FINAL REPORT TO THE QUEENSLAND COMPETITION AUTHORITY

Review of Demand Projections for South East Queensland

28 October 2011

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SKM | MMA

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Contents

Executive Summary

The Queensland Competition Authority (the Authority) engaged SKM MMA to conduct an independent assessment of the demand projections provided by the various SEQ water retailers/distributors. The aim of the project is to provide advice relating to the reasonableness and appropriateness of the demand forecasting methodology.

The challenge faced by the Authority is to ensure that demand forecasts are as realistic as possible in the light of changed circumstances, behaviours and actions over the past decade.

In residential demand forecasting, population and/or customer numbers are generally used as a major driver of demand together with other key drivers affecting the trends in average usage. Changes in average usage derive from changes in income, price and persons per customer, and the impact of conservation measures. It is a key challenge to adequately estimate the impact of strengthening or relaxing water use restrictions in light of changing rainfall patterns and improved water conservation infrastructure. The approach usually taken is to normalise water consumption for a typical rainfall year and project the impact of restrictions and changing infrastructure on the normalised water consumption series.

Some of the key issues to be considered in assessing the forecast include:

- Appropriateness of base year selection and assumptions
- Population growth and housing density
- Assumptions about climate and rainfall going forward
- The ongoing impact of demand management measures.
- The impact of restrictions and potential for rebound due to easing of restrictions
- Changes to infrastructure (e.g. more water tanks, water sensitive gardens, high efficient water use appliances such as dish and clothes washers, recycling in car washes, low flow showerheads and low flow toilets)
- Changes to the pricing structure

Approach to Review

Population

The major growth driver of consumption is population growth. The Queensland Government publishes and uses Office of Economic and Statistical Research (OESR) Planning and Information Forecasting Unit (PIFU) (now the Demography and Planning Unit (DPU)) projection of population, household formation and dwellings. All three entities use this source as a major driver and the OESR provides the Queensland Government's official population forecast. In their submission to the Authority, the utilities used the 2010 OESR/PIFU update (of its 2008 projections) instead of using the latest 2011 data. This was due to the need to meet their budgetary and pricing approval processes which were due for completion prior to the release of the latest OESR projection. Given the timing of the utilities budgetary and approval processes, the use of the 2010 data is consistent with Section 3.2.1 of the Authority's *SEQ Interim Price Monitoring Information Requirements for 2011/12* dated June 2011.

In discussions with the OESR regarding the appropriate series of explanatory variables to use, SKM was informed that due to the recent slowdown in migration, the OESR is of the opinion that the low population growth series is currently more representative of its expectations than the medium series. We have thus used the low series in our analysis. While OESR/ PIFU produces low, medium and high population series, only one dwelling series is produced. Given that we are using the low population series, this may not be consistent with the dwelling projections provided by the OESR. As a result, an adjustment has been made to the dwelling series as published by OESR in 2010. This was done by applying the ratio of the low to medium population series to the dwelling numbers resulting in a lower dwelling series.

Average consumption

According to the South East Queensland Water Strategy, in 2004/05 total urban average consumption in SEQ was about 450 LPD with residential consumption at 282 LPD. In 2008/09, average residential consumption had fallen to 143 LPD. At the height of restrictions (level 6 in 2008) average residential water use in those regions of SEQ that were under restrictions was 131 LPD. With the introduction of Permanent Water Conservation Measures (PWCM) after the end of the drought, residential consumption in the same regions continued to be low, averaging around 165 LPD. This does indicate that some level of rebound was taking place but at a slow rebound rate and that some level of demand reductions implemented during the height of the drought were maintained. These are likely to be structural changes as a result of, for example, the installation of water tanks, low flow showerheads and dual flush toilets.

The three utilities have slightly different water forecasting methods. While all three use average per person consumption, Allconnex applies this to population forecasts for its residential water projections but uses average consumption per connection for non-residential water while QUU applies it to an equivalent person/equivalent tenement (representing the average number of persons per property) to estimate the average consumption per connection for both residential and non-residential water. Unitywater combines residential and non-residential water into its estimate of average per person consumption and applies this to the population forecast. Separation into residential and non-residential water occurs after total water demand is forecast.

Rebound

With the easing of restrictions, the question is how average consumption would respond. The difficulty present in this current study is the lack of historical data at the LGA level which means that the likely rebound target consumption level cannot be estimated. Without knowing what "normal" consumption level was before the drought and the imposition of restrictions, we cannot assess what level of consumption may return to with the easing of restrictions.

While previously the easing of restrictions had led to consumption rebounding to levels that were comparable to that prior to restrictions, we believe that demand levels will not rebound to the levels seen before the Millennium drought. The measures taken to reduce consumption during the drought have resulted in a structural change. These measures include the substantial rebates available to install water efficient fixtures and appliances in households and a business water efficiency program.

The Queensland Government has indicated that it expects water consumption to remain below 200 LPD under PWCM. Lacking any other data to indicate what rebound target is likely to be, this 200 LPD average consumption level can serve as an indication of where average consumption will settle when water consumption has fully rebounded from the lifting of the drought restrictions. The analysis undertaken in this study assumes that average residential consumption in SEQ will rebound from 165 LPD to 200 LPD. While consumption in individual LGAs will show different rebound target levels, they rebound to a level such that overall, SEQ average residential consumption reaches 200 LPD.

Another issue to consider is the length of time it takes for rebound to be fully realised. Previous studies have indicated that in the absence of any ongoing measures or media campaign to retain savings achieved during restrictions, resulted in consumption rebounding to normal levels over a period of 18 to 24 months. However the strong educational and promotion campaign and the timely introduction of demand management programmes targeting water-use efficiency would limit rapid bounce back and thus be likely to delay the full rebound from drought restrictions. The constant media campaign in SEQ to limit water demand as well as the introduction of PWCM will, in our view, lead to full rebound on a per person basis not occurring till about four to five years after the lifting of restrictions.

Recommendations

Short term forecasts

In general, we have found that given the lack of historical information, the approaches taken by the utilities are reasonable. However, we believe that the rebound rates applied by the utilities are inappropriate. Allconnex has assumed that full rebound will be achieved in 2012 while QUU has assumed a rebound of 1% in 2012 and the 0.5% pa thereafter for residential customers and 0.25% pa for non-residential customers. Unitywater has assumed a reduction in average consumption for urban (residential and non-residential) customers in 2012 and average consumption remains at this level over the forecast period.

We recommend applying rebound rates based on a SEQ average consumption level of 200 LPD when full rebound is achieved. While the consumption in individual LGAs and thus in each of the utilities will show different rebound target levels, they rebound to a level such that overall, SEQ average residential consumption reaches 200 LPD, consistent with the QWC assessment of long term average consumption in the region. We have assessed that this level of consumption would be achieved in 4.5 years generally, except for the three rural LGAs of Lockyer Valley, Scenic Rim and Somerset where 8 years was assumed.

The other change we have made to the utilities' forecast is to apply the low series population forecast from the OESR 2011 projections while the utilities have applied the medium series from the 2010 population projection update. We have allow made adjustments to the OESR 2010 dwelling projection (no low series is available for dwelling projections) based on the difference between the low and medium population projections. This adjustment was applied to water and wastewater connection projections.

- **Table 1 Recommended projections**

		FY ending June			
Allconnex	**Unit**	**2011**	**2012**	**2013**	**2014**
Residential connections	Num	365,066	373,405	381,744	390,083
Residential water volume	ML	57,621	61,634	65,627	69,892
Non-residential connections	Num	23,357	23,903	24,449	24,996
Non-residential water volume	ML	15,371	17,324	17,740	18,202
Total water volume	ML	72,992	78,958	83,367	88,094
Residential wastewater connections	Num	341,281	341,527	349,186	356,846
QUU	**Unit**	**2011**	**2012**	**2013**	**2014**
Residential connections	Num	474,903	482,801	490,700	498,598
Residential water volume	ML	66,812	71,451	75,963	80,784
Non-residential connections	Num	34,436	34,933	35,430	35,927
Non-residential water volume	ML	37,482	38,172	38,863	39,558
Total water volume	ML	104,294	109,622	114,827	120,343
Residential wastewater connections	Num	452,446	459,405	466,521	473,800
Non-residential wastewater connections	Num	32,217	32,655	33,100	33,554
Non-revenue water	ML	12,828	13,085	13,346	13,613
Unitywater	**Unit**	**2011**	**2012**	**2013**	**2014**
Residential equivalent water base charge	Num	266,365	272,490	278,615	284,740
Residential water volume	ML	39,750	42,302	44,915	47,591
Non-residential equivalent water base charges	Num	23,763	24,310	24,857	25,404
Non-residential water volume	ML	6,985	7,535	7,703	7,871
Total water volume	ML	46,736	49,837	52,619	55,462
Residential wastewater equivalent base charge	Num	239,815	245,317	250,818	256,320
Non-residential wastewater equivalent base charges	Num	45,717	46,792	47,867	48,941
Wastewater volume	ML	1,895	1,872	1,920	1,968

Long term forecast

The utilities also prepare longer term forecasts for the purposes of long term capacity planning. In contrast to the short term revenue related demand projections, long term forecasts place greater emphasis on a range of other factors such as the desired service standards being delivered by the assets and where demographic changes are likely to occur.

The approach adopted for its long term projections is generally based on similar information to that used in developing the short term forecasts for revenue purposes. However, in developing the long term projections greater weight is placed on meeting the desired service standards. While there may be a need for broad consistency between the forecasting approaches adopted for the short and long term projections, the emphasis on meeting the desired service standard does lead to different assumptions being adopted.

The key point of difference between the two forecasts is the relative weight placed on the different input parameters in preparing the forecasts. In the short term, demographic changes are likely to be known and capacity cannot be changed in the forecast timeframe. The long term forecast however needs to take both these issues into consideration especially where Council population growth areas are likely to be located and to ensure that network capacity continues to meet the desired service standards.

The desired standard of service defines the operating and design parameters of the network. Hence the planning standard, as a desired standard of service defines the demand for residential customers. Factors that impact demand and the desired standards of service that are taken into consideration include PWCM, consumption patterns, the Queensland Building Code, climate risk, non-revenue water (system losses) and mandated operating/design criteria. As a consequence of these considerations, long term demand projections derived are generally more conservative than the short term revenue related demand forecasts. At the local level, mandatory fire-fighting requirements are usually the most important consideration in designing network capacity rather than customer demand requirements.

While there may be a need for broad consistency between the forecasting approach adopted for the short and long term projections, currently, the utilities short term forecasts generally assumes stable or slowly increasing average residential water consumption. The long term forecast however assumes average residential water consumption significantly in excess of their short term average consumption rates that will eventually be reached.

Peaking factors are used to estimate the required capacity of the system to meet peak demand requirements for both the water supply and wastewater systems. While these peaking factors are different in various locations, in SKM's view, the approach adopted by all three utilities in respect to choosing its peaking factors for the Gold Coast is probably too conservative in that it provides a higher than necessary allowance for peak flows. This is a legacy of the historical approach used by the local councils when they owned and operated the water supply and wastewater infrastructure. With the drought and the implementation various water saving, demand management measures, the peaking factors are probably out of date given the changed structure of water demand. Also some behaviour has likely changed permanently as a result of pricing and the introduction of PWCM.

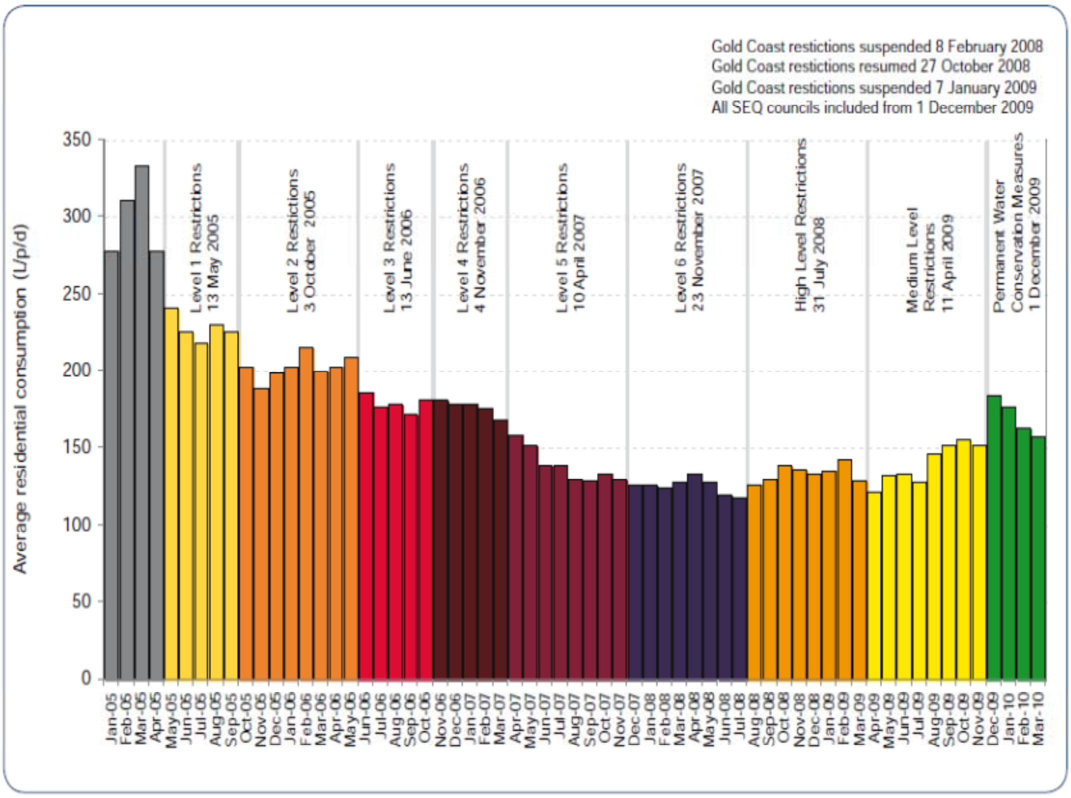
1. Introduction

1.1. Drought, Water Restrictions and Rebound

Over the last decade Australian water authorities have introduced a myriad of programs, on both the supply and demand sides, to achieve more sustainable and secure water supply. The reforms in South East Queensland (SEQ), driven by the severity of the Millennium Drought[1], included the introduction of severe water restrictions, a range of demand management programs and significantly increased prices as well as supply augmentation and efficiencies. With the ending of the drought[2] (at least for the present), the easing of restrictions and their replacement by Permanent Water Conservation Measures (PWCM) some rebound in water consumption can be expected.

According to the South East Queensland Water Strategy, SEQ residential water consumption was 282 litres per person per day (LPD) in 2004/05. With constant water conservation messages and strict water restrictions, the average residential water consumption fell to a low of 131 LPD over the period mid 2007 to mid 2009. With the easing of restrictions in April 2009 and again in December 2009, average water usage in April 2011 was about 150 LPD, still significantly below historical levels and the voluntary residential consumption target of 200 LPD. The impact of various levels of restrictions in SEQ is shown in Figure 1-1 (reproduced from South East Queensland Water Strategy 2010, Figure 4.2).

- **Figure 1-1 Average residential consumption for SEQ regions under restrictions**



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[1] The NWC indicates the this drought lasted from 2002 to 2009. See http://www.nwc.gov.au/resources/documents/Kendall_International_Drought_Symposium_FINAL_mbk_260310.pdf

[2] QWC, *The 2009 Water Report, A Year of Transition*, 2010 page 4

However, since the easing of restrictions, SEQ has experienced a relatively wet period with wide spread rainfall events culminating in major floods in various areas in the summer of 2010/11. This wetter period has meant that any rebound in consumption has been masked by significantly reduced outdoor water consumption. Thus any attempt to identify the extent of the rebound has been difficult.

Prior to the Millennium Drought, attempts to sustain water savings after the end of drought events were not a priority for Australian water authorities. Most water authorities did not introduce any ongoing demand management measures, or education programs. It is generally true that most demand management programs and water pricing changes prior to the Millennium Drought were triggered by concerns about the environmental impacts of water extraction and the perceived need to improve economic efficiencies by linking water charges to consumption. As a result, post drought water consumption rebounded to pre-drought levels gradually over a period of about two years. For example, the SEQ Water strategy presents a case study of the Gold Coast which experienced a severe drought during the period between June 2002 and January 2004. Water restrictions included total outdoor watering bans and reduced average consumption from 440 LPD to 360 LPD. After restrictions were lifted, average demand increased to 400 LPD and continued to rise. Restrictions were then imposed and demand reduced again.[3]

Rapid rebound is not, however, inevitable, and the strength of any rebound can be limited. In their 2009 study for the National Water Commission, the Institute for Sustainable Futures and ACIL Tasman commented that "*it is likely that measures such as a strong educational and promotion campaign and the timely introduction of demand management programmes targeting water-use efficiency would limit rapid bounce back.*"[4]

The extent and duration of demand management measures in SEQ exceeded that experienced in other major cities during the Millennium Drought. It has resulted in significant structural changes with improvements in the water efficiency of the installed appliance stock including showerheads, dual flush toilets and clothes washers. In addition, a significant number of water tanks have been installed some of which have been internally plumbed to provide toilets with tank water instead of grid supplied water as well as to water the garden. Plants (and lawns) have been replaced in gardens with more drought resistant plants that require less watering and often irrigation systems have been made more efficient. With the ending of the drought and easing of water restrictions, these changes will remain and as a result water demand will be unlikely to rebound to the pre-drought levels that were previously experienced. Other factors will also contribute to a reduction in rebound including:

- Impact of the large price increases required to fund measures to increase water supply;
- Continuing (if less onerous) permanent water conservation measures (PWCM);

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[3] QWC, *South East Queensland Water Strategy 2010*, page 57

[4] UTS, *Review of Water Restrictions, Volume 1 – Review and Analysis, Final Report*, 2009, page 37

- Non-residential demand management programs;
- Greater rigour in building codes to encourage water use efficiency and/or government incentives for water management, and
- The substitution of drinking water with recycled and rainwater.

As a result of the factors cited above and the combination of climatic conditions, levels of demand management and penetration of structural efficiencies there is significant uncertainty about the accuracy of demand projections. There is also some uncertainty about population growth expectations. Recent years have seen population growth slow across Australia, although SEQ growth has largely been maintained. In addition, recent years have seen a stabilisation or even reversal of a long standing decline in persons per household which has potential ramifications for demand modelling.

To assist in its processes, the Authority engaged SKM MMA to conduct an independent assessment of the demand projections provided by the various SEQ water retailers/distributors. The aim of the project is to provide advice relating to the reasonableness and appropriateness of the demand forecasting methodology.

1.2. Key Issues in Modelling

The challenge faced by the Queensland Competition Authority (the Authority) is to ensure that demand forecasts are as realistic as possible in the light of these changed circumstances, behaviours and actions over the past decade.

In residential demand forecasting, population and/or customer numbers are generally used as a major driver of demand together with other key drivers affecting the trends in average usage. Changes in average usage derive from changes in income, price and persons per customer, and the impact of conservation measures. It is a key challenge to adequately estimate the impact of strengthening or relaxing water use restrictions in light of changing rainfall patterns and improved water conservation infrastructure. The approach usually taken is to normalise water consumption for a typical rainfall year and project the impact of restrictions and changing infrastructure on the normalised water consumption series.

Some of the key issues to be considered in assessing the forecast include:

- Appropriateness of base year selection and assumptions
- Population growth and housing density
- Assumptions about climate and rainfall going forward
- The ongoing impact of demand management measures.
- The impact of restrictions and potential for rebound due to easing of restrictions
- Changes to infrastructure (e.g. more water tanks, water sensitive gardens, high efficient water use appliances such as dish and clothes washers, recycling in car washes, low flow showerheads and low flow toilets)

- Changes to the pricing structure

1.3. Water Demand Forecasting

Historically, the key drivers of long-term water demand have been:

- Demographic – population growth, household size, changes to housing stock and whether the growth is in single or multiple family residential dwellings
- Economic - household disposable income, employment, price elasticity of demand
- Trends in fixtures and appliance penetration, efficiency and use of appliances – eg penetration of water efficient toilets, clothes washers, showerheads
- Water restrictions at different levels.

In the short-term, demand has typically been modelled on a climate normalised basis, taking into account different demand conditions as a result of different levels of restrictions.

More recently, the key drivers have been water restrictions and a range of demand management measures (including rebates) and legislation such as:

- Mandating water efficiency for new homes including water efficient fixtures and the use of rainwater tanks
- Retrofitting water efficient items such as low flow showerheads, water tanks, front-loading washers and water sensitive gardens
- Regulations mandating efficiency labelling for new water-using fixtures and appliances
- PWCM and Efficient Irrigation Guidelines
- Community education programs
- System water loss management programs
- Changes in the structure of water pricing regimes and significant price increases.

1.3.1. Role of demand forecast

Demand forecast is often required during regulatory price re-sets. It plays a key role in three areas:

- determining the growth dependant capital and operating costs which are, in turn, used to develop efficient costs over the regulatory period
- developing prices under a price cap approach, or average revenues under an average revenue approach
- basis for setting annual tariffs

For the Authority, in the short term, the demand forecast is used to monitor tariffs put in place by the water entities. Accurate short term forecasts are critical in this regard as too low a forecast will result in tariffs that are too high thus unreasonably penalising consumers while too high a forecast will lead to under recovery of cost as revenue falls short of the target.

In the long term, the demand forecast provides the Authority with an estimate of when network augmentation is required. It thus plays an important role in the development of the water supply infrastructure for SEQ.

1.3.2. Water demand forecast approaches used by other regulators

Other economic regulators in Australia have been required to review and approve demand forecasts proposed by various water entities.

Water Grid Manager

In SEQ, under the Water Market Rules, the water utilities are required to provide to the Water Grid Manager (WGM) their demand forecasts based on the three scenarios:

- targeted residential customer consumption of assuming 230 LPD
- targeted residential customer consumption of assuming 200 LPD
- the ‘most likely’ estimated consumption

In forecasting short term (three years) average demand, the WGM uses a regression of historical weekly metered water volume data against historical information on population growth, temperature, rainfall and periods of school holidays. The projections are done on an aggregate basis and do not differentiate between residential and non-residential consumption.

The WGM also produced a longer term forecast for capacity planning and capital expansion purposes. The basis of this projection is the average demand forecast described above, to which a peaking factor is applied to estimate peak demand.

For each of the average and peak demand projections, the WGM produced three series under high, medium and low scenarios. This is done to provide a broad range of forecasts under differing assumptions.

Queensland Water Commission

The Queensland Water Commission has its own water demand forecasting approach. It separates residential and non-residential demand.

For the residential demand forecast, projections are based on the number of dwellings, population and the average consumption. Dwellings are separated into Single Family and Multi-Family Residences with different average (LPD) consumptions. Dwelling data is separated into pre-2007 and post-2007 dwellings to take into account the change in the development code which requires the installation of rain water tanks and water efficient fixtures to new dwellings. Thus post 2007 dwellings are deemed to be more water efficient.

