, as well as from qualitative comments, that people are nervous about *System Risks*. While most people were indecisive about the likelihood of something going wrong with the water supply (i.e. high concentration of those thinking the possibility was *neither likely nor unlikely*), there was a strong sentiment that, if something did occur, the ramifications would be very serious indeed. Given the strong predictive contribution of both *Trust* and *Emotion* to *System Risk*, both these aspects will need careful management. The lack of trust in private companies, and the lesser trust in Veolia Water may have ramifications for public confidence in the system especially as awareness that Veolia Water is a private company becomes more widely known. Similarly, any heightening of negative emotions in the community will impact on perceptions of a risky system. Any heightening of perceptions of *System Risk* will have a major impact on *Health Risk.*

It was also evident from both the attitudinal ratings and the qualitative comments that people are currently unsure about *Health Risks*. With the prevalent feelings of lack of choice in accepting PRW, people will also feel a need to trust those who are providing health and safety information and accept that the water will be safe. However, about half the sample is not convinced there will be no health impacts on the community (as opposed to themselves personally). As stated above, it will be important to attend to both *Trust* and *System Risk* to avoid escalation of perceptions of *Health Risk*.

Finally the issue of *Environmental Risk* is interesting. While the latent variable failed to emerge in the predictive model, the significance of this risk was shown in people's commitment judgements. From the ratings of the individual environmental risk statements, and the lesser reliability of the scale than others, it is apparent that this attitude may not yet be crystallized. Certainly, the lack of reference to any environmental issues in the respondent information will not have helped people in their thinking about this. However, when asked a straight question about their continued support for PRW if there were any negative impacts on the environment in and around the dam, support for the scheme dropped dramatically (to 30% of the supporters and 26% of the total sample). It was this situation that caused most people to change their minds given all the alternatives presented to supporters and opposers. Therefore, it will be important to investigate this issue further.

4.5 Evaluations of Fairness

Fairness is difficult to conceptualise and measure (e.g. Folger 1996; Kals 1996; Syme et al. 2000; Syme and Nancarrow 2001) and the response pattern suggested that people were not discriminating to any great degree between users. There are certainly difficulties in measuring *Fairness* in a questionnaire format.

Having said that, it was evident that the PRW scheme was considered to be significantly less fair to low income households. This may be attributable to an expectation that water costs will rise under PRW, or it could be to do with the perception that the 'well off' will have more options open to them, such as bottled water and rainwater tanks. There was also a significant difference in fairness between households with and without children, though the reason for this is not yet evident. While it may be assumed that health risks might be a factor in this fairness rating, this was not particularly evident in the rating of the statement about the scheme posing a health risk to young children.

The complexity of the concepts of fairness and equity as they relate to PRW will require more detailed exploration, especially in the opportunities for detailed discussion in the coming workshops/focus groups.

4.6 Personal-v-Societal Considerations

On a number of occasions throughout the survey it was evident that people considered the situation in their households to be better than in the wider community. People thought:

- they had more control over their personal household drinking water sources than they had at a system level (*Personal Control)*;
- their close friends and family would be were more inclined to drink PRW than would the people of SEQ (*Subjective Norm);*
- they would be less likely to suffer ill health effects from drinking PRW than would the SEQ community *(Health Risks).*

While it is not unusual for people to judge their personal situations in a more positive light than they do those of the wider community, it is evident here that respondents are not personalising the risks. However, if issues of fairness arise in the wider community where they consider the risks to be, these questions may become of greater concern. Kahlor et al. (2006) have suggested that "the primary distinction that differentiates impersonal risks from more personal risks is the focus on something other than personal safety – oftentimes, that focus is on values or distinct others…. The more immediate perceived impacts are on groups of people or geographic entities rather than the individual" (p.167). Campbell (2006) has described these features as objective, subjective and relative risk in relation to the harm component (or actual risk).

It will be important to understand the types of risks that may be perceived, and their relationship with the actual risks from PRW, from the personal to the societal worldviews (Browne et al. 2007). Relationships with fairness judgements should also be explored.

4.7 PRW and Water Supply Alternatives

When rating the favourability of different water sources and then ranking preferences, it was evident that PRW as a water source was judged to be more favourable than more dams, more desalination plants, and bore water sources. Although PRW was judged as less favourably than everyone having their own rainwater tanks, it was judged relatively similarly to stormwater irrigation of public open space, dual pipe systems in new developments, piping from elsewhere in the state, and using greywater on gardens.

This finding should be viewed in the context that support for PRW drops to less than half the total sample if people thought enough water could be provided by other water management options.

Certainly a wide range of alternative sources and small scale schemes were suggested in unprompted comments at the conclusion of the interviews. In addition, people suggested a range of uses for recycled water other than for drinking.

While it is evident that many people are accepting of PRW because they believe they have no choice, alternative schemes and sources are favoured by people and many would like them seriously considered.

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APPENDIX 1

ADDITIONAL INFORMATION IF REQUESTED BY RESPONDENTS

ADDITIONAL INFORMATION

Survey Background

The former Premier Peter Beattie announced in January 2007 that purified recycled water will be added to South East Queensland's (SEQ's) drinking supplies as part of a broader water security and supply plan. Purified recycled water is expected to be available by December 2008 from Wivenhoe Dam as part of the Western Corridor Recycled Water Scheme.