Average consumption per person is multiplied by the population in each LGA (that are connected to the water grid) to derive total residential water consumption by LGA. All additional growth is allocated to the post 2007 dwelling category.

Similarly, non-residential consumption is also based on LPD multiplied by connected population. Average consumption data was obtained based on metered data. This provided an average consumption per non-residential connection. The average consumption per connection was then converted to an equivalent average consumption per person to facilitate communication with the public. Water consumed by large users were separately analysed and their expected consumption projections included in the analysis of non-residential average consumption. Rebound was assumed to occur for both residential and non-residential sectors over five years.

Essential Services Commission

The Essential Services Commission (Victoria) (ESC) released a guideline to water demand forecasting where it stated its preference for using the number of connections rather than population as the basis for forecasting. The demand forecast for a customer group would then be built up by estimating the number of connections and multiplying it by the average consumption of that group.

In determining average consumption, the ESC requires the use of a base year as a basis for calculating the base average consumption. The base year should represent typical operating conditions, which will be adjusted in the forecasts as assumptions particular to these conditions vary. Some of the conditions impacting consumption are weather (assumes normal weather conditions), demographic changes, price changes and movements in restrictions.

Independent Pricing and Regulatory Tribunal

The Independent Pricing and Regulatory Tribunal (IPART) commissioned a consultant to review Sydney's water consumption forecasts. The consultant employed a regression model on the average consumption per capita using independent variables to capture seasonality, rain fall, temperature, price of water, and water restrictions. The estimated impact of various demand management program were added to consumption data to provide an estimate of consumption without restrictions. Total consumption quantities were converted to a per capita consumption amount by dividing by the population served by Sydney Water.

Forecast total consumption, for each segment, was then estimated based on the expected population served by SWC and by subtracting the forecast impact of demand management activities. Residential and non-residential sectors were analysed using the same model but with different input assumptions.

Independent Competition and Regulatory Commission

The Independent Competition and Regulatory Commission's consultant found that the methodology adopted by ActewAGL was reasonable in forecasting demand. In forecasting water demand, ActewAGL estimated average consumption (litres per capita per day) on an aggregated basis (both residential and non-residential) using a linear regression model with net evaporation rate as the key parameter. This was then multiplied by the projected population to obtain demand projections.

2. Approach to Review

Water demand projections are subject to uncertainty, as they are influenced by a multitude of external factors including assumptions about population growth, residential, industrial and commercial water use patterns, which in turn are based on assumptions about the effectiveness of water conservation programs. Water demand projections are also developed on the basis of "average" or "normal" weather conditions. However, actual water demand may vary considerably depending on the actual rainfall and temperatures. We saw the impact of wet weather clearly in the summer of 2010/11 in SEQ when extremely wet weather resulted in low water use despite the relaxing of restrictions that had prevailed during the drought of 2005 to 2009. We also understand there was a relatively hot dry period in late 2009 that appears to have increased consumption although overall 2009 appears to have been relatively "normal".

Given the variability of the weather, some attempt should be made to 'normalise' consumption for weather conditions. However, trying to estimate a 'normal' year especially when data is complicated by the existence of restrictions and price increases is data intensive and not a simple task. Typically some form of multivariate regression analysis is used to try to isolate the impact of climate on consumption, using some index to measure soil wetness and ambient temperature. This usually requires a time series of historical data on a range of factors including the rainfall, soil moisture and temperature as well as economic factors such as price and income. Other technological factors that may change over this period (eg the penetration of water efficient appliances) would also need to be taken into consideration. In the case of SEQ, the presence of different levels of restrictions would also need to be factored in to the analysis.

The ability to apply these drivers in our analysis requires access to robust data. The difficulty in this study for all three utilities is the lack of data. Lack of historical data prior to and following the drought makes it difficult to completely understand the impact of the imposition of restrictions, and is not available due to the recent establishment of the utilities.

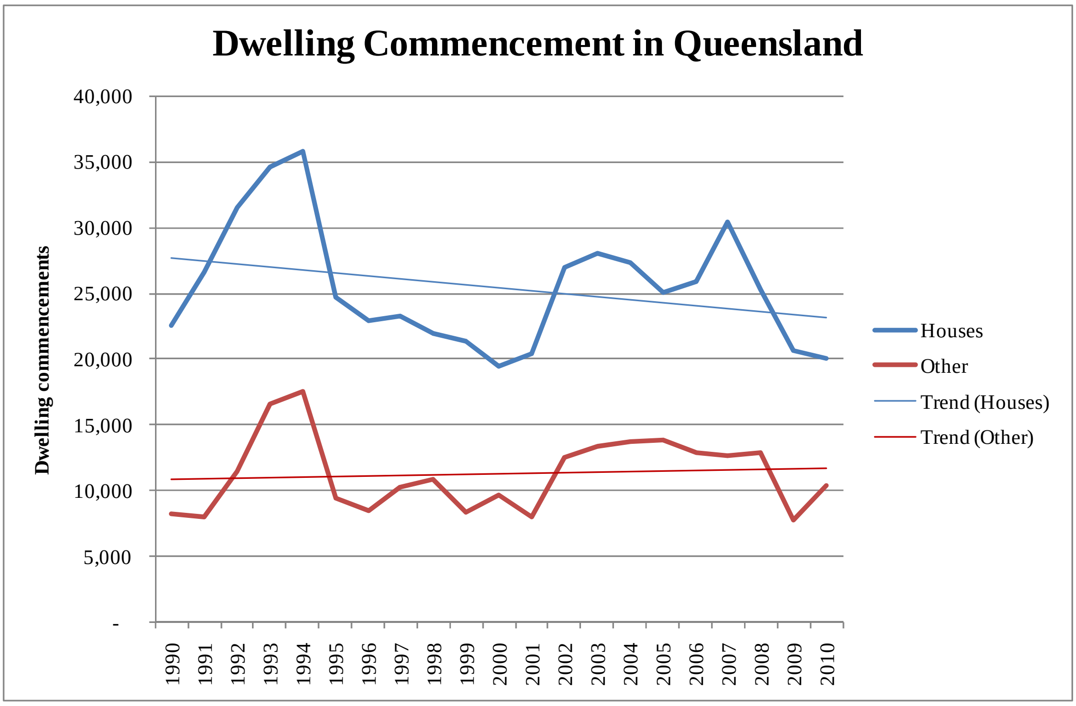
Prior to the start of water reforms in 2008 and the formation of the water utilities in 2010, water was supplied by the individual councils. The utilities have been unable to obtain council data prior to 2009/10 because of data incompatibility issues around the way that data is defined. Even if such data were available there would be some uncertainty about the quality of that data. While some data is available following the drought, the amount is relatively small, inhibiting the ability of analysis to draw any firm conclusions about customer consumption behaviour. We expect that this issue will eventually resolve itself as more time passes and data is collected in the normal course of business.

Due to data insufficiency issues, a robust regression type analysis cannot be undertaken. However, the future demand for water can still be assessed based on a number of factors that can be obtained. These include:

- Population growth - this is a key driver of overall demand growth. Tourist numbers will also impact on both short-term and long-term trends in water usage
- Average consumption levels:

– In Queensland there has been a shift towards multi-unit dwellings and flats. The proportion of multi-unit dwellings has increased over the last ten years. This may be seen in Figure 2-1 where while the number of new houses being built has been declining, the number of multi-unit developments (other) has been increasing. In addition, the trend towards fewer people per household also increases water usage on a per capita basis, although the difference is likely to be small.

▪ **Figure 2-1 Increasing proportion of multi-unit dwellings in Queensland**



Source: ABS, 8750.0 Dwelling Unit Commencements, Australia, Preliminary, June 2011, Table 03. Number of dwelling unit commencements, States and Territories, Original

– Trends in appliance purchases and usage. There has been a move towards multiple toilets and showers in residences, which tends to increase water usage. The installation of automatic sprinkler systems is also likely to increase water usage. Countering this has been the trend towards more water efficient appliances such as dual-flush toilets and more recently front-loading washing machines.

▪ Recently, restrictions have been a major driver of demand and a major issue for forecasting is how demand will behave with the lifting or easing of restrictions ie the extent of rebound.

2.1. Issues in Forecasting

2.1.1. Population

The major growth driver of consumption is population growth.

If the source of population growth projection is credible and the projections are regularly updated, population is usually a good indicator of likely growth in consumption. The Queensland Government publishes and uses Office of Economic and Statistical Research (OESR) Planning and

Information Forecasting Unit (PIFU) (now the Demography and Planning Unit (DPU)) projection of population, household formation and dwellings. All three entities use this source as a major driver and the OESR provides the Queensland Government's official population forecast. Updates are also undertaken on a regular basis and so as long as these updates are incorporated into the projections, the forecasts produced should reflect the latest available population information. We understand that the latest population projection has been released by the OESR in May 2011. In their submission to the Authority, the utilities used the 2010 OESR/PIFU update (of its 2008 projections) instead of using the latest 2011 data. This was due to the need to meet their budgetary and pricing approval processes which were due for completion prior to the release of the latest OESR projection. Given the timing of the utilities budgetary and approval processes, the use of the 2010 data is consistent with Section 3.2.1 of the Authority's *SEQ Interim Price Monitoring Information Requirements for 2011/12* dated June 2011.

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2.1.2. Average consumption

According to the South East Queensland Water Strategy, in 2004/05 total urban average consumption in SEQ was about 450 LPD with residential consumption at 282 LPD. In 2008/09, average residential consumption had fallen to 143 LPD. At the height of restrictions (level 6 in 2008) average residential water use in those regions of SEQ that were under restrictions was 131 LPD. With the introduction of PWCM after the end of the drought, residential consumption in the same regions continued to be low, averaging around 165 LPD. This does indicate that some level of rebound was taking place but at a slow rebound rate and that some level of demand reductions implemented during the height of the drought were maintained. These are likely to be structural changes as a result of, for example, the installation of water tanks, low flow showerheads and dual flush toilets.

The PWCM restrictions are relatively light compared to the restrictions previously imposed. As such the replacement of strict temporary water restrictions with PWCM is not expected to have a major impact of customer water consumption behaviour in the short term as the PWCM daily usage restriction levels are above current average daily usage levels. In the longer term however, the existence of PWCM is likely to reinforce the need to restrain water consumption. This makes it all the more likely that average water consumption will not return to pre-drought levels.

Sunshine Coast residents which were not subject to the strict temporary restrictions as in other parts of SEQ also reduced consumption, although not to the same level as in other parts of SEQ.

Residents in the Sunshine Coast reduced average consumption from about 317 LPD in 2004/05 to about 224 litres at the end of May 2010. While Sunshine Coast residents were not subject to water restrictions, they had access to the same rebate and retrofit schemes as in other parts of SEQ. They were also in receipt of all the media, promotional and educational campaigns the Queensland Government implemented for the rest of SEQ, urging reduced water consumption.

The three utilities have slightly different water forecasting methods. While all three use average per person consumption, Allconnex applies this to population forecasts for its residential water projections but uses average consumption per connection for non-residential water while QUU applies it to an equivalent person/equivalent tenement (representing the average number of persons per property) to estimate the average consumption per connection for both residential and non-residential water. Unitywater combines residential and non-residential water into its estimate of average per person consumption and applies this to the population forecast. Separation into residential and non-residential water occurs after total water demand is forecast.

An approach using LPD has some advantages:

- it is able to take into account all categories of demand, which are important for supply planning
- it requires relatively little information and relatively few assumptions
- it allows analysis on a daily basis and hence identification of important seasonal and weather variables. Other methodologies which rely on quarterly billed data run the risk of not capturing these impacts.

However, we prefer to use the average consumption per connection method for both residential and non-residential customers. The most important reason for this preference is that consumption data is collected by the utilities for billing purposes on the basis of connections, not persons. As a result, data at this level can be easily obtained and verified. However, given that all three utilities have been largely unable to provide any significant historical data negates this advantage in this assignment. Average consumption per connection figures can also provide a direct indication of the impact of demand management measures as well as of price elasticity. To obtain an estimate of these impacts using average consumption per person data requires estimates of average persons per connection.

Using average connection consumption requires forecast connection numbers to create a final forecast of water use. Historical trends of growth in connection numbers can usually be easily obtained from the utilities and used to project the likely future growth. Growth in connection numbers is closely correlated to the growth in dwelling numbers in the residential market, and possibly other business indicators in the commercial and industrial markets. Projections of dwelling numbers may be easily verified using a number of sources including the Housing Industry Association's forecast of dwelling starts, as can other indicators that may be appropriate to particular market sectors. Using average consumption per person on the other hand requires a projection of the connected population. While sources like PIFU/OESR and the Australian Bureau of Statistics (ABS), on which PIFU/OESR numbers are based, are authoritative sources, the numbers put out by such agencies are external to the utilities and thus are not directly observed by them. As a result, the utilities are required to make assumptions regarding the proportion of the population they service. Having to make this assumption introduces an element of potential error as well as the fact that this proportion is likely to change over time. So unless the utilities regularly undertake an update of the proportion of population connected, the error is likely to get larger over time.

Also for revenue forecasting purposes, the LPD approach, while useful for forecasting overall utility demand is less useful for forecasting revenue. Revenue, especially the fixed component is not collected on the basis of the number of people but rather on the number of connections. As a result, a separate forecast has to be undertaken on the number of connections.

However, despite our preference for using average connection consumption values, in SEQ, the Queensland Government has based its water strategy on average consumption per person. Both historical consumption and future target consumption levels are expressed in per person terms. As a result, to calibrate the expected rebound, this can only be done on a per person basis.

While an LPD approach may be considered to be inferior to an approach based on analyzing movements and drivers by customer connection category, in the absence of historical information the use of an LPD approach appears reasonable as it does generate a robust estimate of total water demand which is required for the estimation of operating expenditure. While it may be considered a less desirable method, much of the analysis of underlying drivers applied should be applicable to both approaches.

Over the long term too, consumption targets are expressed in litres per person. This may not be as great an issue as it is for short term forecast as in the long term, population is the major driver of consumption and infrastructure is developed to meet the needs of population growth.

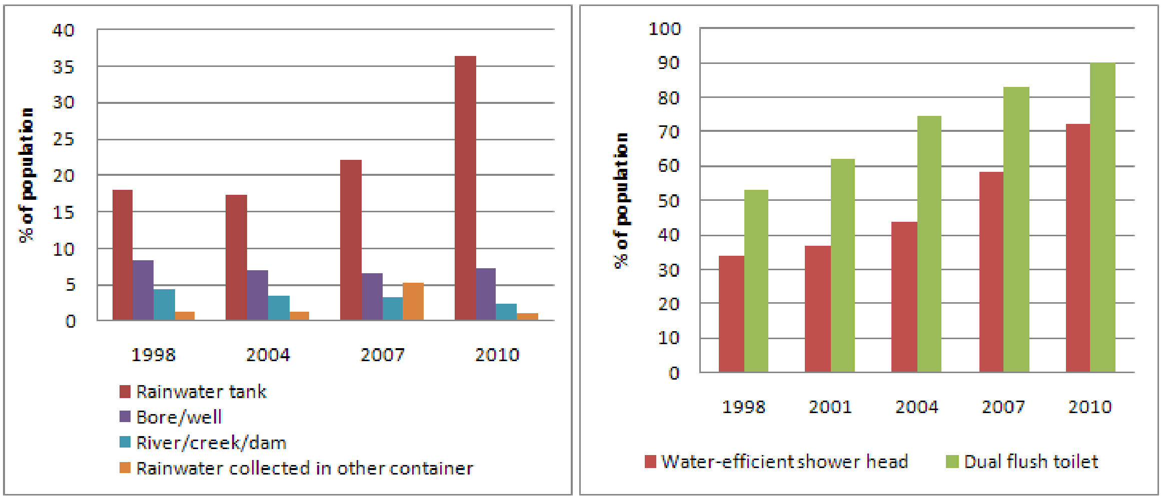
2.1.3. Rebound

With the return to normal weather conditions and the easing of restrictions, the question is how average consumption would respond. Would average residential consumption in SEQ stay at the very low levels seen during the restriction period or rebound to pre-restriction levels of around 280 LPD, and if so over what period? Alternatively, would it rebound to a different perhaps lower level in the presence of PWCM and other structural changes that have occurred? The difficulty present in this current study is the lack of historical data at the LGA level which means that the likely rebound target consumption level cannot be estimated. Without knowing what “normal” consumption level was before the drought and the imposition of restrictions, we cannot assess what level of consumption may return to with the easing of restrictions.

While previously the easing of restrictions had led to consumption rebounding to levels that were comparable to that prior to restrictions, we believe that demand levels will not rebound to the levels seen before the Millennium drought. The measures taken to reduce consumption during the drought have resulted in a structural change. These measures include the substantial rebates available to install water efficient fixtures and appliances in households and a business water efficiency program.

These demand management initiatives resulted in a significant structural change in the uptake of water efficient fixtures, appliances and technologies. Queenslanders have to a very large extent taken the rebates offered by the Queensland Government to install water conservation devices including rainwater tanks, water efficient showerheads and dual flush toilets. The increasing proportion of homes that have such water efficient fixtures are shown in Figure 2-2 below. The installation of these water efficient fixtures in Queensland homes means that lower consumption is locked in and the ending of the drought and temporary restrictions will not lead to consumption levels rebounding back to where they were prior to the drought.

- **Figure 2-2 Increasing penetration of water efficient fixtures in Queensland**



Source: ABS, 4602.0.55.003, Environmental Issues: Water use and Conservation, Mar 2010

As discussed in section 2.1.2, in terms of changing the behaviour of consumers over the long term, the introduction of PWCM also serves to lower average consumption levels. In addition, the large real price increases that will continue into the future are also likely to affect behaviour as well as the continuing media and public interest in water conservation.

The Queensland Government has indicated that it expects water consumption to remain below 200 LPD under PWCM. Lacking any other data to indicate what rebound target is likely to be, this 200 LPD average consumption level can serve as an indication of where average consumption will settle when water consumption has fully rebounded from the lifting of the drought restrictions. The analysis undertaken in the following chapters assume that average residential consumption in SEQ will rebound from 165 LPD to 200 LPD. While consumption in individual LGAs will show different rebound target levels, they rebound to a level such that overall, SEQ average residential consumption reaches 200 LPD.

Another issue to consider is the length of time it takes for rebound to be fully realised. As the SEQ Water strategy case study of the Gold Coast experience indicated, rebound from a severe drought, in the absence of any ongoing measures or media campaign to retain savings achieved during restrictions, resulted in consumption rebounding to normal levels over a period of 18 to 24 months.

However as the UTS 2009 study also noted that strong educational and promotion campaign and the timely introduction of demand management programmes targeting water-use efficiency would limit rapid bounce back and thus be likely to delay the full rebound from drought restrictions. The constant media campaign in SEQ to limit water demand as well as the introduction of PWCM certainly necessitates giving strong consideration to the UTS assessment. As a result, in our view, full rebound on a per person basis will not occur till about four to five years after the lifting of restrictions.

2.1.4. Impact of economic growth, income and development trends

Economic growth has a direct impact on non-residential water demand. It also potentially affects residential demand via the income effect through the move towards multi-unit dwelling by encouraging the formation of smaller (1 or 2 person) households, the purchase of more appliances including spas and increases in discretionary water uses such as swimming pools, garden irrigation as income levels increase.[5]

Generally, such economic factors are assessed using multivariate time series analysis. Given the lack of historical water consumption data, we have not directly assessed the impact of economic growth and income in our analysis.

2.1.5. Water pricing

A potential strong driver of demand is water pricing. Water pricing can be used to encourage behavioural change, and to reward efficient use. However, water as a commodity is different from the standard economic textbook treatment of demand and supply analysis. The primary difference is that the price of water is not set by the interaction of market forces.

Billing and the payment for water is also different from that of most goods and services and this may lead to issues with the way consumers perceive the price of water. Since the advent of metered water consumption, most water customers are billed quarterly for their water consumption. Consumers do not pay for water as they purchase or consume it; instead they pay for the accumulated consumption. Other utility services such as electricity and natural gas have similar billing practices and approaches. This is different from other commodity markets where consumers pay for the good at the point of or prior to consumption (eg petrol or bread).

What makes water different is that in addition to receiving bills for water consumed in arrears customers face complicated pricing structures and may also have their bill for wastewater services bundled into the bill. Occasionally they may even have other government charges included in the same bill (eg drainage or parks charges). The tariff structure for water can be a two (or multi) -part tariff with a fixed fee plus a per kilolitre charge for water consumed. In many jurisdictions including SEQ the volumetric charge for water can exhibit several inclining tiers with the marginal price for water rising as the individual customer consumes additional water. The bundling of wastewater and other services (such as council rates as used to be the case for water consumers in SEQ) with the bill for water may provide customers with a single payment to the utility but the customer may only be concerned with the bottom line payment and not the volumetric charge for water. As such, it may be difficult to determine an appropriate price level against which water consumption is to be analysed.

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[5] Whether there is sufficient data at the level required for inclusion into the forecast may be an issue in seeking to assess the impact of economic growth and income on water demand given the recent formation of the entities.

The price elasticity of demand (PED) for water is a measure of the responsiveness of the quantity demanded to changes in the price of water. It is calculated as a ratio of the percentage change of quantity demanded relative to the percentage change in price. A brief discussion on the price elasticity of demand in the Australian context is provided in Appendix A. The estimates fall in the range -0.05 to -0.6. The large variations in the estimated values are due in part to large variations between study areas in terms of urban design, consumption behaviour, technologies, institutional and regulatory factors, climate and custom. Even when research featuring the same study area is compared, estimated values can vary due to differences in the application of econometric techniques and assumptions, as well as differences in data. The most recent study conducted for Sydney (Abrams et al (2011)), made the point that "*(t)he results are specific to Sydney remain and remain valid as households continue to maintain the water use patterns established during drought related water restrictions.*"[6]

Perhaps more interest to the Authority is the study that found the largest price elasticity of demand. Hoffman el at (2006) [7] found that the estimate of the price elasticity of demand for Brisbane was -0.588 in the short-run and -1.442 in the long-run. These estimates imply that water demand in Brisbane is relatively sensitive to price in the long-run. However the data used in this study was from 1988 to 2003 and related only to the residential sector. Demand may have changed significantly in recent years due to changed consumer attitudes as a result of the drought and an adjustment to the published elasticity estimate needs to be made to covert to real prices as the study made use of nominal prices in their time series modelling.

We note that the demand management programmes that have been put in place in SEQ includes a broad range of behavioural and structural measures that will overlap in part with the expected response of customers to changes in pricing arrangements. In particular, measures to improve the water efficiency of appliances fixtures will over time result in a reduction in water demand. Price changes over the same time period will also result in a reduction in water demand.

It must also be noted that the price elasticity of demand is a marginal measure. That is, it measures the quantity impact of a small marginal change in price. It may not be appropriate to assess the large residential water price changes as recently experienced in SEQ.

None of the three utilities have considered the impact of price on demand. QUU does not address price elasticity of demand in its submission while Unitywater "*considers water demand, in aggregate, to be highly inelastic at the current price*", and acknowledges that "*there is the potential for changes in customer behaviour*" due to the price of water "*in relation to discretionary water use*".[8] However there is no assessment of this potential in its submission or other material presented to us to support their demand projections. Allconnex specifically stated that it "*has not adopted a formal estimate of price elasticity of demand for the purposes of forecasting consumption, therefore current projections do not vary with respect to specific pricing policy*

[6] Abrams, B., Kumaradevan, S., Sarafidis, V. and Spaninks, F. (2011) *The Residential Price Elasticity of Demand for Water*, Joint Research Study, Sydney, February, page 4

[7] Hoffman, M., Worthington, A., and Higgs, H. (2006) Urban water demand with fixed volumetric charging in a large municipality: the case of Brisbane, Australia, *Australian Journal of Agricultural and Resource Economics*, vol. 50, pp. 347-359

[8] Unitywater, *Interim Price Monitoring Submission - 2011/12*, page 53

decisions."[9] Allconnex also indicated that while it understands the Authority's desire to take price into consideration when assessing demand, Allconnex holds "*the view that a comprehensive investigation into price elasticity of demand would need to be conducted over an extended period of time and would need to consider the impact of the (possible) future introduction of tenant billing*" and that "*historic consumption data is distorted by the imposition of water restrictions, necessitating complex data adjustments to develop a "clean" data set on which to base elasticity estimates.*"[10]

Given the lack of historical information and especially the fact that the demand for water in SEQ is in the process of rebounding from restriction constrained levels of consumption, we have not been able to assess the impact of pricing and have in all cases left pricing out of our analysis in this review.

However, we note that while price may not have been explicitly considered in the submissions and in our analysis, it is likely that the recent large increases in price has had an impact and has contributed to the slow rebound from drought consumption levels. Once consumption has rebounded to non-drought influenced levels, we recommend that the impact of price elasticity be made an explicit component of demand forecasting to be undertaken by the utilities.

2.2. Categories of Water Demand

Three categories of consumptive water use can be considered in developing water demand projections for SEQ. These are residential use, non-residential use and non-revenue water.

2.2.1. Residential demand

Residential demand accounts for between 60% and 75% of total bulk water consumption in SEQ. The main drivers of residential water demand are population growth and the pattern of water use of individuals and/or household across the population. This dependent on:

- Demographic changes including changes to household size - the number of people in a residential dwelling and expected trends due to demographic factors eg trend towards apartment living and housing estates with recycled water systems are likely to decrease average consumption of potable water use.
- The installation of water efficient appliances including low-flow showerheads, dual flush toilets water efficient washing machines which will result in a sustained reduction in residential water demand
- How permanent behavioural changes are from water demand management programs which serves to limit the extent of rebound in water use after the easing of restrictions
- The price elasticity of demand and thus the ability of increased water prices due to supply augmentation projects to again limit the rebound in discretionary water use.

[9] Allconnex, *Allconnex Water Price Monitoring Submission 2011-2012*, page 51
[10] Allconnex, *Allconnex Water Price Monitoring Submission 2011-2012*, page 21

In residential demand forecasting, best practice would require an assessment of changing historical customer numbers and average usage. Changes in average usage over time take into account variables such as dwelling size, number of persons per dwelling, comfort (income) effects and impact of conservation measures. One challenge is to assess the impacts of weather and restrictions separately, and then to forecast for normal weather taking into account the continuing impact of restrictions or rebound from the easing of restriction. The definition of what constitutes normal weather, given the potential for climate change, is also an important consideration.

The second step is to take into account impacts of fundamental changes to key drivers, such as conservation measures and pricing mechanisms. Where possible, attempts to disaggregate demand into external (garden, pool) and internal demand, and then look at the impacts of various measures on usage by appliance.

Both steps require adequate data. Most of the data required is not available for this review. In the absence of such data, average usage trends combined with estimated key driver impacts have been used.

2.2.2. Non-residential consumption

Non-residential consumers include government, commercial and industrial users. They are less homogenous than residential customers and thus it is more difficult to define a set of drivers appropriate for all non-residential users. Often sector-specific issues have a significant impact on demand that affects only those sectors eg mining or electricity generation. Where the data is available, statistical regression analysis incorporating economic growth drivers where the state of the economy may be an indicator of the level of commercial and industrial activity may be used in the forecast eg a recession is likely to reduce both average volume as well as numbers of non-residential connections. However, the level of data required for such analysis is not available for use in this study.

Non-residential water demand currently accounts for about 10% to 30% of total bulk water consumption in SEQ. Non-residential water use is partially dependent on population growth, as increased population would place a greater demand for industrial and commercial goods and services as well as requiring higher employment.

However there is a strong potential for increased water efficiency across industry which may have a larger influence on non-residential water use than population growth. Increased water prices due to supply augmentation projects may lead to a reduction in water demand, depending on the elasticity of non-residential demand for water. Also reductions in the total amount of non-residential water use in recent years, despite increases in population over this time have been observed due to demand management initiative put in place by governments. In SEQ, non-residential customers above a certain size are required implement water efficiency measures through the Water Efficiency Management Plans (WEMPs). These plans are aimed at assisting non-residential customers to identify opportunities to achieve cost-effective water savings in their operations. This programme applies to the following categories of non-residential water customers:

- all non-residential water users consuming more than 10 ML a year,

- nurseries, turf farms, and market gardens using less than 10 ML per year,
- public pools using less than 10 ML per year,
- all cooling towers, and
- non-residential premises using potable water to irrigate areas greater than 500 square metres.

The programme requires such businesses to develop a WEMP with the aim of achieving 25% reduction in water use initially and to achieve water use best practice over the long term. This programme is ongoing despite the ending of the drought and is part of the PWCM.

2.2.3. Non-revenue water

Non-revenue water is water that is not accounted for. It includes system losses such as leakage and water that is stolen or unaccounted for due to inaccurate meters. Water used for fire-fighting and water used for cleaning of water main are also classified as non-revenue water. Non-revenue water currently accounts for about 10% of total bulk water consumption in SEQ across all three utilities. The utilities have to some extent invested leakage control programs to locate leaks for subsequent repair, in order to ensure that non-revenue water is minimised. However it is not economically viable to attempt to eliminate all losses as the water supply networks have millions of joints and leaks may be characterised as being anything between slow seepages and high volume flows. The amount of non-revenue water across the system is largely independent of flow although it may be weakly related to the number of connections. Some utilities have initiated pressure reduction to minimise losses however, these may result in complains if it affects the pressure at which customers receive the water. The ability to reduce mains pressure may also be limited by fire fighting flow requirements.

2.3. Long Term Forecasting for Infrastructure Planning

In the long term utilities are required to prepare demand forecasts to meet capital planning purposes. According to the SEQ Water Strategy, the planning assumption to be applied is for total urban average consumption of 375 LPD. This includes a residential use allowance of 230 LPD. The SEQ Water Strategy recognises that this level of consumption is conservative but maintains that it is a prudent approach to planning for water supply, taking into account the timeframes for delivering bulk water supply infrastructure and the level of uncertainty regarding:

- the extent of permanent behavioural changes by the community
- population growth
- climate variability
- the potential impacts of climate change

However, the SEQ Water Strategy also maintains a voluntary initiative for consumers to maintain average residential consumption below 200 LPD. The initiative claims that by maintaining consumption below this level would defer the need for new supplies for at least five years.

In SEQ, under the Water Market Rules, the utilities are required to provide to the Water Grid Manager their demand forecasts based on the three scenarios:

- targeted residential customer consumption of assuming 230 LPD
- targeted residential customer consumption of assuming 200 LPD
- the 'most likely' estimated consumption

Infrastructure planning to meet water supply service standards is based on meeting the 230LPD design standard for residential customers plus ensuring that peak day and peak hour requirements are met. In addition, leakages (non-revenue water) must also be considered in developing the design standard. Often mandatory fire fighting requirements are super-imposed to ensure that the capacity to meet such emergencies is available. The fire fighting requirements range from achieving 5 litres per second to full tankers, 15 litres per second in most urban residential areas, 30 litres per second for industrial areas to 60 litres per second for high rise apartments.

Prior to the drought, average consumption in SEQ ranged between 350 and 400 LPD. With the imposition of water restrictions, average consumption fell to around 150 LPD in most of SEQ. We expect that with the easing of restrictions and its replacement with PWCM, consumption will rebound to around 200 LPD and remain at this level for the long term. However, this expectation is not consistent with the long term planning criteria of 230 LPD. Whether the long term planning criteria should be lowered to reflect the likely lower average rate of consumption is however an issue to be debated given that changing the 230 LPD long term forecasting consumption target will require an explicit change to the desired service standard used to determine infrastructure capacity. We also note that most of the reticulation network capacity is determined not by the 230 LPD criteria but rather by fire-fighting flow requirements. As a result, any change to the capacity criteria is unlikely to have much of an effect on street level pipe sizes. In addition, the marginal cost of installing the next higher pipe size is negligible as most of the cost is in digging and making good the trench that houses the pipe. Where any change to the desired service standard criteria will have a major impact is on the timing of the installation or upgrading of trunk mains. These are timed and sized to meet customer demand. Installing too great a capacity or too early will have significant cost implications as these assets run into the many millions of dollars. On the other hand if the capacity of a trunk pipeline is insufficient or not available, stressed parts of the network may well run out of water in the event of a series of peak demand days results in reticulation reservoirs running dry.

2.4. Impact of Demand Forecast on Forecast Expenditure

The current water consumption rate is below both the required 230 LPD and the aspired 200 LPD as contained within the SEQ Water Strategy. Trunk water infrastructure design criteria is based on the average day demand and factors of it, such as mean day maximum month (MDMM) and mean day (MD). These factors are greater than one and generally less than two. Consequently a change in the average day consumption rate can result in an amplified change to the design criteria. Notwithstanding this, caution should be used as, in practice, a reduction in average day consumption does not necessarily lead to a reduction in the peak consumption rate. Peak consumption is a function of human behavioural responses to extreme weather. Consequently, the average day to maximum day (AD:MD) factor may increase if the average day rate decreases, unless the customer behaviour is changed to reduce the use of water on extreme weather days.

Consequently, maintaining the current design criteria with lowered average consumption rates may result in some reserve capacity within the water distribution system. Coarse analysis suggests that this may be in the order of 20 percent. Without data from a longer period it would not be prudent to attempt to utilise this spare capacity as a long term solution, as the consumption habits of a population can change faster than the ability to augment trunk infrastructure.

With respect to water reticulation infrastructure, the critical design criterion is usually fire fighting flows. Consequently the reduction in unit consumption rates is unlikely to have a significant impact on the size of smaller diameter infrastructure.

Overall water system infrastructure sizes are unlikely to be highly sensitive to variances in the unit consumption rate and reducing the rates may be premature given the limited amount of information.

The augmentation of water distribution trunk infrastructure generally results in a step change in capacity and consequently, the variance in near term demand forecast usually changes the anticipated date of the next augmentation only slightly. These are usually accommodated in timing reviews of these works, which are a mandatory action for strategic planning projects and their associated business cases.

With regard to wastewater, an increase in the consumption of reticulated drinking water does not necessarily lead directly to an increase in wastewater generation, as not all reticulated water is released to the sewers. In particular during water restrictions, irrigation, which is not directly entrained into sewers, is dramatically reduced. Consequently, when restrictions are lifted, water consumption can increase without a commensurate increase in wastewater generation.

The wastewater flows are likely to be more sensitive to inflow and infiltration, whereby storm water enters sewers directly or groundwater enters sewers through infrastructure defects, respectively. It is usually co-incidental that the increase in wastewater generation from increased inflow and infiltration occurs in the same timeframe as increased reticulated water consumption as rainfall replenishes both surface water storages (ie dams) and groundwater tables. The implementation of reduced infiltration gravity sewers (nuSewers, Smartsewers, RIGS) aims to reduce this inflow and the system is generally designed for the consequent reduction in the peaking factor.

Both water conservation measures and infrastructure improvements have significantly reduced design criteria such as average dry weather flows. There are generally already allowed for in the generation rate and peaking factors currently used.

With regard to wastewater treatment the design criteria of various elements of a plant are either based on organic load or hydraulic load. A reduction in the amount of water transporting the organic load does not change the load, just the concentration. Consequently these elements such as a reactor tank (anoxic and aerobic compartments) size are not varied. For the elements where hydraulic load is the design criteria, these are usually specifically design based on gathered data and potential savings are only a small reduction in vessel height or pump capacity.

Consequently the cost of a treatment facility is generally not sensitive to changes in hydraulic load. Conversely they can be sensitive to apparently small changes in environmental licence concentrations, as these can require additional process elements.

As the required wastewater infrastructure is not highly sensitive to changes in generation rates, the demand aspect of connections is the significant factor. Wastewater system augmentations usually result in a step change in capacity and consequently the variances in near term demand forecasts usually change the anticipated timing slightly only.

3. Allconnex

3.1. Allconnex Forecasting Approach

The approach adopted by Allconnex is based on establishing an underlying level of consumption on a per person per day basis (litres per person per day) and multiplying this average consumption by population in the case of residential demand. For non-residential consumption the average consumption is based on average daily consumption per connection. This average consumption is multiplied by the number of connections in the case of non-residential demand. The population is adjusted in some cases such as the number of tourists visiting and the proportion of properties connected to the water and wastewater service delivery network. Implicit in the forecast average consumption is the current Permanent Water Conservation Measures (PWCM).

The baseline average consumption is based on metered residential and non-residential consumption data based on recent quarterly billing data. Customer connections are also based on historical billing data while historical population estimates are sourced from PIFU, taking account of the percentage of the population serviced and tourist in the case of the Gold Coast.

Forecast for wastewater connections have been developed based on the number of wastewater connections in 2009/10. The annual growth rate is assumed to be the same as the growth rate in the number of connections of water. Projections on the number of connections are then split into residential and non-residential using historical ratios.

Wastewater volume forecasts are provided only for non-residential customers in the Gold Coast and Logan. Only the Gold Coast has volumetric based charging for wastewater. The forecasts are based on a proportion of water use depending on the customers' industry type. This wastewater discharge factor ranges from a low of 0.02 for concrete batching plants which while it uses water for the mixing of concrete, does not discharge the consumed water into the sewerage system and 0.1 for nurseries to 0.9 for accommodation type businesses where most of the water consumed is discharged into the sewerage system. These proportions have been developed based on previous Council estimates.

3.1.1. Proposed forecast

A summary of the Allconnex demand projections provided to the Authority for the period 2010/11 to 2013/14 is shown in Table 3-1. Also shown are the average annual expected growth rates over the same period.

▪ **Table 3-1 Allconnex proposed demand projections**

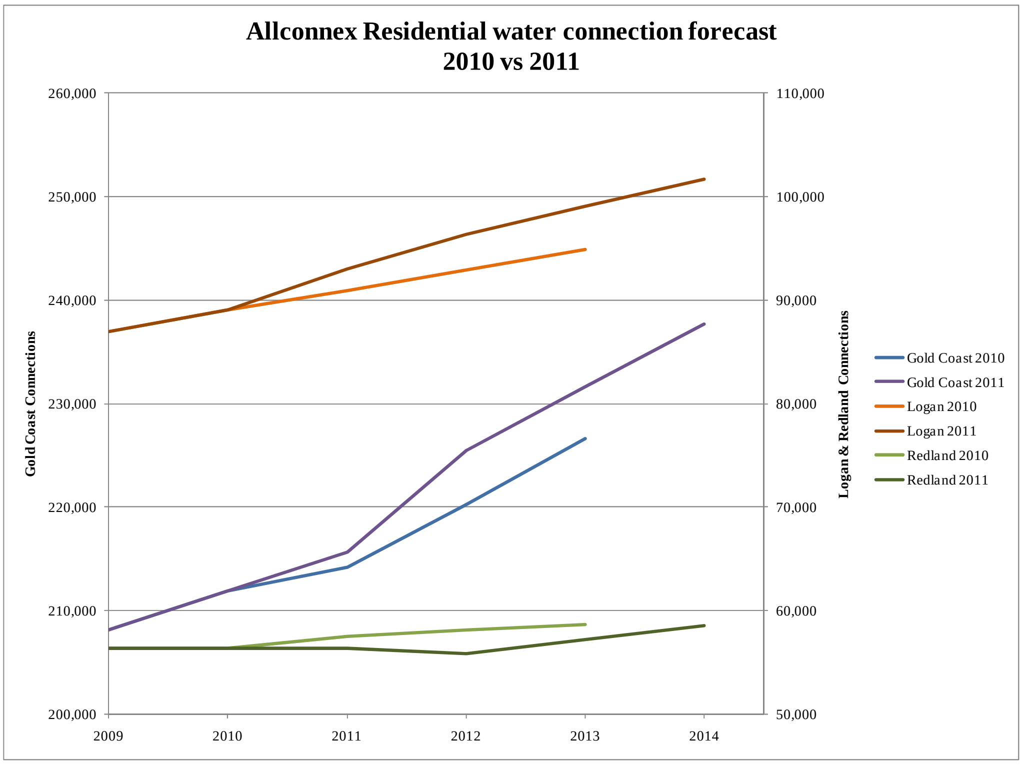
		FY ending June				CAGR %pa
Allconnex Forecast	**Unit**	**2011**	**2012**	**2013**	**2014**	**2011 - 2014**
Residential connections	Num	365,066	377,748	387,810	397,872	2.9%
Residential water volume	ML	57,621	63,183	64,489	65,967	4.6%
Non-residential connections	Num	23,357	24,374	25,026	25,679	3.2%
Non-residential water volume	ML	15,371	17,324	17,740	18,202	5.8%
Total water volume	ML	72,992	80,507	82,228	84,169	4.9%
Residential wastewater connections	Num	341,281	338,748	347,778	356,809	1.5%
Non-residential wastewater connections	Num	19,291	31,843	32,698	33,552	2.6%
Treatment plant wastewater volume	ML	63,046	69,180	70,640	72,286	4.7%
Non-residential wastewater volume	ML	6,479	24,341	24,684	25,492	2.3%
Trade waste connections	Num	2,227	1,903	1,903	1,903	-5.1%
Trade waste volume	ML	72,992	80,507	82,228	84,169	4.9%
Non-revenue water volume	ML	7,474	7,592	7,755	7,939	2.0%

We note the two highlighted cells in 2011. There appears to be a break in the data series between the current estimated actual numbers for non-residential wastewater (both connection numbers and volumes) and the forecast. In the case of non-residential wastewater volume, this is explained by the fact that Allconnex did not provide the estimate of the current (2011) volume for Logan. Logan wastewater customers are not charged for wastewater volumes. No volumes were available for previous financial years as this information was not recorded. Non-residential wastewater connection numbers are also inconsistent as a result of changes due to the consolidation of Allconnex from the three Council water businesses where a number of data sets, based on Council provided data have been combined. These datasets may have coded properties differently resulting in the inconsistencies. In particular, for Logan the wastewater connection number is not an actual number of connections but rather a calculated number resulting by dividing total revenue by the average charge. However the charge for wastewater connections of non-residential customers is based on the number of deemed pedestals. The Logan wastewater number is thus not a valid number for historical comparison. As a result of these anomalies and inconsistencies, the compound annual growth rate (CAGR) for non-residential wastewater is based on the growth from 2012 to 2014.

3.2. Previous forecast

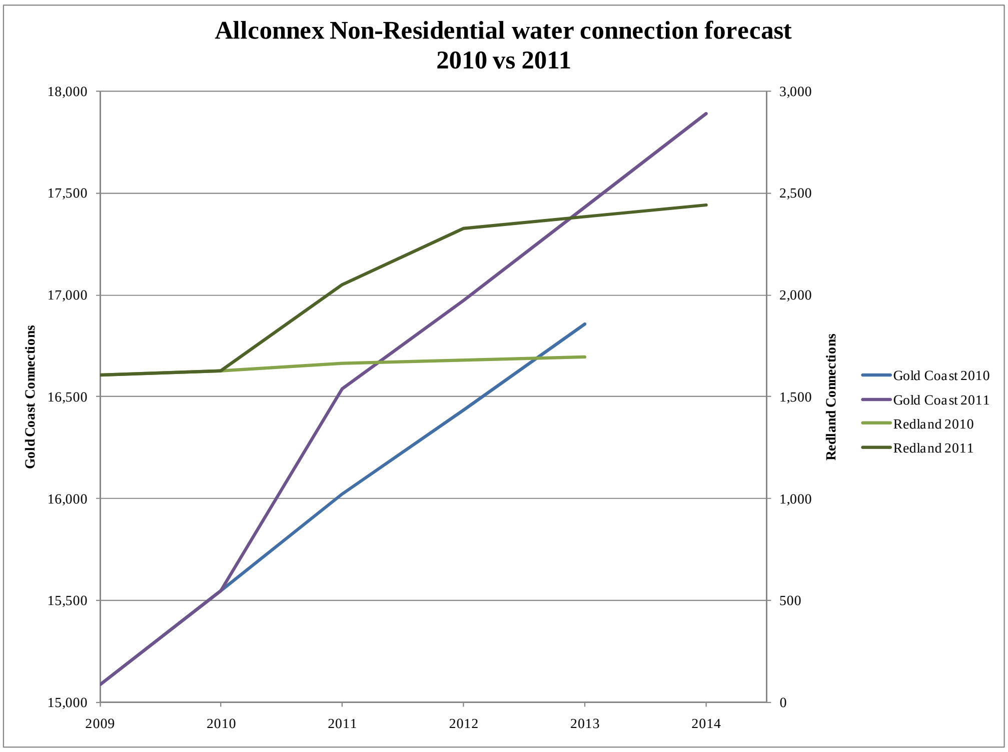
Comparing Allconnex's current proposed forecast with its 2010 proposal indicates that Allconnex residential connection forecast has increased slightly for the Gold Coast and Logan but its forecast has fallen in Redland. Residential connection the Gold Coast is currently forecast to increase by 2.7% pa over the 2009 to 2014 period, up from the 2010 growth forecast of 2.1% pa from 2009 to 2013. Similarly, residential connection in Logan is currently forecast to grow by 3.2% pa, an increase from its 2010 forecast growth of 2.2% pa over the same periods. On the other hand, residential connection growth in Redland has fallen to 0.8% pa from 1% pa previously. This can be seen in Figure 3-1.

- **Figure 3-1 Allconnex residential water connection**



For non-residential connections, there appears to have been a step change in the way such connections have been counted or classified. This is shown in Figure 3-2.