As part of a research collaboration investigating the recycled water proposals, the *South East Queensland Urban Water Security Research Alliance* has been established to ensure the quality of the science behind these new initiatives. This includes a focus on social research to better understand community views about and responses to the decisions and how this can be incorporated into the ongoing science and implementation.

The survey currently being undertaken by ARCWIS is the first stage of the social research and is designed to provide information about the understanding and views of SEQ residents about the purified recycled water scheme. The information from the survey will help in understanding what, if any, concerns people may have and how these might best be addressed.

Recent Surveys and Studies in the Area

The Queensland Water Commission (QWC) has collaborated in a number of brief surveys in the SEQ area recently, including the following:

- A survey conducted in December last year by The University of Queensland in association with QWC. This asked about eating vegetables grown with recycled water and drinking recycled water.
- A survey undertaken in July 2007 asking about support of the purified recycled water scheme. The survey was conducted by *UMR Research* who polled 1000 people across the 12 councils in SEQ by phone in late July.

Wivenhoe Dam

Wivenhoe Dam, the largest water storage in South East Queensland, is located in Esk Shire on the Brisbane River, approximately 150km upstream from the river mouth. While the primary function of Wivenhoe Dam is to provide a safe supply of raw drinking water to Brisbane and adjacent local authorities, it also plays a role in flood mitigation and is a regional recreational and tourist/camping area. Wivenhoe dam supplies water to the cities of Brisbane, Ipswich, Logan, Gold Coast and Shires of Beaudesert, Esk, Gatton, Laidley, Kilcoy & Nanango plus Tarong and CS Energy.

All of the suburbs we are surveying should have their water supplied (at least some of the time) by Wivenhoe Dam.*

*Suburbs that fall within the shires of Redcliffe, Pine Rivers and Caboolture Shires usually get their water from the North Pine Dam. However, when levels in this dam drop too low (as they have been for the last several months), their water is provided by Wivenhoe Dam.

Pre-Drought Dam Levels:

Average dam storage levels in South East Queensland in 2001 were just over 70%. Wivenhoe Dam is currently at 20%.

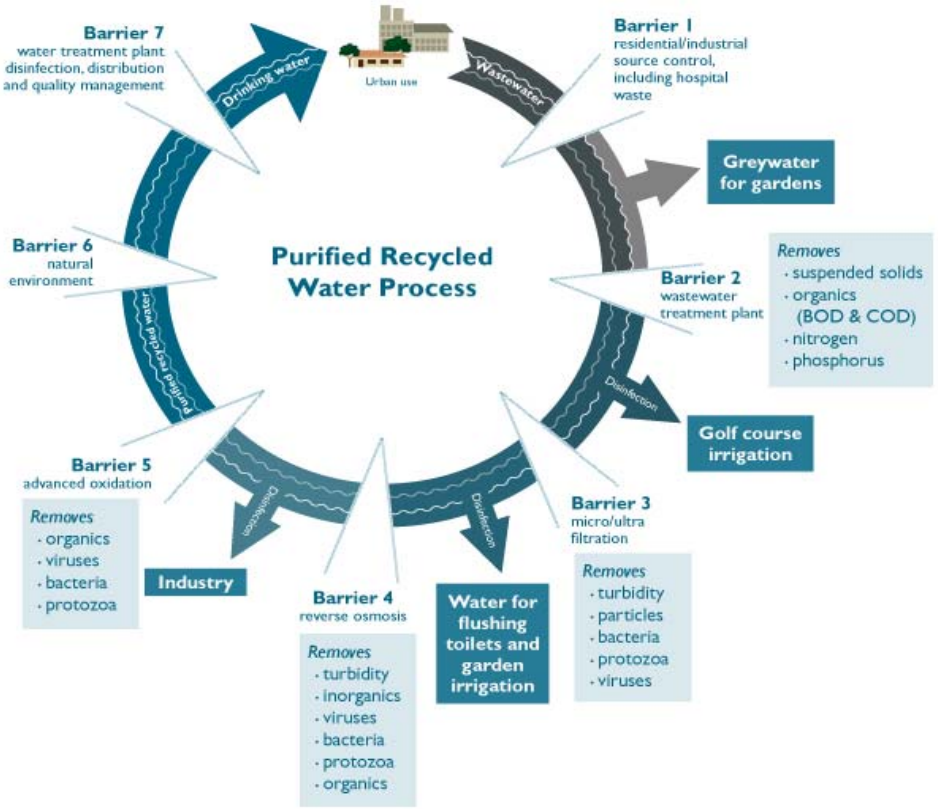
Purified Recycled Water

Definition according to the Queensland Water Commission:

Purified recycled water is wastewater that has been treated to the highest standard. The system planned for South East Queensland involves a 7-barrier treatment process. To eliminate impurities, the water is passed through a range of biological reactors, separators and filters – including microfiltration and reverse osmosis membranes. It also undergoes oxidation to further disinfect and remove chemical and biological traces.