- **Figure 3-2 Allconnex non-residential water connection**

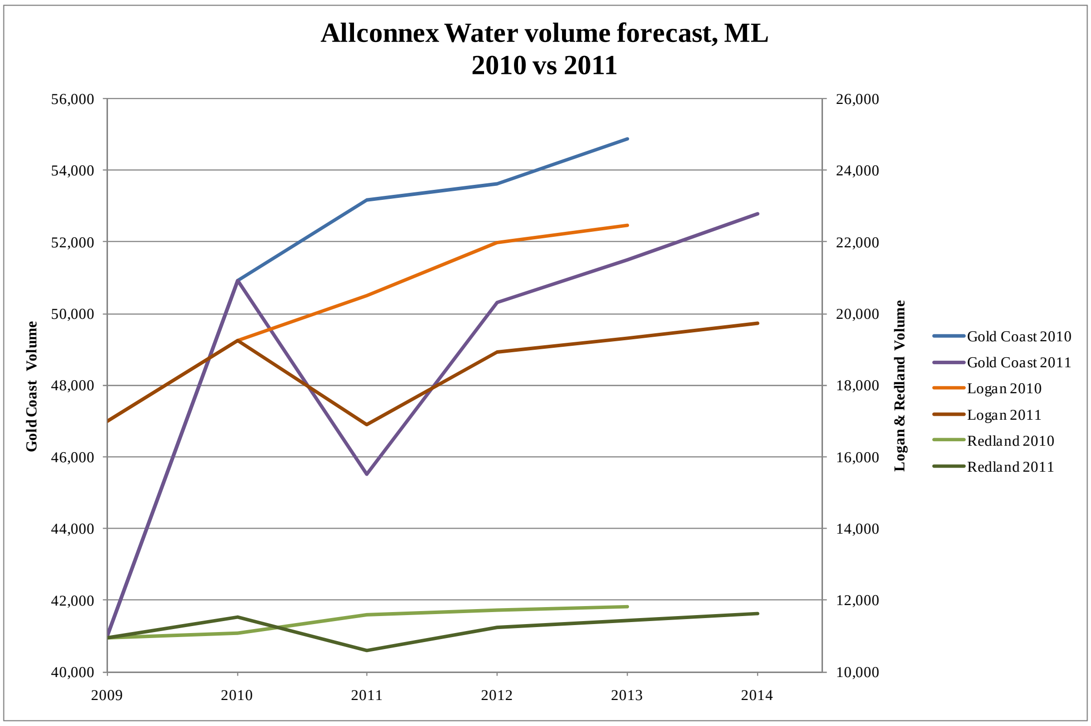


While the 2009 and 2010 connection numbers are the same over the two proposals, it can be seen in Figure 3-2 that Allconnex has estimated a step increase in its 2011 connection numbers before return to a more linear trend at least in the Gold Coast.

Logan's non-residential connection numbers are not show in Figure 3-2 as it is clear that there has been a break in the series as connection numbers had fallen from over 17,000 in 2009 and 2010 to around 5,000 in the current forecast. Allconnex indicated that this was the result of a change in the way connection numbers had been calculated. Previously non-residential connection numbers were calculated based on the revenue divided by the average fixed supply charge while the current estimates and forecasts are based on actual connections.

A comparison was also made for Allconnex's water volume forecast over the two submissions. The forecasts indicate that Allconnex's expectations of water sales have fallen in all three LGAs. The reason for this reduction in its sales expectations is the absence of the rebound it had previously expected. This is shown in Figure 3-3

Figure 3-3 Allconnex water volume forecast



Allconnex has forecasted more connection with lower sales volume. This is the result of lower average consumption assumed. In its 2010/11 submission, the weighted average residential consumption was forecast to change from 208 LPD in 2010-11 to 206 LPD in 2014-15.[11] In its current submission, this weighted average residential consumption is forecast to remain relatively constant at around 188 LPC over the forecast period. Allconnex acknowledges this in its current submission, stating that

> *In aggregate, demand for water in 2010-11 was approximately 15% lower than Allconnex Water's previous forecast. Calculated residential consumption of 172 l/p/d, is approximately 16.5% lower than Allconnex Water's previous (average) forecast of around 206 l/p/d and 14% lower than the 200 L/p/d target under Permanent Water Conservation Measures.*[12]

3.3. Historical Data

In materials provided to support its submission, Allconnex included a study undertaken by the Centre for International Economics, titled "*Review of Demand Forecasting Methodology, Allconnex Water*" dated June 2011. Some historical data from 2008 has been obtained from this report and is reproduced in Table 3-2, Table 3-3 and Table 3-4.

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[11] Allconnex, *Allconnex Water Price Monitoring Submission 2010-2011*, page 31

[12] Allconnex, *Allconnex Water Price Monitoring Submission 2011-2012*, page 51

▪ Table 3-2 Billed metered consumption, ML per quarter

Financial year	Quarter	Gold Coast		Logan		Redland	
		Non-residential	Residential	Non-residential	Residential	Non-residential	Residential
2008	Jan–Mar	3 974	9 255	857	3 662	466	2 502
2008	Apr–Jun	2 500	7 164	797	3 382	426	2 364
2009	Jul–Sep	2 680	8 877	753	3 175	341	2 033
2009	Oct–Dec	2 611	8 329	751	3 163	406	2 352
2009	Jan–Mar	2 867	8 844	869	3 604	442	2 544
2009	Apr–Jun	2 610	8 464	817	3 362	419	2 313
2010	Jul–Sep	2 671	8 973	723	3 205	369	2 325
2010	Oct–Dec	2 708	9 413	880	3 712	410	2 617
2010	Jan–Mar	3 364	11 686	1,055	4 394	450	2 765
2010	Apr –Jun	2 734	8 818	771	3 292	344	2 185
2011	Jul–Sep	2 509	8 867	819	3 376	418	2 304
2011	Oct–Dec	2 506	8 299	696	3 026	423	2 236
2011	Jan–Mar	3 150	10 148	923	4 012	452	2 292

Source: CIE, *Review of Demand Forecasting Methodology, Allconnex Water*, June 2011, page 22

▪ Table 3-3 Total number of connections

	Allconnex Billing data	PIFU estimate	Difference
	No.	No.	%
Gold Coast	231 323	215 238	7.5
Logan	96 644	102 246	-5.5
Redland	55 508	53 437	3.9

Source: CIE, *Review of Demand Forecasting Methodology, Allconnex Water*, June 2011, page 22

▪ Table 3-4 Population estimates, PIFU

	2008-09	2009-10	2010-11
	No.	No.	No.
Gold Coast	513 072	528 618	544 165
Logan	277 415	283 213	289 010
Redland	140 008	142 941	145 874

Source: CIE, *Review of Demand Forecasting Methodology, Allconnex Water*, June 2011, page 23

Based on the data from these tables, we have estimated the historical average consumption levels and compared them with the average consumption levels implicitly proposed in the templates. This is shown in Table 3-5.

▪ Table 3-5 Comparison of average consumption estimates

	Gold Coast		Logan		Redland	
	Litres/ Con-nection/Day	Residential LPD	Litres/ Con-nection/Day	Residential LPD	Litres/ Con-nection/Day	Residential LPD
2008	554	180	479	132	549	181
2009	551	185	487	134	565	188

2010	561	190	484	134	538	178
Template Proposed						
2010/11	537	176	422	130	398	167
2011/12	570	188	459	141	426	177
2012/13	569	188	458	140	425	176
2013/14	569	188	457	140	425	176

Note: To be consistent with the data provided in the CIE report, population numbers used to calculate the residential LPD for this table are obtained directly from the 2011 OESR update without any adjustments.

The historical average consumption levels do appear to show some level of rebound between 2008 and 2010. In 2010/11 data from the templates provided by Allconnex which are estimates of the actual consumption shows a fall in average consumption. This is probably a reasonable outcome of the wet weather experienced that year. Going forward however, there is no evidence that Allconnex has factored in a continuation of rebound that was apparent prior to the wet weather and, in many cases, Allconnex has assumed an average consumption level that is lower than the average consumption of its customers prior to the wet weather affected 2010/11. Further assessments of average consumption are provided in sections 3.6.2 and 3.6.5.

3.4. Population

Allconnex bases its forecast of population on the 2008 PIFU/OESR projection of population as updated in 2010. While Allconnex Water provides water and wastewater services to the Gold Coast, Logan and Redland Local Government Areas (LGAs), the area covered by its network does not include the entire geographical region of the LGAs. As the OESR/PIFU population projections are estimated resident figures for the whole LGA these projects thus include areas outside Allconnex network area. As a result the OESR/PIFU population figures are adjusted to only consider the serviced population. This adjustment factor was determined by MWH for the Regional Water Supply Strategy to be 96.2% and has been applied to all three districts.

In addition, 15,000 have been added to the Gold Coast population to reflect the number of tourist that resides in residential accommodation rather than tourist accommodation. During our discussions, Allconnex had informed SKM that number of 15,000 tourists has been accepted by Council and the QWC as a reasonable approximation of the average number of tourist staying in residential accommodation every night. They subsequently provide SKM with additional information sourced from Queensland Tourism showing how this number was estimated. These are tourists not staying in a commercial accommodation operation but rather with friends, family and possibly at non-commercially classified operations like a bed and breakfast. While we have been unable to verify the accuracy of their numbers we have accepted this estimate.

SKM's view

Given that the Allconnex network does not fully cover the three LGAs, the adjustment to the population figures to take only the connected portion into consideration is appropriate. We accept that in the absence of any other information and the fact that MWH is a reputable and independent consultant, the recommended adjustment factor is appropriate.

We understand that the OESR has published a 2011 update to its population projections. As discussed in section 2.1.1, the OESR has informed us that the appropriate series to use in the short term is the low series which better reflects the current low migration rate. Table 3-6 show the comparison of Allconnex estimated population growth rates against the growth rates from the 2010 PIFU projections update and the latest projections from the OESR.

- **Table 3-6 Population growth rates**

LGA	Allconnex	2010 PIFU/OESR Population (medium)	2011 PIFU/OESR Population (low)
	2011-2014	2011-2016	2011-2016
Gold Coast	2.6%	2.5%	1.9%
Logan	2.1%	2.1%	1.8%
Redland	1.8%	1.8%	1.1%
Allconnex	**2.3%**	**2.3%**	**1.7%**

The comparison shows that the latest OESR projections based on the low series indicates that population growth is slower than that proposed by Allconnex. Using the medium 2010 PIFU projections update we have been able to replicate the Allconnex population growth rates fairly closely, which implies that a reasonable basis has been used in the absence of discussions with the OESR.

While we understand the need for early estimates of the population for capital and infrastructure planning purposes, as these would feed into the development of Allconnex capex programme, the latest population update should be used for revenue purposes as these provide the most up to date information on the likely population of the areas serviced by Allconnex. We however do note that use of the 2010 data is consistent with Section 3.2.1 of the Authority's *SEQ Interim Price Monitoring Information Requirements for 2011/12* dated June 2011.

3.5. Connections

The growth rates of residential and non-residential connections projected by Allconnex are shown in Table 3-7. This is compared with the household/dwelling growth rates projected by OESR/PIFU based on the latest (2010) update. As discussed in section 2.1.1, we have adjusted the OESR/PIFU to be consistent with the low population series. This is separately identified in Table 3-7.

- **Table 3-7 Water connection growth rates**

LGA	Allconnex 2011-2014		2011-2016 OESR/PIFU Household/Dwelling	
	Residential	Non-residential	Unadjusted	Adjusted
Gold Coast	3.3%	2.6%	2.8%	2.2%
Logan	3.0%	3.9%	2.5%	1.8%
Redland	1.3%	6.0%	2.4%	1.9%
Allconnex	**2.9%**	**3.2%**	**2.7%**	**2.1%**

3.5.1. Residential

Allconnex has forecast 2.9% residential connection growth from 2011 to 2014. The growth rates range from 1.3%pa in Redland to 3.3% in the Gold Coast. This is compared with PIFU forecasted growth of dwellings over the period 2011 to 2016 shown in Table 3-7.

For residential connection numbers, Allconnex applies the OESR/PIFU growth rates for household found in Appendix E of *Household and dwelling projections Queensland Local Government Areas* to produce the forecasts for 2011 to 2014. While Allconnex indicated in its submission that this source refers to dwelling numbers, it in fact is household numbers. Dwelling numbers from OESR/PIFU may be found in Appendix G of the same OESR/PIFU publication. While household numbers are similar to dwelling numbers, it tends to be lower given the proportion of empty houses especially in areas with high number of holiday homes like the Gold Coast.

The residential connection growth rates projected by Allconnex are also shown in Table 3-7. It shows residential connections in the Gold Coast growing at 3.3% and Logan at 3%. These rates of growth are higher than the PIFU household/dwelling growth rates. On the other hand, OESR/PIFU expects Redland household/dwellings to grow at 2.4% which when adjusted for lower population growth falls to 1.9% while Allconnex has reduced the growth in Redland to just 1.3%. This is based on Council development policies that may differ from estimates published from the OESR/PIFU. While it may be reasonable to adjust dwelling numbers to account for connections (excluding non-connected dwellings), we would expect that the rate of growth in connections to be similar to dwellings.

In developing the connection forecast, Allconnex adds the average change in the number of households from 2011 to 2016 from OESR/PIFU to its base year (2009/10) total connection numbers to forecast the number of connections. Adjustments are made to account for the proportion of dwellings/households that are not connected to the Allconnex network. This is then proportioned based on the historical ratio between residential and non-residential connections.

SKM's view

For revenue determination purposes, we are of the opinion that the latest source of data available should be used, and that the low scenario growth rate in household numbers should be applied as recommended by the OESR, or risk overstating growth in connections. Further, we are of the opinion that adding the average increase in households or dwellings (in absolute number terms) to the total connections then proportioning it to residential and non-residential sectors may be underestimating the number of likely connections. This is because the increase in household or dwelling numbers should be applied to the residential sector only. The increase in the non-residential sector should then be increased at the rate of increase in the residential sector (rather than splitting the increase between the two sectors). We thus believe that the average increase in the number of dwellings adjusted by the likely number of non-service dwellings (in this case, 96.2% of properties in the absence of any further information) should be added to the number of residential connections. The recommended residential connection numbers are shown in Table 3-8. In total however, these connection numbers are lower than those proposed by Allconnex reflecting the lower population and dwelling growth rates.

Table 3-8 Recommended residential water connections

Residential connections	Inc pa	2011*	2012	2013	2014	CAGR 2011 - 2014
Gold Coast	5,312	215,710	221,022	226,333	231,645	2.4%
Logan	1,946	93,023	94,969	96,916	98,862	2.1%
Redland	1,081	56,333	57,414	58,495	59,576	1.9%
Allconnex		**365,066**	**373,405**	**381,744**	**390,083**	**2.2%**

* Estimated actuals

3.5.2. Non-residential

Non-residential water and wastewater connections forecasts are driven by the growth in total connections, and are based on the composition of (current) residential/non-residential connections. Total connections were projected using the absolute change in OESR/PIFU household and dwelling estimates (as described above), and then allocated to residential/non-residential connections using the current (actual) percentage composition of connections. As noted in section 3.5.1, total forecast connections were forecast using the absolute change in OESR/PIFU household, and then allocated to residential/non-residential connections using historical proportion of connections.

The non-residential connection growth rates projected by Allconnex are also shown in Table 3-7. It shows non-residential connections in the Gold Coast growing at 2.6%. This is probably reasonable given that households/dwellings are growing at 2.8% and population (see Table 3-6) is growing at 1.9% according to OESR/PIFU. Logan however is projected to grow at 3.9%, significantly faster than both the population growth and household/dwelling growth. Similarly, Allconnex has projected non-residential connections in Redland growing at 6%. Population is only growing at 1.1% in Redland while household/dwelling growth is projected to be 2.4%. We are thus of the opinion that the projected growth in non-residential connections in both Logan and Redland is excessive.

SKM's view

As expressed in section 3.5.1, we have concerns with the method Allconnex employed in determining the increase in the number of residential connections. As a result we have reservations about their non-residential customer connections. In the absences of better information, we believe that increasing non-residential water connections at the same rate as residential connections thus maintaining the historical ratio of residential/non-residential connections is appropriate. This is shown in Table 3-9.

■ **Table 3-9 Recommended non-residential water connections**

Non-residential connections	2011*	2012	2013	2014	CAGR 2011 - 2014
Gold Coast	16,540	16,948	17,355	17,762	2.4%
Logan	4,767	4,867	4,966	5,066	2.1%
Redland	2,049	2,089	2,128	2,167	1.9%
Allconnex	**23,357**	**23,903**	**24,449**	**24,996**	**2.2%**

* Estimated actuals

When the data series is sufficient for a regression type analysis, we would consider non-residential connection a function of economic activity as well as residential connections or population. This will require at least 12 (probably 16) data points (3 to 4 years of quarterly data) uncontaminated by major disruptions like restrictions or flood events. The number of data points (and thus the length of time) required is due to the fact that we would need to take into consideration seasonality (through the use of 4 seasonal dummy variables) plus a pair of explanatory variables. Having fewer than 12 data points would means that there may not be sufficient degrees of freedom for a robust econometric analysis.

3.6. Water Demand

Allconnex has forecast water demand to grow from 73GL to over 84GL at an average of 4.9% pa over the 2011 to2014 period. This is shown in Table 3-10.

■ **Table 3-10 Allconnex proposed water demand forecast**

					CAGR %pa
Water Demand (ML)	**2011**	**2012**	**2013**	**2014**	**2011 - 2014**
Residential	57,621	63,183	64,489	65,967	4.6%
Non-residential	15,371	17,324	17,740	18,202	5.8%
Total Customer Water Demand	72,992	80,507	82,228	84,169	4.9%

3.6.1. Residential consumption

Allconnex's projection for residential water demand is calculated based on the average daily consumption per connected person (LPD). Average consumption is multiplied by population to derive the residential consumption. As shown in Table 3-10, total residential consumption is forecast to grow at an average of 4.6% pa from 57.6 GL in 2011 to 66 GL in 2014. The residential water demand for individual Council areas is shown in Table 3-11.

- **Table 3-11 Allconnex proposed residential water consumption**

Residential Water Demand (ML)	2011	2012	2013	2014	CAGR %pa 2011 – 2014
Gold Coast	35,038	38,294	39,169	40,148	4.6%
Logan	13,682	15,294	15,579	15,906	5.1%
Redland	8,900	9,595	9,741	9,913	3.7%
Allconnex	**57,621**	**63,183**	**64,489**	**65,967**	**4.6%**

3.6.2. Average residential consumption

Table 3-12 shows the LPD projected by Allconnex for each of the LGAs over the forecast period. Based on historic consumption data and previous forecasts, Allconnex has different expected average consumption rates across the three LGAs, reflecting the different customer profiles across these areas.

- **Table 3-12 Allconnex proposed average residential water consumption rates**

LGA	2011	2012	2013	2014
Gold Coast	179	190	190	190
Logan	156	170	170	170
Redland	170	185	185	185

Based on recent consumption data, Allconnex indicates that demand for 2010/11 was significantly below the levels experienced when Allconnex developed its previous forecasts. Based on billing data, average residential consumption was calculated at 172 LPD, 16.5% lower than Allconnex Water's previous forecast of around 206 LPD and 14% lower than the (voluntary) 200 LPD target under Permanent Water Conservation Measures set by the Queensland Water Commission. Allconnex Water considers that this low rate of consumption is due to a number of factors, namely the high incidence of wet weather in SEQ, the lack of a "rebound" of consumption due to structural changes in water demand as a result of increased water efficiency measures and changed consumption behaviour, rather than as a result of increase prices. As a result, while the 2011 average consumption figure is affected by the wet weather, average consumption is projected to increase in 2012 and stay at this same increased rate until 2014.

SKM's view

We have accepted Allconnex 2011 estimated actual numbers as an accurate reflection of the average demand it experienced in 2011. While we agree that the average consumption rate in 2011 is affected by the high incidence of wet weather in SEQ and thus did not exhibit any incidence of rebound, we believe that it is unlikely that consumption will rebound to the steady state by 2012 and remain at that level over the forecast period. As we had discussed in sections 2.1.2 and 3.2, average consumption in SEQ as well as in Allconnex had exhibited some level of rebound in 2010 before the onset of the wet weather and we expect rebound to continue with the return to normal weather conditions into and beyond 2012.

We do not agree with Allconnex that demand is expected to settle at 190 LPD. As indicated in section 2.1.3, we expect rebound to occur over a four to five year period and settle at a level that averages around the 200 LPD voluntary target set by the Queensland Government for SEQ as a whole from its current 165 LPD. Based on this expectation, we propose that the average consumption be adjusted to reflect rebound to 200 LPD over 4.5 years for all of SEQ. This implies that in 2014 average consumption would grow by about 16% from the current levels of consumption. This is shown in Table 3-13.

- **Table 3-13 Recommended projected average residential water consumption rates (LPD)**

LGA	2011*	2012	2013	2014	Rebound target
Gold Coast	179	188	198	207	221
Logan	156	164	172	180	193
Redland	170	179	188	197	210

* Estimated actuals

3.6.3. Residential water demand projection recommendation

Our recommended residential water consumption may be obtained by applying these recommended average residential water consumption rates to the population projections based on the population increase from the low series of the most recent OESR/PIFU population projections and making adjustments for the number of water connected customers and adding an additional 15,000 to the Gold Coast to account for tourist. We have accepted Allconnex 2011 estimated actual numbers for both population and water consumption as an accurate reflection of the demand it experienced in 2011. This is shown in Table 3-15.

- **Table 3-14 Recommended residential water consumption projection**

Population	Inc pa	2011*	2012	2013	2014
Gold Coast	10,089	536,543	546,632	556,338	566,043
Logan	5,050	240,526	245,384	250,242	255,100
Redland	1,620	139,159	140,717	142,276	143,834
Recommended	**CAGR %pa 2011 – 2014**	**Residential Water Demand (ML)**			
Gold Coast	6.9%	35,038	37,681	40,141	42,771
Logan	7.1%	13,682	14,741	15,736	16,799
Redland	5.1%	8,900	9,212	9,749	10,322
Allconnex	**6.6%**	**57,621**	**61,634**	**65,627**	**69,892**

* Estimated actuals

3.6.4. Non-residential consumption

Non-residential water demand is calculated based on the average daily consumption per connection (LCD). Average consumption is multiplied by the number of non-residential connections to derive total non-residential consumption. As shown in Table 3-10 and Table 3-15, total non-residential consumption is forecast to grow at an average of 5.8% pa from 15.4 GL in 2011 to 18.2 GL in 2014. The Allconnex proposed non-residential water demand for individual Council areas is shown in Table 3-15.

- **Table 3-15 Allconnex proposed non-residential water consumption**

Non-Residential Water Demand (ML)					CAGR %pa
	2011	2012	2013	2014	2011 - 2014
Gold Coast	10,466	12,030	12,320	12,644	6.5%
Logan	3,209	3,642	3,732	3,831	6.1%
Redland	1,695	1,652	1,688	1,727	0.6%
Allconnex	**15,371**	**17,324**	**17,740**	**18,202**	**5.8%**

3.6.5. Average non-residential consumption (litres per connection per day)

Based on the number of connections for non-residential customers, we have derived the average daily consumption of each non-residential connection in each LGA in Allconnex's area used by Allconnex in its forecast. While we have attempted to estimate the historical average non-residential connection consumption, there appears to be significant data inconsistencies which make it difficult to draw any conclusions from historical data. We have been informed by Allconnex that the 2011 data is based on actual billing data that they have confidence in.

Based on the data submitted, it appears that some increase in average consumption in 2012 is expected for both the Gold Coast and Logan from that seen in 2011. However, average consumption in Redland is expected to fall from 2,267 ML per connection to 1,947 ML in 2012. Also in 2013 and 2014, average consumption is expected to fall in all areas from its 2012 level. The proposed average non-residential consumption rates are shown in Table 3-16.

- **Table 3-16 Allconnex proposed non-residential water consumption rates**

Non-Residential Average Consumption per Connection	2011	2012	2013	2014
Gold Coast	1,734	1,942	1,936	1,936
Gold Coast increase in consumption		12%	-0.3%	0%
Logan	1,845	1,967	1,962	1,962
Logan increase in consumption		6.6%	-0.25%	0%
Redland	2,267	1,945	1,940	1,940
Redland increase in consumption		-16.2%	-0.26%	0%
Allconnex	**1,803**	**1,947**	**1,942**	**1,942**

SKM's view

Rebound is unlikely to be a major issue in non-residential consumption. Reductions in business consumption during the drought are largely structural and they continue to be applicable with the lifting of restrictions. Attempts continue to ensure that businesses continue with efforts to reduce water use through the Water Efficiency Management Plan (WEMP.) The continuation of this programme could explain the small projected reduction in average consumption in 2013 and 2014.

We accept that some increase in consumption is likely in 2012 (demand based on normal weather conditions) from the wet conditions effected demand experienced in 2011. We thus accept the increase in average consumption in the Gold Coast and Logan and also applying the relative reduction from the WEMP in 2013 and 2014.

We see no reason why the average consumption in Redland will fall in 2012. In the draft report SKM recommended applying the Logan expected increase (6.6% based on Allconnex increased proposed for Logan non-residential water consumption in 2012) to the 2011 Redland consumption on the basis that in our view, the non-residential characteristics of Redland is closer to Logan than the Gold Coast. In its response to the draft report, Allconnex disagrees with the increase recommended on the basis of current estimates of aggregate non-residential water demand. We do note that the non-residential average demand seen in Redland over 2009 to 2011 does show significant variations. In 2009, from the data provided by Allconnex in its template submission, the average consumption was 1,838 litres per account per day. This increased to 2,524 litres per account per day in 2010 before falling to 2,267 litres per account per day in 2011. Given this variability, we recommend using the average consumption over the three years of 2,210 litres per account per day for 2012.

Our recommended non-residential water consumption rates are shown in Table 3-17.

- **Table 3-17 Recommended average non-residential water consumption rate projections**

Non-Residential Average Consumption per Connection	2011*	2012	2013	2014
Gold Coast	1,734	1,942	1,936	1,936
Logan	1,845	1,967	1,962	1,962
Redland	2,267	2,210	2,204	2,204
Allconnex	**1,803**	**1,973**	**1,986**	**1,967**

* Estimated actuals

3.6.6. Non-residential water demand projection recommendation

Our recommended non-residential water consumption may be obtained by applying the recommended average non-residential water consumption rates shown in Table 3-17 to the most recent OESR/PIFU dwelling projections (adjusted for low population growth) after making the adjustments for the number of water connected customers. This is shown in Table 3-18. We have accepted as accurate Allconnex 2011 estimated actual non-residential water demand numbers.

■ **Table 3-18 Recommended non-residential water consumption projections**

Non-residential connections	2011*	2012	2013	2014	CAGR %pa 2011 - 2014
Gold Coast	16,540	16,948	17,355	17,762	2.4%
Logan	4,767	4,867	4,966	5,066	2.1%
Redland	2,049	2,089	2,128	2,167	1.9%
	Non-residential Water Demand (ML)				
Gold Coast	10,466	12,044	12,267	12,554	6.3%
Logan	3,209	3,504	3,556	3,628	4.2%
Redland	1,695	1,689	1,711	1,743	0.9%
Allconnex	**15,371**	**17,396**	**17,695**	**18,089**	**5.3%**

* Estimated actuals

3.7. Wastewater and Trade Waste

Allconnex has not developed a forecasting methodology for trade waste and has continued to apply previous Council forecasts. Forecasts for trade waste are constant over the three-year period.

Residential wastewater volumes are not relevant as Allconnex's wastewater charges are fixed charges per connection, and not based on the volume of wastewater discharged into the sewer. Only Gold Coast non-residential customers have a volume based charge and the volume is based on the discharge factors as discussed in section 3.1. This approach to forecasting wastewater volumes is consistent with approaches adopted in other jurisdictions. Rather than actually metering wastewater volumes, assumptions are made on the proportion of a customers' metered drinking water consumption flowing into the sewer. This approach avoids the extensive expenditure that would be required to meter consumption of wastewater services. However it is only applied to the non-residential wastewater volume in the Gold Coast which is forecast to grow by a compounding annual rate of about 4%. The discharge factors applied is based on factors applied by the Gold Coast City Council when it was operating the water and wastewater business.

Of greater relevance to revenue and pricing are residential wastewater connection numbers. Allconnex has forecast wastewater connections based on the number of wastewater connections in 2009/10. The annual growth rate is assumed to be the same as the growth rate in the number of connections of water. The numbers of connections are then split into residential and non-residential using historical ratios (page 52 of submission).

As with population and water connection projections, we recommend the use of the most up to date data sourced from OESR. We also found that Allconnex has applied a lower residential wastewater to water connection ratio for the Gold Coast than that seen in the recent past. On the other hand the ratio applied to Logan's projections is higher than that seen in the last few years. There also appears to be an anomaly in Redland's 2011 wastewater connection number as it significantly higher than both the years before and after. This analysis is shown in Table 3-19.

■ **Table 3-19 Allconnex proposed wastewater connections**

Residential wastewater connections	2009	2010	2011	2012	2013	2014
Gold Coast	199,152	199,300	204,556	204,836	210,354	215,873
Logan	76,619	76,883	81,649	86,353	88,717	91,082
Redland	47,068	47,945	55,075	47,559	48,707	49,854
Percentage of residential water connection						
Gold Coast	95.7%	94.0%	94.8%	90.8%	90.8%	90.8%
Logan	88.1%	86.4%	87.8%	89.6%	89.6%	89.6%
Redland	83.5%	85.1%	97.8%	85.1%	85.1%	85.1%

SKM's view

While we accept that the methodology applied to estimate wastewater volumes is appropriate, we believe that it would be useful to update the estimate of the discharge factors for each of the industries taking into account the changing nature of these industries as well as changes to drinking water consumption patterns due to the drought and restrictions. It is highly possible that the discharge factors will have changed as behaviour has changed due to the increased awareness to reduce water consumption.

We are of the opinion that the lower ratio applied to residential wastewater in the Gold Coast is inappropriate and recommend that the average ratio from 2009 to 2011 be applied to the years 2012 to 2014. This results in an increase in the ratio of wastewater connection to water connection in the Gold Coast increasing to around 95% from under 91%. Similarly we would also apply the Logan's average ratio from 2009 to 2011 to the forecast. However, it in case, the ratio falls from 89.6% to 87.4%. For Redland, we believe that the ratio applied is appropriate as it ignores the apparent anomaly of 2011 and is consistent with the 2010 ratio. Applying these ratios to the residential connection projections based on the latest OESR dwelling projection publication results in the wastewater connection projections shown in Table 3-20.

■ **Table 3-20 Recommended wastewater connections projections**

Residential wastewater connections	Connection ratio	2011*	2012	2013	2014
Gold Coast	94.9%	204,556	209,647	214,685	219,723
Logan	87.4%	81,649	83,015	84,717	86,418
Redland	85.1%	55,075	48,865	49,785	50,705
Allconnex		**341,281**	**341,527**	**349,186**	**356,846**

* Estimated actuals

Given the disconnect between the 2011 and forecast non-residential wastewater projections, we are unable to offer a view on the reasonableness of the non-residential wastewater connection numbers and volume.

No information and methodology is available on trade waste volumes as Allconnex has simply applied previous Council forecast. In the absence of any forecast, we are unable to offer a view of their reasonableness.

3.8. Recycled Water

Approximately 5,000 customers in the Gold Coast suburbs of Pimpama and Coomera are supplied with Class A+ Recycled Water. The reticulated recycled water is connected to business and residential dwellings for outdoor and toilet use only. Average consumption per residential household has been approximately 34 kL per property based on 2010/11 meter data. Overall 140 ML of Class A+ recycled water was supplied during 2010/11. Given that recycled water has only been available since late 2009, there is a limited history of consumption information. Allconnex has indicated that no major uptake in recycled water is anticipated over the next few years and, therefore, has assumed that there will be no growth in recycled water consumption. If fact, with the easing of the drought, recycled water consumption is expected to fall from 200ML to 160ML.

Given limited data and small amounts involved, we have not expended significant effort to review recycled water forecasts. The reduction in consumption may be justified given that a significant proportion of recycled water is used outdoors for garden watering and with the ending of the drought[13]and return to normal rainfall conditions, the need for garden watering will likely be reduced.

3.9. Non-revenue Water

Non-revenue water is the difference between bulk supply data (water use supplied by the SEQ Water Grid Manager) and billable consumption from residential and non-residential customers. This includes network leakage, water theft and authorised unbilled water consumption (fire-fighting and pipe flushing). We understand that the baseline forecast for non-revenue water use is based on historical estimate (2005/06) of non-revenue water use less estimated savings from leakage reduction programs and growth in losses from leaks. The forecast increase in non-revenue water consumption is 2% pa from 2011 to 2014.

We understand that the leakage component of non-revenue water is loosely related to the number of connections rather than volume of water demand assuming that water pressure remains the same. Connection (both residential and non-residential) is expected to grow at about 2.2% pa and we thus would expect non-revenue water to grow at approximately that same rate. With continuing measures to reduced leakage the forecast growth of non-revenue water of around 2% pa is considered reasonable.

3.10. Long Term Projections

3.10.1. Water Demand

Allconnex also prepares longer term forecasts for the purposes of long term capacity planning. In contrast to the short term revenue related demand projections, long term forecasts place greater

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[13] QWC, *The 2009 Water Report, A Year of Transition*, 2010 page 4

emphasis on a range of other factors such as the desired service standards being delivered by the assets and where demographic changes are likely to occur.

The approach adopted for its long term projections is generally based on similar information to that used in developing the short term forecasts for revenue purposes. However, in developing the long term projections greater weight is placed on meeting the desired service standards. While there may be a need for broad consistency between the forecasting approaches adopted for the short and long term projections, the emphasis on meeting the desired service standard does lead to different assumptions being adopted.

The key point of difference between the two forecasts is the relative weight placed on the different input parameters in preparing the forecasts. In the short term, demographic changes are likely to be known and capacity cannot be changed in the forecast timeframe. The long term forecast however needs to take both these issues into consideration especially where Council population growth areas are likely to be located and to ensure that network capacity continues to meet the desired service standards.

Currently, Allconnex's short term forecasts are based on water consumption rebounding to around 200LPD although it may be higher in individual LGAs. This consumption level is lower than the long term forecast of average water demand of 230 LPD which is based on the SEQ Water Strategy plan for meeting SEQ water supply requirement for the next 50 years.

The desired standard of service defines the operating and design parameters of the network. Hence the planning standard of 230 LPD, as a desired standard of service defines the demand for residential customers. Factors that impact demand and the desired standards of service that are taken into consideration include PWCM, consumption patterns, the Queensland Building Code, climate risk, non-revenue water (system losses) and mandated operating/design criteria. As a consequence of these considerations, long term demand projections derived are generally more conservative than the short term revenue related demand forecasts. At the local level, mandatory fire-fighting requirements are usually the most important consideration in designing network capacity rather than customer demand requirements.

The average day demand criteria used in the Gold Coast depends on the type of house under consideration. For existing houses, the planning criterion is currently 880 litres per tenement per day. This translates to 260 LPD based on 2.73 persons per household with adjustments for non-revenue water and risk factor. For new houses, 616 litres per tenement is used which translates to 188 LPD on the same basis. New homes in dual reticulated areas (recycled water) with no rainwater tank requirements are assumed to require 484 litres per tenement per day while those with rainwater tanks are provided with 396 litres per tenement per day.

Average consumption levels are inadequate in determining the required capacity of the system. The water supply system must be able to meet daily or seasonal peaks associated with behavioural and weather conditions. This requires the network to determine the peaking factors to meet the system fluctuations required by daily demand characteristics. Based on recent production flow records system peaking factors for the Gold Coast were derived to reflect the current climatic and seasonal fluctuations over the past few years. As the over which such readings were taken had demand restrictions in place, this also needs to be taken into consideration in establishing a reasonable set of peaking factors. The peaking factors determine for the Gold Coast are shown Table 3-21.

- **Table 3-21 Gold Coast Peaking Factors**

Financial Year	Restriction Level	Quantity (ML/day)			Peaking Factors	
		AD	MDMM	MD	MDMM:AD	MD:AD
2001/02	Odds and Evens	207	254	307	**1.23**	**1.49**
2002/03	4	160	179	193	1.12	1.21
2003/04	4a	167	181	213	1.08	1.27
2004/05	1	192	225	244	1.17	1.27
2005/06	2	174	191	210	1.10	1.21
2006/07	3 & 4	156	171	189	1.09	1.21
2007/08	5 & 6	137	143	179	1.04	1.31

Note: AD – average day
MDMM – mean day maximum month
MD – maximum day

Source: GHD, *Gold Coast Water, Desired Standards of Service Review 2008*, dated October 2009

Allconnex believes that these peaking factors provide a good indication of likely future system peak demand. Allconnex also believes that Level 1 restrictions (2004/05) provide the closest approximation to the ongoing PWCM. However, Allconnex has adopted the higher peaking factors that were seen during 2001/02 when the "Odds and Evens" system was in place. This was to provide a conservative approach and allow rebound once restrictions are lifted and system characteristics stabilise.

In Logan and Redland, Allconnex forecasts long term demand uses higher MDMM:AD and MD:AD ratios than the Gold Coast. In the Redland Design Criteria document submitted to the Authority in support of its proposal, it appears that a long term 300 LPD average demand criteria has been proposed for Redland[14]. These demand criteria and ratios are shown in Table 3-22.

- **Table 3-22 Redland and Logan Peaking Factors**

	Redland	Logan
Average Day Demand (LPD)	300	230
MDMM:AD	1.4	1.45
MA:AD	1.9	1.9

Another consideration that Allconnex has to account especially at the level of the street water supply capacity infrastructure is the fire fighting flow requirements. It is mandatory to put in place a water supply system that will allow the emergency services to fight fires built up areas through the potable water supply system. This usually requires sufficient water pressure to produce a 12m head at a flow rate of 15 metres per second in residential areas and up to 30 meters per second in commercial and industrial areas. The fire fighting requirement generally dictates pipe sizes at the street level while customer demand requirements dictates pipe sizes at the trunk main level.

[14] SKM has been informed during a discussion that Redland average day demand has been using the QWC planning target of 230 LPD.

SKM's view

In SKM's view, the approach adopted by Allconnex in respect to choosing its peaking factors for the Gold Coast is probably too conservative in that it provides a higher than necessary allowance for peak flows. We agree with Allconnex that Level 1 restriction is most similar to PWCM. The "Odds and Evens" system was brought in before the introduction of strict water restrictions where behaviour and public acceptance of the need to restrain water use was still relatively low. Level 1 restriction on the other hand was introduced after a period of higher restrictions and public education, an environment similar to the current situation where PWCM is in place. The other reason provided for choosing a more conservative value was to account for rebound. This we believe is better accounted for under a higher average day allowance which 200 or 230 LPD already takes into consideration.

For Logan and Redland, the higher factors were determined based on pre-drought levels and does not take into consideration the impact of water restrictions, media educational campaigns and the resulting change in water use behaviour.

For Allconnex, the short term forecasting methodology is based on the average consumption of around 200LPD although in the Gold Coast, we are expecting around 216 LPD. For long term planning purposes, the network capacity is designed to meet various levels of demand depending on where they are located and in the case of the Gold Coast, the type of housing. Both forecasts are based on the estimated resident population projection published by the OESR. However, the short term forecast assumption of average consumption around 200LPD is generally lower than the long term planning criteria based on the standard of service under the design standard. Whether the lower term planning criteria should be lowered to reflect the likely lower average rate of consumption is however an issue to be debated given that changing the long term forecasting consumption target will require an explicit change to the desired service standard used to determine infrastructure capacity. We understand from our discussion with Unitywater that there is a project currently under way in SEQ to review this standard and to determine if the projected reduced average consumption warrants a reduction in the long term planning criteria.

Generally, we believe that the approach taken by Allconnex to estimate capacity required is too generous. The peaking factors used for all three LGA are conservative and does not take into consideration the likely change in water consumption behaviour. This is built upon the fairly conservative estimate of average demand which currently is expected to peak at around the 200 LPD level in SEQ although it may be higher in individual LGAs like the Gold Coast. Nevertheless even in areas like the Gold Coast, the long term average consumption is still less than the various average day demand criteria used for long term planning. However, any decision to lower the planning criteria needs to be taken carefully as it has significant long term financial implications and should probably only be taken after obtaining sufficient consumption data to indicate that consumption behaviour has indeed permanently shifted lower.

3.10.2. Wastewater

While there is some information on non-residential wastewater demand, information on residential wastewater is sparse although this component is significantly larger than the non-residential sector.

As the dry weather demand for waste water services is a function of potable water demand, an estimate of the proportion of potable water flow into the waste water system needs to be made.

Average dry weather flow (ADWF) is defined as the average daily flow from domestic, commercial and industrial sources, excluding rainfall dependent inflow and infiltration. Ground water infiltration (GWI) may be in some cases a permanent component of the dry weather flow, and where appropriate this in be included in determining ADWF.

However, the major impact on the demand for waste water service is not ADWF but peak flows during wet weather. The planning and design of a wastewater collection system to efficiently and safely transports sewage, and reduces the risk of overflow events to the environment to an acceptable level depends on determining the peak flow factors that are applicable. To account for peak wet weather flows, Allconnex applies a factor of 4 in designing reduced infiltration gravity sewers and a factor of 5 for conventional sewers in the Gold Coast. Redland applies a peak wet weather flow rate 5 times the average dry weather flow of 250 LPD while Logan's peak wet weather flow rate is 5.68 times the average dry weather flow 220 LPD.

SKM's view

Based on the Queensland Department of Environment and Resource Management guidelines[15] these peak and flow rates are reasonable. The guidelines state that that "(g)*enerally ADWF will range between 150-275 L/EP/d. This flow should be consistent with internal household water use*." It also states that peak wet weather flow of 5 times ADWF is appropriate for a conventional gravity system. The Allconnex supplied document from the Logan Water Alliance also provided evidence of peak wet weather flows exceeding 5 times ADWF do occasionally occur resulting in overflow of the sewerage system. As a result, to prevent the system from frequent overloading resulting in overflow of untreated sewerage, proposed peak and flow rates appear reasonable.

Given the lack of information on residential wastewater volume, it would be useful to obtain, at least in aggregate, wastewater volume information since they are a major driver of capital expenditure. However, the most significant amount of wastewater capital is driven by wet-weather overflow requirements within the network and at the Wastewater Treatment Plants. We understand that peak flows during wet weather periods can be many multiples of average volume flows. Allconnex needs to better understand its likely volume and thus likely multiple of ADWF. Given that charging for residential wastewater services is unlikely to be volume based in the near future, it is likely that understanding the peak demand volumes for network capacity purposes is more important than estimating average wastewater volumes.

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[15] Department Of Environment and Resource Management, *Planning Guidelines for Water Supply and Sewerage*, Chapter 5 Demand/Flow and Projections

4. Queensland Urban Utilities (QUU)

4.1. QUU Forecasting Approach

The basis for QUU's water consumption projections is the number of properties. The approach adopted by QUU is based on establishing an underlying level of consumption on a litres per connection per day basis (LCD). For residential consumption, the estimate of this average consumption per connection is based on estimates of the average consumption on a per person per day basis and multiplying this by an assumed number of people per tenement (property). For non-residential consumption, the average consumption per connection was calculated directly from historical data. The average consumption per connection is then multiplied by the number of connections based on OESR/PIFU dwelling projections adjusted by the proportion of properties connected to the water and wastewater service delivery network. Implicit in the forecast average consumption is the current Permanent Water Conservation Measures (PWCM).

The baseline average consumption is based on metered residential and non-residential consumption data based on recent quarterly billing data.

Forecast for wastewater connections have been developed based on the number of wastewater connections in 2009/10. The annual growth rate is assumed to be the same as the growth rate in the number of connections of water. Wastewater connection forecast is based on applying the rate of forecast growth in properties to the actual number of wastewater connections charged at the end of March 2011. Wastewater and trade waste volumes have not been forecast as charges are not imposed based on wastewater volumes.

We have been informed by QUU that the only data that they have any confidence in is the 2011 data which has been estimated based on actual QUU billing data. With the exception of Brisbane, much of the demand related data for 2009 and 2010 is not provided for the other LGAs. In response to a request for historical information, QUU stated that "(v)*erifiable data is not available for prior to and including 2009/10*." Detailed forecast projections for 2014 were also not provided in the template however, QUU subsequently provided to SKM forecast connection data for that year.

4.1.1. Proposed forecast

A summary of the QUU demand projections provided to the Authority for the period 2010/11 to 2013/14 is shown in Table 4-1. Also shown are the average annual expected growth rates over the same period.