What percentage of the water supply will be purified recycled water?

The percentage will depend on dam levels. The scheme will add roughly 115ML of water to Wivenhoe dam per day.



Source: Queensland Water Commission

Expert Advisory Panel

According to the Queensland Water Commission, an expert advisory panel has been established to provide advice on technical issues associated with purified recycled water.

The panel is made up of specialists in ecotoxicology, environmental science, microbiology and advanced water treatment. They will provide independent advice on the regulatory framework and the Western Corridor Water Recycling Scheme.

Water Restrictions

The whole of SEQ is currently under Level 5 restrictions.

Further Information

If respondents want specific information about the purified recycled water scheme, they can contact the Queensland Water Commission on 1300 789 906. Alternatively they can visit their website at www.qwc.qld.gov.au

APPENDIX 2

RESPONDENTS' KNOWLEDGE OF SOURCES AND USES OF WASTEWATER IN SEQ

Table 39. Where does wastewater come from? Unprompted responses

Source of Wastewater	Percentage of Respondents (n=583)
Sewage	55.3
Water from bathrooms	50.8
Water from laundries	49.9
Water from kitchens	49.4
Water from toilets	45.3
Water from rain or gutters	26.1
Greywater from homes	25.0
Treatment plant	25.0
Industries or factories wastes	18.0
Don't know	7.5
Farms	7.2
Drains	3.6
Hose	3.6
Other purification	3.6
Overflow	3.6
Multiple sources	3.6
Creeks	3.6
Buildings	3.6
Car wash	3.6
Everything that comes from pipes	3.6
General waste from non-sewered areas	3.6
Possibly not sewage	3.6

Table 40. How is recycled wastewater currently being used in SEQ? Unprompted responses

Use of Recycled Wastewater	Percentage of Respondents (n=583)
Industries	41.3
Don't know	38.1
Watering parks/reserves	33.1
Power stations	27.3
Watering household lawns/gardens	18.5
Watering sport ovals	9.4
Watering golf courses	6.6
Drinking water	4.7
Watering food crops	4.7
Construction	4.4
Road works	3.3
Farms	3.0
Use recycle water at home	3.0
Washing trucks/cars/buses	2.2
Replenishing dams	1.9
Watering median strips	1.8
Commercial uses	1.5
Irrigation	1.5
Cleaning purposes (e.g. roads)	1.1
Cooling purposes (engines, air conditioning)	0.7
Filling private pool	0.7
Hospitals recycle own water	0.7
Mining	0.7
Tanks/tankers	0.7
All water is recycled, we don't make anymore	0.4
Caboolture river as catchments	0.4
Desalination plants	0.4
Flushing school toilets	0.4
Islands	0.4
Know it is being used	0.4
Laboratory	0.4

Pipeline to wet ground	0.4
Surplus to river	0.4
University of Queensland	0.4
Treatment plants	1.1
Watering forestry areas	0.4

Table 41. For those who answered “drinking water” above ….. Where?

Location	Number of Respondents (n=16)
Toowoomba	4
Bundamba	2
Other (e.g. can’t remember; don’t know)	2
Algester/Calamvale	1
Caboolture	1
Gold coast	1
Inala	1
Ipswich	1
Logan	1
South East Queensland	1
Townsville	1

Table 42. Do you know of future planned uses for recycled wastewater in SEQ? Unprompted responses

Use of Recycled Wastewater	Percentage of Respondents (n=583)
Drinking water	66.1
Power station	35.0
Industrial use	33.6
Replenishing dams	31.7
Don't know	23.5
Treatment plants (including Bundamba)	5.1
Watering golf courses	4.5
Desalination plants	4.4
Businesses	3.6
Watering household lawns/gardens	2.7
Irrigation	2.2
Watering food crops	2.2
Watering sports ovals	1.8
3rd pipes systems for householders	1.5
Greywater use	1.5
Household rainwater tanks	1.5
Put water into water supply somewhere	1.4
Bottled water	0.7
Farming	0.7
Heard about sewage in Brisbane	0.7
Lockyer valley	0.7
Mines	0.7
Recycling in Goodna, Brisbane area	0.7
Showering	0.7
Southwest Queensland corridor	0.7
To flush toilets	0.7
Universities	0.7
Woodford Correctional Centre	0.7

Table 43. For those who answered “drinking water” above ….. Where?

Location	Percentage of Respondents (n=289)
All suburbs in South East Queensland	48.4
Don’t know/Not sure	10.7
Brisbane	10.0
Wivenhoe Dam	6.9
Toowoomba	5.2
Households	3.8
Locally in my area	3.8
Somerset etc dams	1.4
All over Queensland	1.3
Boronia Heights	0.7
Brisbane and surrounds	0.7
Everywhere/all areas	0.7
Inala	0.7
Ipswich	0.7
The dams in South East Queensland	0.7
Bardon	0.3
Down the coast	0.3
Lake Manchester	0.3
Luggage Point	0.3
Northern Territory	0.3
Not where I am	0.3
Sewerage plants	0.3
South West Queensland	0.3
Town	0.3

Urban Water Security Research Alliance