■ **Table 4-1 QUU proposed demand projections**

Proposed		FY ending June				CAGR %pa
QUU Forecast	**Unit**	**2011**	**2012**	**2013**	**2014**	**2011 - 2014**
Residential connections	Num	474,903	483,874	493,038	502,398	1.9%
Residential water volume	ML	66,812	70,677	72,379	74,126	3.5%
Non-residential connections	Num	34,436	34,782	35,132	35,486	1.0%
Non-residential water volume	ML	37,482	38,237	38,717	39,203	1.5%
Total water volume	ML	104,294	108,913	111,096	113,328	2.8%
Residential wastewater connections	Num	452,446	460,842	469,414	478,166	1.9%
Non-residential wastewater connections	Num	32,217	32,541	32,867	33,198	1.0%
Trade waste connections	Num	4,657	4,704	4,751	4,798	1.0%
Non-revenue water volume	ML	12,828	13,385	13,642	13,905	2.7%

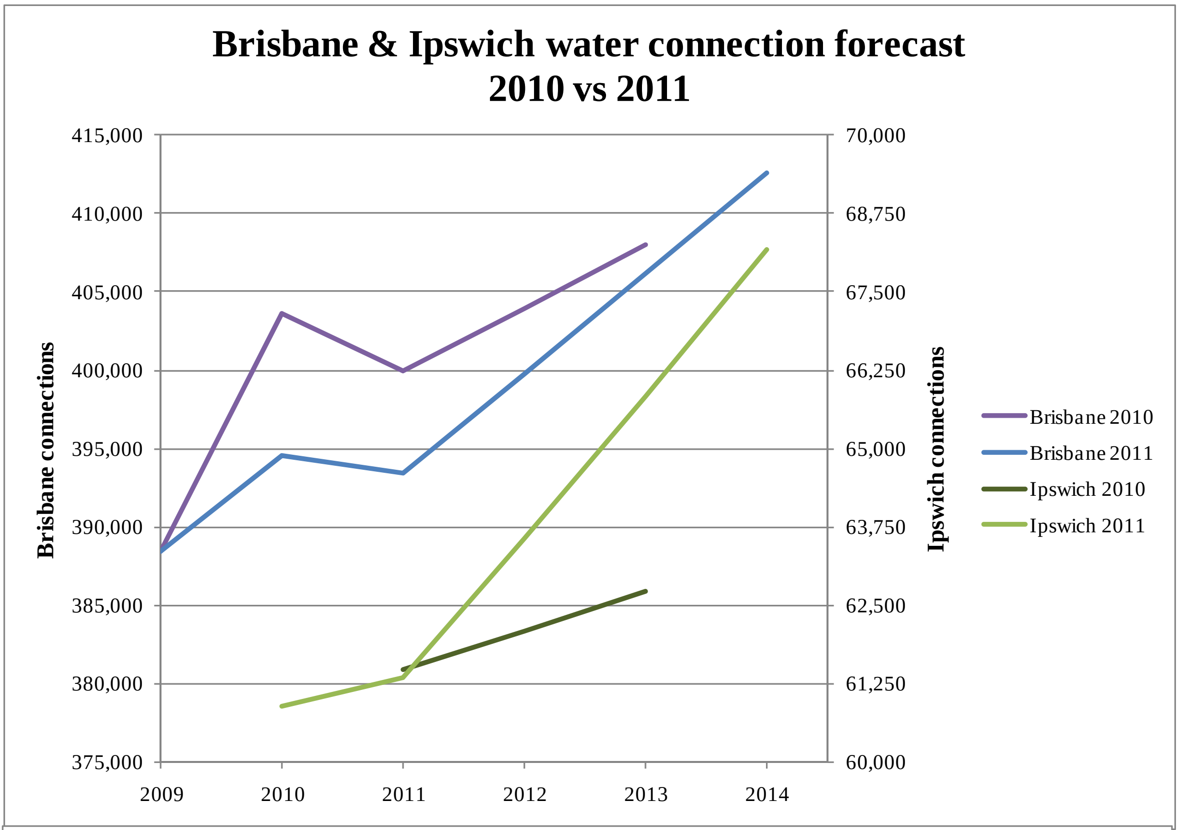
4.2. Previous forecast

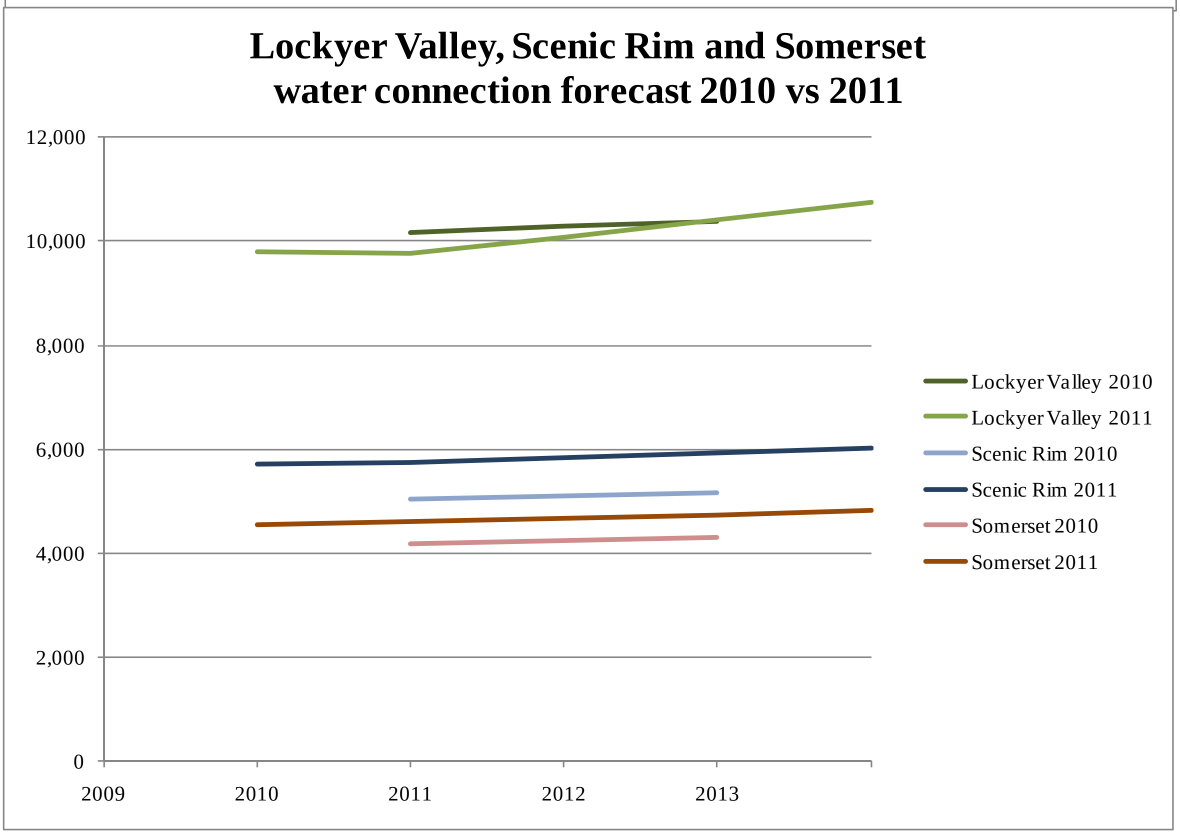
Comparing QUU's current proposed forecast with its 2010 proposal indicates that QUU residential connection forecast has fallen in Brisbane but risen in Ipswich and two of the three rural LGAs (Scenic Rim and Somerset). The residential connection numbers forecast for Lockyer Valley is similar over the two projections. The growth rates however appear to have increased. Brisbane's residential connection growth between 2011 and 2014 is now forecast to be 1.6% pa, up from 1% pa in the previous forecast. The increase in growth rate is even more pronounced in Ipswich which is now expected to growth by 2.9% between 2010 and 2014 while previously its expected growth rate was only 1%. This can be seen in Figure 4-1.

The number of non-residential connections in Brisbane and Ipswich are lower in the current proposal than they were in the 2010 submission. While the reduction is around 2.4% in Brisbane, it is around 54% in Ipswich. As it is unlikely that such a reduction is reasonable in Ipswich, there appears to be a change in the way non-residential numbers have been determined in this LGA. Similarly there appears to be some data inconsistencies between the two proposals in the two of the three rural LGA where non-residential connection numbers have changed by 25% in Scenic Rim and 40% in Somerset. Only Lockyer Valley's non-residential connection numbers appear to be comparable. There non-residential customer number projections from the 2010 and 2011 submissions are shown in Figure 4-2.

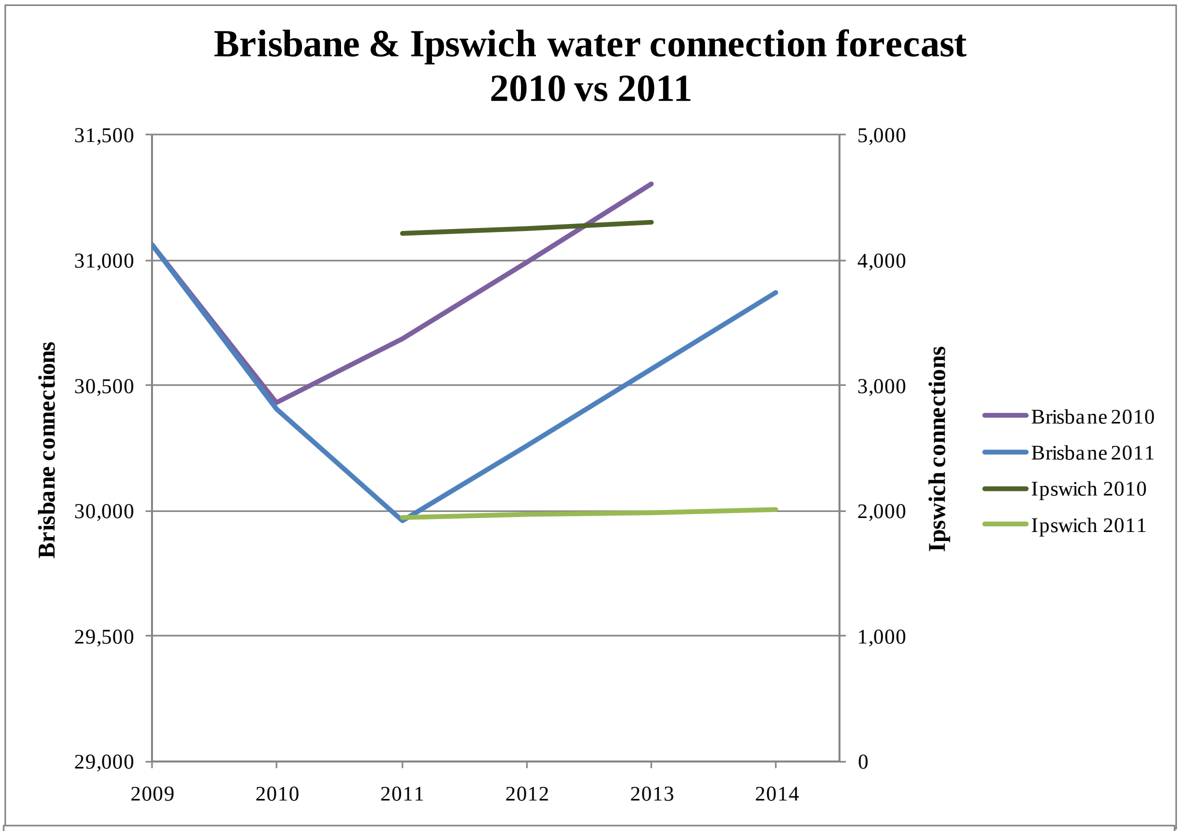
The comparison of water volume forecast highlights two distinct trends. QUU's forecast of water consumption has fallen for Brisbane and Ipswich while it has risen for the three rural LGAs. This is seen in Figure 4-3. The reduction in the forecast for Brisbane and Ipswich is consistent with the lack of rebound seen in the last year, while the rise in the rural LGA consumption is off relatively small volumes.

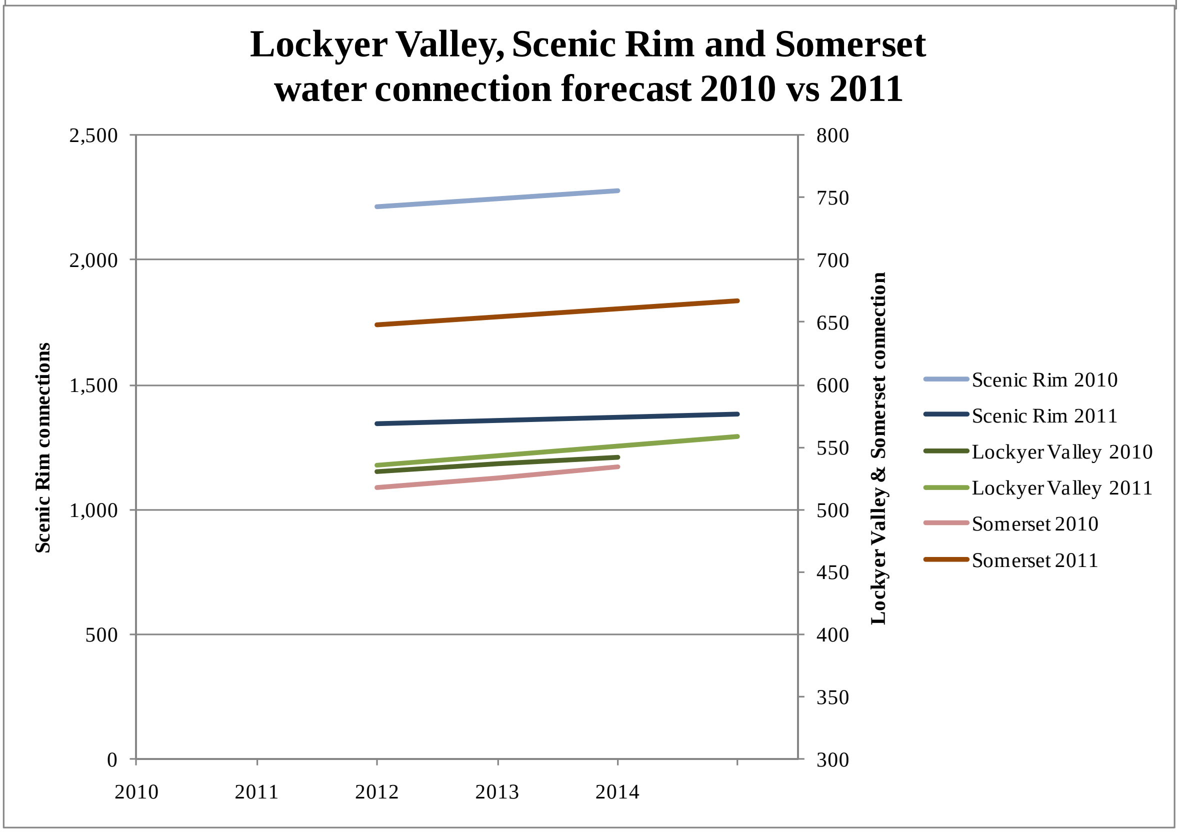
■ **Figure 4-1 QUU residential water connection**



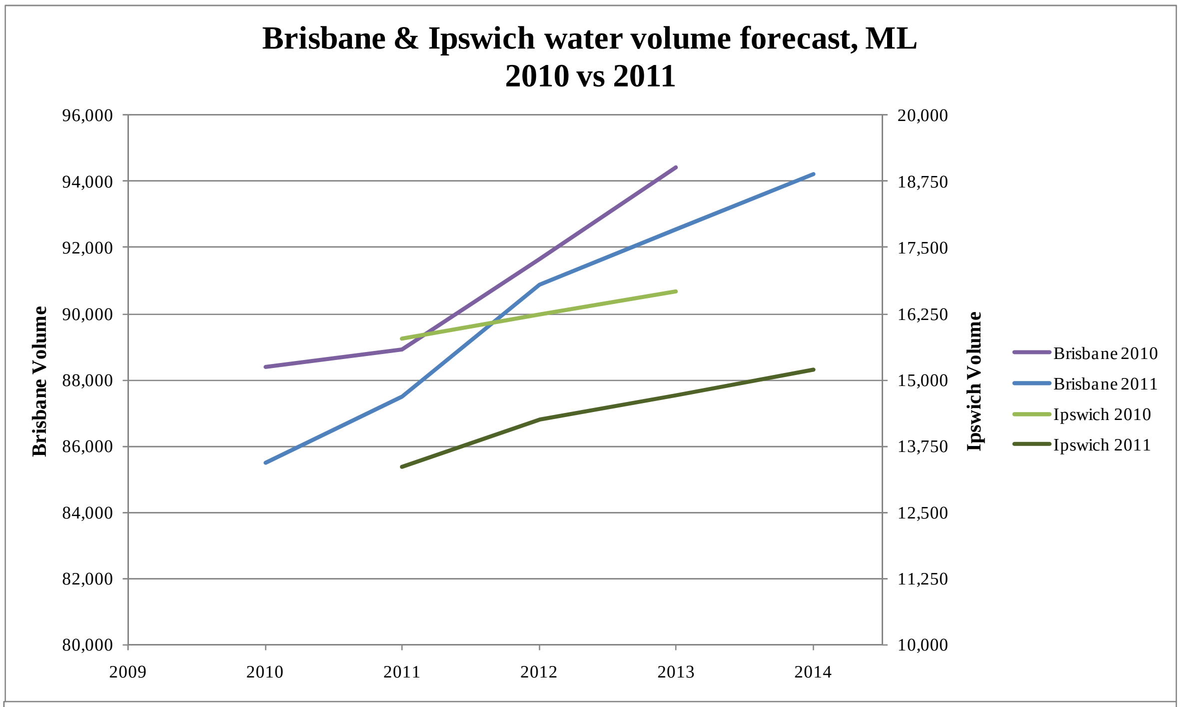


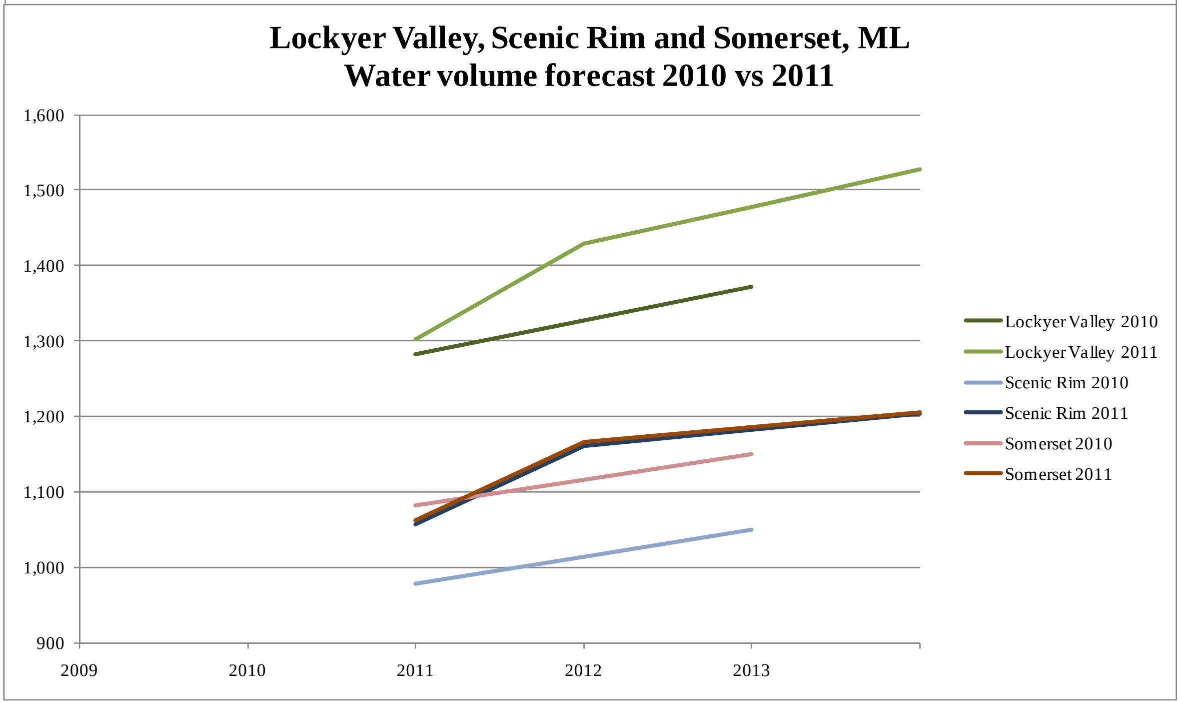
■ **Figure 4-2 QUU non-residential water connection**





■ **Figure 4-3 QUU water volume forecast**





4.3. Population

QUU does not directly use population as the basis of its forecast. However, QUU does provide its estimate of the population in its service area based on the 2010 PIFU/OESR projection of population.

Table 4-2 shows the comparison of QUU estimated population growth rates against the growth rates from the 2011 projections from the OESR. However as discussed in section 2.1.1, we have used the low series as we have been informed by the OESR that this series is a better representation of the current population growth environment

- **Table 4-2 Population growth rates**

LGA	QUU[16]	2011 PIFU/OESR Population
Brisbane	1.6%	0.8%
Ipswich	3.5%	3.8%
Lockyer Valley	2.9%	2.3%
Scenic Rim	3.0%	2.0%
Somerset	2.2%	1.9%
QUU	**2.3%**	**1.3%**

The comparison shows that overall the population growth rate proposed by QUU based on the 2010 PIFU projections are higher than the latest OESR projections. At the LGA level, the population growth rates adopted by QUU are higher than the latest projected by the OESR/PIFU with the exception of Ipswich.

SKM's view

While we understands the need for early estimates of the population for capital and infrastructure planning purposes, as these would feed into the development of QUU capex programme, the latest population update should be used for revenue purposes as these provide the most up to date information on the likely population of the areas serviced by QUU. We however do note that use of the 2010 data is consistent with Section 3.2.1 of the Authority's *SEQ Interim Price Monitoring Information Requirements for 2011/12* dated June 2011 given the needs of QUU's internal budgetary and approval processes.

4.3.1. Persons per tenement

While QUU does not directly use population as the basis of its forecast, it methodology uses an estimate of persons per tenement. In the information provided to SKM, QUU has provided its estimated persons per tenement as shown in Table 4-3. This does not change over the forecast period.

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[16] Estimated base on Figure 6-1 and 6-2 of QUU's Information Returns 2011/12 dated 31 August 2011

- **Table 4-3 Estimated residential persons per tenement**

LGA	Persons per tenement
Brisbane	2.36
Ipswich	2.6
Lockyer Valley	2.6
Scenic Rim	2.6
Somerset	2.6

SKM's view

To verify the persons per tenement estimate provided by QUU, we have utilised the 2011 OESR projections for population and dwellings in each of QUU's LGA. As discussed in section 2.1.2, an adjustment was made to the OESR dwelling projections to take into consideration the use of the low population projection series rather than the medium series. The resulting estimate of persons per dwelling in each of the QUU LGAs is shown in Table 4-4. It also includes our recommendation based on the average between the 2011 and 2016 estimates. These recommended estimates are higher than QUU's estimates for Brisbane, Ipswich and Lockyer Valley, while lower for Scenic Rim and Somerset.

- **Table 4-4 Persons per dwelling based on 2011 OSER Population and Dwelling Projections**

LGA	2011	2016	Recommended
Brisbane	2.50	2.47	2.48
Ipswich	2.77	2.71	2.74
Lockyer Valley	2.67	2.63	2.65
Scenic Rim	2.48	2.44	2.46
Somerset	2.49	2.42	2.45

4.4. Connections

The growth rates of residential and non-residential connections projected by QUU are shown in Table 4-5. These are compared with the household/dwelling growth rates projected by OESR/PIFU based on the 2010 update adjusted for the low population projection.

- **Table 4-5** **Water connection growth rates**

LGA	QUU 2011-2014		2011-2016 OESR/PIFU (adj)
	Residential	**Non-residential**	**Dwelling**
Brisbane	1.6%	1.0%	1.1%
Ipswich	3.6%	1.0%	4.3%
Lockyer Valley	3.3%	1.4%	2.6%
Scenic Rim	1.6%	1.0%	2.3%
Somerset	1.6%	1.0%	2.4%
QUU	**1.9%**	**1.0%**	**1.6%**

We also note that QUU has also provided a number of connected properties not consuming any water. We understand that these properties are undeveloped land where an access charge is levied as the water supply network reaches the property but no water is consumed. The proportions assumed based on 2011 data are provided in Table 4-6.

- **Table 4-6** **Percentage of connections without water consumption**

LGA	Residential	Non-residential
Brisbane	3%	9%
Ipswich	8%	8%
Lockyer Valley	25%	31%
Scenic Rim	7%	50%
Somerset	13%	37%

4.4.1. Residential

QUU has forecast 1.9% residential connection growth from 2011 to 2014. The growth rates range from 1.6% pa in Brisbane, Scenic Rim and Somerset to 3.3% in the Lockyer Valley and 3.6% in Ipswich. This is compared with PIFU forecasted growth of dwellings over the period 2011 to 2016 shown in Table 4-5. The dwellings growth rates projected by QUU are somewhat lower than the OESR/PIFU projections especially in Ipswich, Scenic Rim and Somerset as shown in Table 4-5. The largest difference in absolute terms is in Ipswich which the latest OESR projections indicate is expected to add more dwellings between 2011 and 2031 than Brisbane.

In total, QUU projects that the number of residential customers will grow at 1.9% pa to over 500,000 connections by 2014. Over 80% of its customers will remain in Brisbane. However, the fastest growing region is expected to be in Ipswich. The proposed connection projections are shown in Table 4-7.

■ **Table 4-7 Proposed residential water connection projections**

Residential connections	2011	2012	2013	2014	CAGR 2011 - 2014
Brisbane	393,432	399,727	406,123	412,621	1.6%
Ipswich	61,355	63,552	65,827	68,183	3.6%
Lockyer Valley	9,765	10,084	10,414	10,755	3.3%
Scenic Rim	5,755	5,844	5,935	6,027	1.6%
Somerset	4,596	4,667	4,740	4,813	1.6%
QUU Proposed	**474,903**	**483,874**	**493,038**	**502,398**	**1.9%**

SKM's view

Given that QUU network does not fully cover the five LGAs, the adjustment to the dwelling figures to take only the connected portion into consideration is appropriate. While QUU has not provided the historical ratios, based on the connection numbers submitted in the template for 2010/11 and comparing it with the 2011 OESR/PIFU dwelling numbers, we've estimated that about 88.9% of all dwelling in the QUU LGAs are connected to the water supply network. The breakdown of the proportion of connected dwellings is shown in Table 4-8.

■ **Table 4-8 Estimated proportion of dwellings connected**

LGA	QUU
Brisbane	91.0%
Ipswich	97.3%
Lockyer Valley	70.0%
Scenic Rim	36.9%
Somerset	51.3%
QUU	**88.9%**

While it may be reasonable to adjust dwelling numbers to account for connections (excluding non-connected dwellings), we would expect the rate of growth in connections to be similar to the growth in number of dwellings. Applying this adjustment and taking the latest OESR/PIFU dwelling projections into consideration, we have developed our recommend residential connections projections as shown Table 4-9.

Table 4-9 Recommended residential water connection projections

Residential connections	Inc pa	2011*	2012	2013	2014
Brisbane	4,492	393,432	397,924	402,417	406,909
Ipswich	2,883	61,355	64,238	67,122	70,005
Lockyer Valley	269	9,765	10,034	10,303	10,571
Scenic Rim	137	5,755	5,892	6,030	6,167
Somerset	116	4,596	4,712	4,829	4,945
QUU	**7,898**	**474,903**	**482,801**	**490,700**	**498,598**

* Estimated actuals

4.4.2. Non-residential

The non-residential connection growth rates projected by QUU are also shown in Table 4-5. It shows non-residential connections in most of QUU's area growing at 1% with the exception of the Lockyer Valley which is expected to grow at 1.4%. In its submission Information Returns 2011/12 dated 31 August 2011, QUU states that the "*lower growth rates in non-residential properties are based on Brisbane's experience, where non-residential growth has historically been lower than residential growth*" (page 32). No further information or data is however provided on how this adjustment is made.

Non-residential connection numbers are further divided into quarterly and monthly accounts. This was provided to SKM as part of our Request for Information and it shown that QUU has applied the same growth rates to both quarterly and monthly accounts. Quarterly accounts make up to vast majority of connections. The quarterly accounts percentage of total accounts is shown in Table 4-10.

Table 4-10 Percentage of quarterly accounts

Brisbane	98.1%
Ipswich	98.5%
Lockyer Valley	100%
Scenic Rim	100%
Somerset	99.8%

As with residential connections, QUU also provided SKM with the number of non-residential connections that do not consume water. This is shown in Table 4-6. These are empty commercial and industrial premises that while still paying a fee for the connection of the property to the water network, have no water consumption. We note that in the rural LGAs, the proportion of properties not consuming any water is fairly large. As we have only one year's worth of data, we have no way of verifying the validity or otherwise of the estimated percentages of such non-consuming properties.

SKM's view

QUU's projection of non-residential connection growth rates is lower than their residential growth rates. While we would prefer to forecast non-residential connection numbers as a function of economic activity as well as residential connections or population the absence of any data means that projection has to be undertaken on a limited basis. As historical information is also not available, the only information that may be used and is available to us is the number of non-residential customer connections as a proportion of residential connections. In the absences of better information, we believe that increasing non-residential water connections at the same rate as residential connections thus maintaining the historical ratio of residential/non-residential connections may be appropriate. The projection based on this ratio is shown in Table 4-11.

- **Table 4-11 Recommended non-residential water connection projections**

Non-residential connections	2011*	2012	2013	2014
Brisbane	29,961	30,303	30,645	30,987
Ipswich	1,950	2,042	2,133	2,225
Lockyer Valley	536	551	566	580
Scenic Rim	1,341	1,373	1,405	1,437
Somerset	648	664	681	697
QUU	**34,436**	**34,933**	**35,430**	**35,927**

* Estimated actuals

4.5. Water Demand

QUU has forecast water demand to grow from 104.3 GL to 113.3 GL at an average of 2.8% pa over the 2011 to2014 period. This is shown in Table 4-12.

- **Table 4-12 QUU proposed water demand forecast**

					CAGR %pa
Water Demand (ML)	**2011**	**2012**	**2013**	**2014**	**2011 - 2014**
Residential	66,812	70,677	72,379	74,126	3.5%
Non-residential	37,482	38,237	38,717	39,203	1.5%
Total Customer Water Demand	104,294	108,913	111,096	113,328	2.8%

4.5.1. Residential consumption

QUU's projection for residential water demand is calculated based on the average daily consumption per connection (LCD). Average consumption is multiplied by the number of connections to derive the residential consumption. As shown in Table 4-12, total residential consumption is forecast to grow at an average of 3.5% pa from 66.8 GL in 2011 to 74.1 GL in 2014. The residential water demand for individual Council areas is shown in Table 4-13.

▪ **Table 4-13 QUU proposed residential water consumption**

Residential Water Demand (ML)					CAGR %pa
	2011	**2012**	**2013**	**2014**	**2011 – 2014**
Brisbane	55,620	58,368	59,599	60,855	3.0%
Ipswich	8,938	9,744	10,143	10,559	5.7%
Lockyer Valley	1,020	1,141	1,184	1,229	6.4%
Scenic Rim	719	816	833	850	5.7%
Somerset	514	608	621	633	7.2%
QUU	**66,812**	**70,677**	**72,379**	**74,126**	**3.5%**

4.5.2. Average residential consumption

Table 4-14 shows the LPD projected by QUU for each of the LGAs over the forecast period. Based on historic consumption data, QUU has different expected average consumption rates across the five LGAs, reflecting the different customer profiles across these areas.

▪ **Table 4-14 QUU proposed average residential water consumption rates per person (LPD)**

LPD	2011	2012	2013	2014
Brisbane	169.0	175.0	175.9	176.8
Ipswich	166.0	175.0	175.9	176.8
Lockyer Valley	146.0	158.0	158.8	159.6
Scenic Rim	142.0	158.0	158.8	159.6
Somerset	136.0	158.0	158.8	159.6

QUU anticipates that the current historically low levels of per capita demand will continue in the short-term, with potentially some upwards creep over the longer term as a response to relaxed water restrictions. The low actual consumption seen in 2011 is weather affect due to the high rainfall conditions experienced in SEQ and a rebound is expected in 2012 as normal weather returns. However, in our discussions, QUU notes that recent data indicates that the rebound is not as significant as that forecast for 2012 and average consumption is expected to be somewhat lower than that provided in Table 4-14 for 2012. From 2012 onwards, average residential demand per person is forecast to increase by 0.5% pa. QUU forecasts that average demand will reach a plateau at around 200 LPD which is significantly lower than the pre-drought average consumption of over 300 LPD.

The 2011 average consumption rates have been based on the estimate of the actual consumption in 2011 per residential property divided by the assumed persons per tenement (see Table 4-3). Forecasts are based on these average consumption rates multiplied by the persons per tenement to arrive at an estimate of the projected average consumption per connection. The average consumption per residential property is shown in Table 4-16.

Table 4-15 QUU proposed average water consumption per residential property per year

LGA	2011	2012	2013	2014
	KL per residential property per year			
Brisbane	145.6	150.7	151.5	152.3
Ipswich	157.5	166.1	166.9	167.7
Lockyer Valley	138.6	149.9	150.7	151.4
Scenic Rim	134.8	149.9	150.7	151.4
Somerset	129.1	149.9	150.7	151.4

SKM's view

While we agree that the average consumption rate in 2011 is affected by the high incidence of wet weather in SEQ and thus did not exhibit any incidence of rebound, we believe that it is likely that consumption will rebound in 2012. While recent data may indicate that rebound is lower than that expected by QUU when developing their projections, this is likely to be a legacy of the very wet conditions earlier in the year which has led to saturated soils and thus lower than average outdoor usage. We also have not yet experienced hot summer conditions in 2011/12 which will probably increase water consumption. We also agree that 200 LPD is an appropriate level at which rebound growth will cease. However, increasing average consumption by 0.5% pa will mean that it could be up to 48 years (given that QUU has forecast the 2012 average consumption in Lockyer Valley, Scenic Rim and Somerset at 158 LPD) before the target200 LPD level is reached. This assumed level of water saving behaviour is, we believe, much too optimistic. As we have discussed in section 2.1.2, some level of rebound had been seen in SEQ in 2010 before the onset of wet weather. While the wet weather had disrupted the pattern, we expect a resumption of rebound when the weather returns to normal conditions.

As indicated in section 2.1.3, we expect rebound to occur over a four to five year period and settle at a level around the 200 LPD voluntary target set by the Queensland Government. Based on this expectation, we propose that the average consumption be adjusted to reflect rebound to an SEQ average consumption level of 200 LPD over 4.5 years for Brisbane and Ipswich. For the three relatively rural regions of the Lockyer Valley, Scenic Rim and Somerset, rebound may take longer than the 4 to 5 years estimate to complete. Rural customers have traditionally also been more willing to use alternative sources of water including rainwater tanks and ground water to supplement their water supply. Given the severity of the drought, it is likely that customers in these areas have installed such alternative supplies which we expect will continue to be used. However, given the lack of data especially in respect of data providing an indication of post drought water consumption behaviour, it is difficult to be definitive about the likely rebound in average consumption. Nevertheless, to reflect the expectation that it may take longer to rebound from a low consumption base, we have extended the rebound period for Lockyer Valley, Scenic Rim and Somerset to 8 years.

Given that the 2011 average consumption estimated by QUU was based on the assumed persons per tenement as shown in Table 4-3 and we have recommended an adjustment to this assumption (Table 4-4) based on updated OESR population and adjusted dwelling data, an adjustment has been made to the 2011 average consumption rate.[17] The resulting average consumptions for all the QUU LGAs are shown in Table 4-16. To estimate the rebound target of individual LGAs, we have assumed that average consumption will settle at a level that averages to the 200 LPD voluntary target set by the Queensland Government for SEQ as a whole from its current 165 LPD. Based on this expectation, average residential consumption in Brisbane and Ipswich would, by 2014, increase by about 16% with rebound completed in 4.5 years while Lockyer Valley, Scenic Rim and Somerset would consume about 9% more than at present with rebound completed in 8 years.

- **Table 4-16 Recommended average residential water consumption rates (LPD) projections**

LGA	2011*	2012	2013	2014	Rebound target
Brisbane	161	169	177	186	198
Ipswich	158	166	174	182	195
Lockyer Valley	143	147	152	156	177
Scenic Rim	150	154	159	163	185
Somerset	144	148	153	157	178

* Estimated actuals

4.5.3. Residential water demand recommendation

To be consistent with the method adopted by QUU, we have multiplied our recommended average consumption rate projections by the recommended persons per tenement to derive a projection of the average consumption per residential connection. The recommended residential water consumption projection may be obtained by applying these rates to the most recent OESR/PIFU dwelling projections and making adjustments for the number of water connected but not water-consuming dwellings. (Table 4-6) These projections are shown in Table 4-17.

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[17] For example, QUU's estimate of 169LPD for Brisbane was adjusted by multiplying by QUU's persons per tenement of 2.36 then divided by SKM's esimate of 2.48.

■ **Table 4-17 Recommended residential water consumption projections**

Residential Water Demand (ML)	2011*	2012	2013	2014	CAGR 2011 – 2014
Brisbane	55,620	59,202	62,668	66,362	6.1%
Ipswich	8,938	9,857	10,780	11,775	9.6%
Lockyer Valley	1,020	1,083	1,140	1,202	5.6%
Scenic Rim	719	763	801	842	5.4%
Somerset	514	546	573	603	5.5%
QUU	**66,812**	**71,451**	**75,963**	**80,784**	**6.5%**

* Estimated actuals

4.5.4. Non-residential consumption

Non-residential water demand is calculated based on the average daily consumption per connection (LCD). Average consumption is multiplied by the number of non-residential connections to derive total non-residential consumption. As shown in Table 4-12and Table 4-18, total non-residential consumption is forecast to grow at an average of 1.5% from 37.5 GL in 2011 to 39.2 GL in 2014. The QUU proposed non-residential water demand for individual Council areas is shown in Table 4-18. All LGAs with the exception of Lockyer Valley is expected to grow at a rate of 1.5% pa. The growth rate of non-residential water consumption proposed for the Lockyer Valley is 1.9% pa.

■ **Table 4-18 QUU proposed non-residential water consumption projections**

Non-Residential Water Demand (ML)	2011	2012	2013	2014	CAGR %pa 2011 - 2014
Brisbane	31,889	32,530	32,937	33,350	1.5%
Ipswich	4,425	4,514	4,571	4,628	1.5%
Lockyer Valley	283	289	294	299	1.9%
Scenic Rim	338	345	349	353	1.5%
Somerset	548	559	566	573	1.5%
QUU	**37,482**	**38,237**	**38,717**	**39,203**	**1.5%**

4.5.5. Average non-residential consumption (litres per connection per day)

Given the lack of historical data, it difficult to draw any conclusions on average non-residential consumption. From supplementary information provided to SKM, it appears that QUU has divided its non-residential customer base into two categories, monthly and quarterly accounts. The majority of accounts are quarterly accounts. These are smaller accounts than the monthly accounts. Monthly accounts are assessed on average to consume over 80 times more water than the quarterly accounts (in Brisbane in 2011, quarterly accounts are assessed to consume an average of 460 kL pa while monthly accounts consume over 37.6 ML pa). The average consumptions of both types of accounts are assumed to grow at 1% in 2012 and 0.25% pa thereafter. The reduction in growth after 2012 is based on the view held by QUU that the water saving practices have been ingrained into the customer base and that nay rebound will occur gradually. The proposed average non-residential consumption rates are shown in Table 4-19 for both quarterly and monthly accounts.

- **Table 4-19 QUU proposed non-residential average water consumption rates**

Non-Residential Average Consumption per Connection (KL pa)		2011	2012	2013	2014
Brisbane	Quarterly	460	464	466	467
	Monthly	37,611	37,987	38,082	38,177
Ipswich	Quarterly	444	448	449	450
	Monthly	125,481	126,736	127,053	127,371
Lockyer Valley	Quarterly	766	774	775	777
	Monthly	-	-	-	-
Scenic Rim	Quarterly	508	513	514	515
	Monthly	-	-	-	-
Somerset	Quarterly	367	371	372	373
	Monthly	397,838	401,816	402,821	403,828

SKM's view

Given the lack of historical data, we are unable to verify the average daily consumption of each non-residential connection in each LGA in QUU's area as used by QUU in its forecast. We however note that rebound is unlikely to be a major issue in non-residential consumption. Reductions in business consumption during the drought are largely structural and the reduction measures continue to be applicable with the lifting of restrictions. Attempts continue to ensure that businesses continue with efforts to reduce water use through the WEMP. This is likely to constraint growth in water consumption. We accept that some increase in consumption is likely in 2012 as normal weather returns from the wet conditions experienced in 2011. However, non-residential demand is not as greatly impacted by wet weather as residential demand.

As the forecast numbers are understood to be estimates driven off metered 2011 data, we consider the forecast average consumption of non-residential customers to be reasonable. We also consider the growth rates appear reasonable.

4.5.6. Non-residential water demand recommendation

Our recommended non-residential water consumption projections have been obtained by applying the recommended average non-residential water consumption rates shown in Table 4-19 to the number of non-residential customers (Table 4-11) based on the most recent OESR/PIFU dwelling projections after making adjustments for the number of non-water consuming connections (Table 4-6). The calculations were undertaken on quarterly and monthly accounts then summed to provide the recommended non-residential water demand projections shown in Table 4-20.

- **Table 4-20 Recommended non-residential water consumption projections**

Non-Residential Water Demand (ML)	2011*	2012	2013	2014	CAGR 2011 - 2014
Brisbane	31,889	32,575	33,025	33,477	1.6%
Ipswich	4,425	4,387	4,595	4,804	2.8%
Lockyer Valley	283	293	302	311	3.2%
Scenic Rim	338	350	359	368	2.8%
Somerset	548	567	583	598	3.0%
QUU	**37,482**	**38,172**	**38,863**	**39,558**	**1.8%**

* Estimated actuals

4.6. Wastewater and Trade Waste

Wastewater volumes are not relevant as QUU's wastewater charges are fixed charges per connection, and not based on the volume of wastewater discharged into the sewer. Forecasts were thus not provided for wastewater volumes.

Of greater relevance to revenue and pricing are wastewater connection numbers. QUU has forecast wastewater connections based on the number of wastewater connections as at March 2011. The annual growth rate is assumed to be the same as the growth rate in the number of water connections for both residential and non-residential wastewater connections (see Table 4-5).

The wastewater connection projections proposed by QUU are shown in Table 4-21.

- **Table 4-21 QUU proposed wastewater connections**

Wastewater connections	2009	2010	2011	2012	2013	2014
Residential						
Brisbane	380,772	385,931	386,463	392,646	398,929	405,312
Ipswich	-	54,822	55,238	57,216	59,264	61,385
Lockyer Valley	-	4,037	3,998	4,129	4,264	4,403
Scenic Rim	-	3,923	3,994	4,056	4,119	4,183
Somerset	-	-	2,753	2,796	2,839	2,883
QUU proposed residential connections			**452,446**	**460,842**	**469,414**	**478,166**
Non-residential						
Brisbane	27,183	28,743	28,791	29,079	29,370	29,663
Ipswich	-	-	1,779	1,797	1,815	1,833
Lockyer Valley	-	-	380	385	390	396
Scenic Rim	-	-	778	786	794	802
Somerset	-	-	489	494	499	504
QUU proposed non-residential connections			**32,217**	**32,541**	**32,867**	**33,198**

SKM's view

The assessment of the methodology applied to estimate wastewater connections is hampered by the lack of data. As with the water connection numbers, historical data is not available to assess if the growth rates proposed are appropriate. In this environment, we can only recommend that dwelling growth rates projected by the OESR/PIFU be applied to wastewater connection numbers as well. As with population and water connection projections, we recommend the use of the most up to date data sourced from OESR. Table 4-22 shows our recommended wastewater connection number projections based on the 2011 connections and growing at the OESR/PIFU growth rates shown in Table 4-5

- **Table 4-22 Recommended wastewater connection projections**

Residential	2011	2012	2013	2014
Brisbane	386,463	390,778	395,142	399,554
Ipswich	55,238	57,620	60,104	62,695
Lockyer Valley	3,998	4,102	4,210	4,320
Scenic Rim	3,994	4,085	4,178	4,274
Somerset	2,753	2,819	2,888	2,957
QUU	**452,446**	**459,405**	**466,521**	**473,800**
Non-Residential				
Brisbane	28,791	29,112	29,438	29,766
Ipswich	1,779	1,856	1,936	2,019
Lockyer Valley	380	390	400	411
Scenic Rim	778	796	814	832
Somerset	489	501	513	525
QUU	**32,217**	**32,655**	**33,100**	**33,554**

4.7. Recycled Water

QUU provides recycled water to non-residential customers in Brisbane and Ipswich. Since 2009, the supply of recycled water in Brisbane grew at 19% (2010) and 14% (2011) to 6,615 ML. However, with the easing of restrictions, QUU does not expect the use of recycled water to increase further and has maintained the consumption of recycled water in Brisbane at the 2011 level of 6,615 ML. Some 116 ML of recycled water was also supplied to non-residential customers in Ipswich in 2011. This level of supply is expected to be maintained in the forecast period as shown in Table 4-23.

■ **Table 4-23 Recycled water projections**

Recycled water (ML)	2009	2010	2011	2012	2013
Brisbane	4,905.00	5,815.00	6,615.00	6,615.00	6,615.00
Ipswich	0.00	0.00	116.00	116.00	116.00

Given limited data and the fact that QUU has simply maintained the expected supply of recycled water at current levels we have not expended significant effort to review recycled water forecasts. The maintenance of consumption at current level may be justified given that the supply of recycled water was only to non-residential customers and with the easing of the drought[18], it is unlikely that new customers will be sought to increase the take up of recycled water.

4.8. Non-revenue Water

Non-revenue water is the difference between bulk supply data (water use supplied by the SEQ Water Grid Manager) and billable consumption from residential and non-residential customers. This includes network leakage, water theft and authorised unbilled water consumption (eg fire fighting and pipe flushing). This component of water consumption however is highly uncertain given the lack of data as is the level of water theft and unbilled authorised consumption. We understand that the baseline forecast for non-revenue water use is based on historical estimate (2005/06) of non-revenue water use less estimated savings from leakage reduction programs plus growth in losses from leaks.

We understand that the leakage component of non-revenue water is loosely related to the number of connections rather than volume of water demand assuming that water pressure remains the same. However, there are no clear drivers of the other components of non-revenue water. Connection (both residential and non-residential) is expected to grow at about 1.6% pa and we thus would expect leakage to grow at approximately that same rate. QUU has forecast non-revenue water to grow at 2.7% pa. This growth rate is higher than the growth in connections. While we acknowledge the high uncertainty of this category, we believe that the estimated growth is too high and would recommend increasing the allowance for non-revenue water at around 2% pa (in line with the Allconnex estimate). This allowance is nevertheless still higher than the expected connection growth rate, reflecting the level of uncertainty. The non-revenue water projections are shown in Table 4-24.

■ **Table 4-24 Non-revenue water projections**

Non-revenue water (ML)	2011	2012	2013	2014	CAGR 2011-2014
Proposed	12,828	13,385	13,642	13,905	2.7%
Recommended	12,828	13,085	13,346	13,613	2.0%

[18] QWC, *The 2009 Water Report, A Year of Transition*, 2010 page 4

4.9. Long Term Projections

4.9.1. Water Demand

QUU also prepares longer term forecasts for the purposes of long term capacity planning. In contrast to the short term revenue related demand projections, long term forecasts places greater emphasis on a range of other factors such as the desired service standards being delivered by the assets and where demographic changes are likely to occur.

While there may be a need for broad consistency between the forecasting approach adopted for the short and long term projections, currently, QUU's short term forecasts are based on water consumption rebounding to around below 200LPD and staying at this level. In fact the three less urban LGAs of Lockyer Valley, Scenic Rim and Somerset have expected long term average consumption significantly below 200 LPD. This indicates that in some parts of the QUU system, the long term forecast of average water demand of 230 LPD is likely to significantly overstate capacity requirements.

However, the key point of difference between the two forecasts is the relative weight placed on the different input parameters in preparing the forecasts. In the short term, demographic changes are likely to be known and capacity cannot be changed, materially, in the forecast timeframe. The long term forecast however needs to take both demographic change and information as to where Council projected population growth areas are likely to be located into consideration when informing capacity requirements to ensure that network capacity continues to meet the desired service standards.

The desired standard of service defines the operating and design parameters of the network. Based on the planning standard of 230LPD, the desired standards of service define the demand for residential customers. Factors that impact demand and the desired standards of service that are taken into consideration include PWCM, consumption patterns, the Queensland Building Code, climate risk, non-revenue water (system losses) and mandated operating/design criteria. As a consequence of these considerations, long term demand projections used for network capacity planning are generally more conservative than the short term revenue related demand forecasts.

At the local level, fire-fighting requirements are usually the most important consideration in designing network capacity rather than customer demand requirements. While customer demand at this level rarely exceeds 6 litres per second, minimum fire fighting flow rate requirements are at least 7 litres per second up to 60 litres per second depending on the environment. We understand that there is a project currently under way in SEQ to review the 230 LPD planning standard and to determine if the reduced average consumption warrants a reduction in the long term planning criteria.

SKM's view

QUU has not provided as much information on its long term forecast as it did for its short term forecast. Nevertheless, from the material presented and from the discussions we conducted, it is clear that the criteria for developing its long-term forecasts are different to that of its short terms forecasts. The main aim of the long term forecast is to ensure that there is sufficient capacity to meet peak demand requirements and the need to meet the various applicable codes and guidelines. In the short term, the forecast seeks to reflect current and the immediate future likely demand. Capacity is not a major consideration as it usually takes longer than three years to augment any capacity except at the lower levels.

It is also likely that parts of the QUU network will not need to be based on its current design criteria of 230 LPD. These include the three more rural LGAs of Lockyer Valley, Scenic Rim and Somerset where the projected average consumption is around the 165 LPD to 180 LPD level. However, whether the term planning criteria should be lowered to reflect the likely lower average rate of consumption is however an issue to be debated given that changing the 230 LPD long term forecasting consumption target will require an explicit change to the desired service standard used to determine infrastructure capacity. We understand that there is a project currently under way in SEQ to review this standard and to determine if the reduced average consumption warrants a reduction in the long term planning criteria.

4.9.2. Wastewater

QUU states in its submission that the design average dray weather flow is 210 LPD. This comprises a sewage load from its customers of 150LPD and a continuous groundwater infiltration of 25%-30% of dry weather flow of which QUU has allowed an additional 60 LPD. The QUU system is designed to carry 5 times the average dry weather flow in accordance with the DERM planning guidelines

Based on the Queensland Department of Environment and Resource Management guidelines[19] these peak and flow rates are reasonable. The guidelines that that "(g)*enerally ADWF will range between 150-275 L/EP/d. This flow should be consistent with internal household water use*." It also states that peak wet weather flow of 5 times ADWF is appropriate for a conventional gravity system. As the Allconnex supplied document from the Logan Water Alliance shows, there is evidence of peak wet weather flows exceeding 5 times ADWF do occur resulting in overflow of the sewerage system. As a result, to prevent the system from frequent overloading resulting in overflow of untreated sewerage, proposed peak and flow rates appear reasonable.

While there is some information on non-residential wastewater demand, information on residential wastewater is sparse although this component is significantly larger than for the non-residential sector. Given that residential wastewater volumes are one of the key drivers of capital expenditure we consider that priority should be given capturing residential wastewater volume data. We also understand that a significant amount of wastewater capital is driven by wet-weather overflow requirements within the network and at the Wastewater Treatment Plants. Understanding the peak demand volumes for wastewater as driven by wet weather peaks for network and plant capacity purposes is thus also important and a better understanding of the frequency and volumes associated with peak flow events will need to be a priority.

[19] Department Of Environment and Resource Management, *Planning Guidelines for Water Supply and Sewerage*, Chapter 5 Demand/Flow and Projections

5. Unitywater

5.1. Unitywater forecasting approach

Unitywater uses the concept of “Equivalent Base Charge” for demand projections instead of network connections. This is a calculated average used for the purposes of calculating the revenue impacts of demand changes. The total water access charge revenue for a period is divided by the access charge for a standard residential connection to give the number of equivalent base (or standard residential charges). Thus it converts a non-residential connection to a number of equivalent residential connections. In estimating the equivalent base charge, Unitywater excludes those properties and hence population that are not connected to the network from the calculations. It is assumed that the proportion of both population and properties not connected will not change over the three year forecast period.

The approach adopted by Unitywater for forecasting volumes is based on establishing an underlying level of consumption on a per person per day basis (litres per person per day) and multiplying this average consumption by population. For the purposes of pricing and budgeting over the next three years Unitywater has calculated the water consumption forecasts that reflect anticipated population increases with no forecast change in per person per day usage. Implicit in the forecast average consumption is the current PWCM.

Population projections are based on the 2010 update of the PIFU forecast which provides projections in a 5 yearly period. This population projection is interpolated to obtain annual forecasts by assuming linear increase between periods.

Water demand/consumption including pricing tier breakdown for 2010/11 is based on budget (3rd quarter review). The water demand forecast including tier breakdown for 2011/12 is based on recent trends, this forecast form the basis of future years projections. Demand per litre per person per day is calculated by dividing total demand by number of days in the year, by the population projection in 2011/12.

Projections of total demand for subsequent years (2012/13 to 2020/21) are based on:

- Demand per litre per person in 2011/12 (assumed constant throughout period)
- Multiplied by number of days in the year
- Multiplied by the projected population number

Projections are then broken down to pricing tiers consumption assuming the same ratio as 2011/12. Projections at the pricing tier level are further split into residential and non-residential using historical ratios.

A similar method is applied for wastewater connections. Forecast sewerage volume is applicable only for Maroochy and is based on 2010/11 revenue divided by price per litre, growing at the same rate as the Sunshine Coast water demand.

In the template provided to the Authority Unitywater has not provided a forecast of non-revenue water. However, in its supplementary information, Unitywater has provided a loss factor which encompasses network losses, unbilled water and theft. To work out the non-revenue water, a loss factor from 2010/11 was calculated by comparison of customer meter reads to bulk meter reads, this ratio is assumed to be constant throughout the period.

5.1.1. Proposed forecast

A summary of the Unitywater demand projections provided to the Authority for the period 2010/11 to 2013/14 is shown in Table 5-1. Also shown are the average annual expected growth rates over the same period.

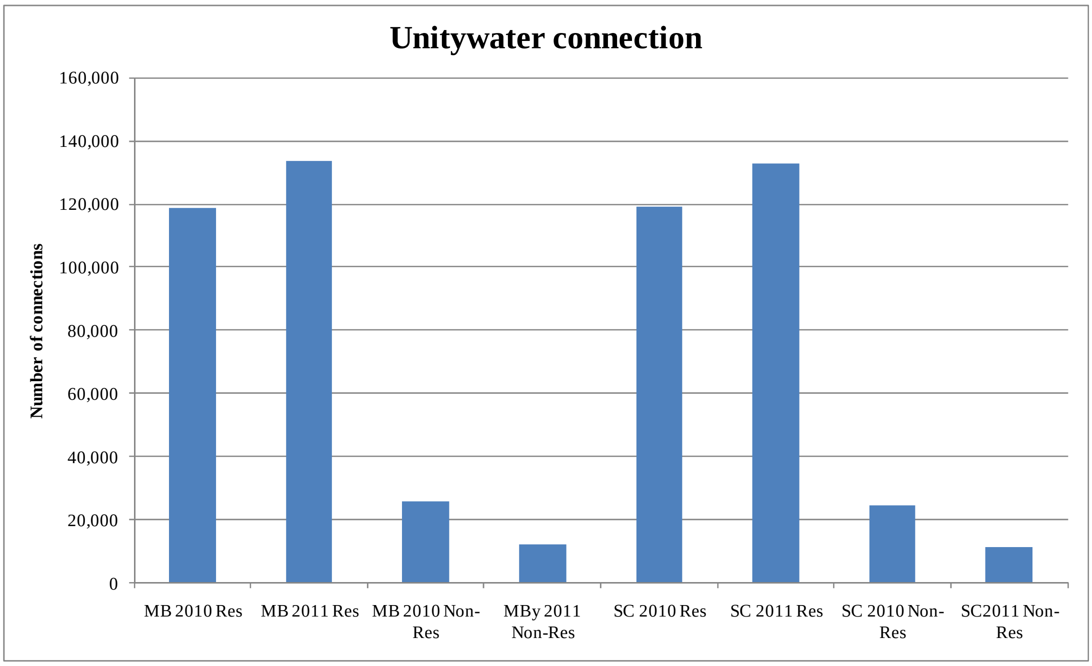
- **Table 5-1 Unitywater proposed demand projections**

		FY ending June				CAGR %pa
Unitywater Forecast	**Unit**	**2011**	**2012**	**2013**	**2014**	**2011 - 2014**
Residential equivalent water base charge	Num	266,365	273,784	281,100	288,630	2.7%
Residential water volume	ML	39,750	38,582	39,369	40,282	0.4%
Non-residential equivalent water base charges	Num	23,763	24,425	25,079	25,752	2.7%
Non-residential water volume	ML	6,985	7,418	7,570	7,746	3.5%
Total water volume	ML	46,736	46,000	46,939	48,028	0.9%
Residential wastewater equivalent base charge	Num	239,815	246,485	253,051	259,808	2.7%
Non-residential wastewater equivalent base charges	Num	45,717	47,008	48,302	49,635	2.8%

5.2. Previous forecast

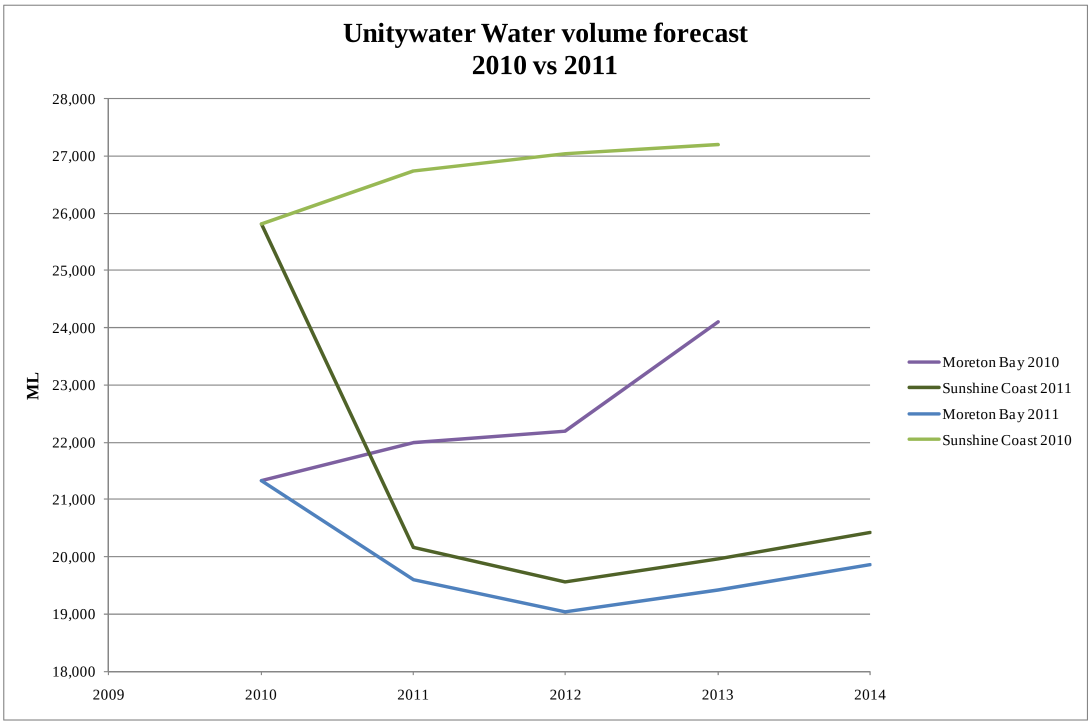
Unitywater did not provide any customer number forecast with its 2010 proposal except for the 2011 forecast number. Comparing the 2011 numbers over the two proposals, Figure 5-1 shows that while Unitywater has increased it estimated residential connections while reducing its estimated non-residential connections from that forecast a year ago. Residential customer numbers are about 12.4% and 11.4% higher in Moreton Bay and Sunshine Coast respectively while non-residential customers are about 52.5 and 53% lower respectively. It is unlikely that such large differences are simply the result of changes in expectation especially given that it was less than a year ago that the previous forecasts were made. It is more likely that it has been the result of a change in customer classification or a change in how the numbers were determined that has caused these large changes.

■ **Figure 5-1 Unitywater 2011 water connection projections**



The water consumption forecast also show a large diversion averaging around 15% in the case of Moreton Bay and over 26% in the Sunshine Coast. Some of the difference may be explained by the wet weather of the 2010/11summer and the lack of rebound. Also the introduction of PWCM in the Sunshine Coast on top of the wet weather may have resulted in the large reduction in 2011 consumption. This is shown in Figure 5-2.

■ **Figure 5-2 Unitywater water consumption projections**



5.3. Population

Unitywater base its forecast of population on the 2010 PIFU/OESR projection of population. During our discussions, Unitywater acknowledges that the population forecasts used are not the 2011 figures as the budget and pricing processes were essentially complete before these figures were released.

Table 5-2 show the comparison of Unitywater estimated population growth rates based on the growth rates from the 2010 update of PIFU projections and the latest projections from the OESR.

- **Table 5-2 Population growth rates**

LGA	Unitywater	2011 PIFU/OESR Population
	2011-2014	2011-2016
Moreton Bay	2.3%	2.0%
Sunshine Coast	2.4%	2.2%
Unitywater	**2.4%**	**2.1%**

The comparison shows that based on the 2010 update of PIFU projections at the LGA level, the population growth rates adopted by Unitywater are higher than that latest projected by the OESR/PIFU. While SKM understands the need for early estimates of the population for capital and infrastructure planning purposes, as these would feed into the development of Unitywater's capex programme, the latest population update should be used for revenue purposes as these provide the most up to date information on the likely population of the areas serviced by Unitywater. We however do note that use of the 2010 data is consistent with Section 3.2.1 of the Authority's *SEQ Interim Price Monitoring Information Requirements for 2011/12* dated June 2011 given the timing needs of Unitywater's budgetary and pricing approval processes.

5.4. Equivalent Base Charge

As indicated in section 5.1, Unitywater employs the concept of an "Equivalent Base Charge" to calculate the number of charges it collects (residential and non-residential) that is equivalent to a standard residential connection. The numbers of equivalent base charges are assumed to grow in line with dwelling numbers.

The growth rates of the number of equivalent base charge projected by Unitywater are shown in Table 5-3. This is compared with the dwelling growth rates projected by OESR/PIFU based on the 2010 update and that adjusted for lower population growth.

- **Table 5-3 Water connection growth rates**

LGA	Equivalent Base Charge	2011-2016 OESR/PIFU Dwelling	2011-2016 OESR/PIFU Dwelling (adj)
Moreton Bay	2.8%	2.8%	2.3%
Sunshine Coast	2.6%	2.5%	2.1%
Unitywater	**2.7%**	**2.7%**	**2.2%**

Unitywater has forecast 2.7% growth in its equivalent base charge from 2011 to 2014. The growth rates vary slightly in the two LGAs, 2.8% in Moreton Bay and 2.6% in the Sunshine Coast. These growth rates are comparable with the unadjusted OESR/ PIFU forecasted growth of dwellings over the period 2011 to 2016 shown in Table 5-3. The proposed equivalent base charges are shown in Table 5-4.

- **Table 5-4 Unitywater's proposed equivalent base charges**

Residential	2011	2012	2013	2014	CAGR 2011 - 2014
Moreton Bay	133,577	137,397	141,288	145,303	2.8%
Sunshine Coast	132,788	136,387	139,812	143,328	2.6%
Non-Residential					
Moreton Bay	12,239	12,589	12,946	13,314	2.8%
Sunshine Coast	11,523	11,836	12,133	12,438	2.6%

SKM's view

The growth rates used by Unitywater and the unadjusted 2010 OESR projections of dwelling growth are very similar. However, they are likely to be too high given the latest OESR view that population growth and hence dwelling growth in likely to be lower than the medium series they have published which can been seen in the adjusted column of Table 5-3. Accordingly, we recommend adjusting the proposed equivalent base charges to that shown in Table 5-5.

- **Table 5-5 Recommended equivalent base charges**

Residential	Inc pa	2011*	2012	2013	2014	CAGR 2011 - 2014
Moreton Bay	3,207	133,577	136,784	139,992	143,199	2.3%
Sunshine Coast	2,918	132,788	135,706	138,624	141,541	2.2%
Unitywater	**6,125**	**266,365**	**272,490**	**278,615**	**284,740**	**2.2%**
Non-Residential						
Moreton Bay		12,239	12,533	12,827	13,121	2.3%
Sunshine Coast		11,523	11,777	12,030	12,283	2.2%
Unitywater		**23,763**	**24,310**	**24,857**	**25,404**	**2.3%**

* Estimated actuals

5.5. Water Demand

Unitywater has forecast total water demand to grow from 46.7GL to over 48GL at an average of 0.9% pa over the 2011 to2014 period. This is shown in Table 5-6.

Table 5-6 Unitywater proposed water demand forecast

Water Demand (ML)	2011	2012	2013	2014	CAGR 2011 - 2014
Residential	39,750	38,582	39,369	40,282	0.4%
Non-residential	6,985	7,418	7,570	7,746	3.5%
Total Customer Water Demand	46,736	46,000	46,939	48,028	0.9%

Unitywater forecasts total water consumption based an underlying level of consumption on a per person per day basis and multiplying this average consumption by population. Projections are then broken down to tiers assuming the same ratio as 2011/12. Projections at a tier level are further split into residential and non-residential using historical ratios.

5.5.1. Average consumption

Table 5-7 shows the LPD for the combined residential and non-residential demand projected by Unitywater for each of the LGAs over the forecast period. Unitywater's forecasting method does not separately identify residential and non-residential average consumption. Unitywater assumes that consumption levels for both residential and non-residential customers would remain at current levels in the short terms.

Based on historic consumption data Unitywater has different expected average consumption rates for the two LGAs, reflecting the different customer profiles as well as the fact that the Sunshine Coast had not been subject to restrictions during the drought (the Sunshine Coast was not in drought in between 2005 and 2008).

Table 5-7 Unitywater proposed urban average water consumption rates

LGA	2011	2012	2013	2014
Moreton Bay	162	158	158	158
Sunshine Coast	202	191	191	191

Unitywater estimates that in 2011, total urban water consumption (residential and non-residential) averaged 162 LPD in Moreton Bay and 202 LPD in the Sunshine Coast. It expects that in 2012, average consumption will fall to 158 LPD in Moreton Bay (down 2.6%) and 191 LPD in the Sunshine Coast (down 5.7%). These lower average consumption rates continue to apply till 2014.

SKM's view

No information was provided in the template as to what the average consumption was in 2010. While total water consumption was provided, no population details were supplied (this was not required in the template). However, from the supplementary information provided to SKM, we have calculated that in 2010, average total water consumption was 187 LPD in Moreton Bay and 252 LPD in the Sunshine Coast. This is some 15% and 25% above the 2011 average consumptions respectively. We consider that the projected outturn for 2011 over 2010 represents a reasonable assessment of likely reduction in average consumption over these two years as 2011 was an extremely wet year, affected by floods in summer. Also the greater reduction in the consumption seen by the Sunshine Coast may have been affected by introduction of PWCM in the area when previously, there were no restrictions .in force However, we believe that it is unlikely that consumption will continue to fall from the weather affected 2011 level to the even lower level proposed by Unitywater. As indicated in section 2.1.2, we expect residential consumption rebound to occur over a four to five year period and settle at a level around the 200 LPD voluntary target set by the Queensland Government. Non-residential consumption however is unlikely to rebound as most of the reduction is likely to be structural.

While Unitywater's forecasting method does not separately identify residential and non-residential average consumption, from the data supplied for 2010 and 2011 and over the forecast period, we have calculated the average consumption of residential customers on a LPD basis and non-residential customers on a litres per connection per day basis implied by Unitywater's forecast. This is shown in Table 5-8. This was done by dividing total residential consumption by population numbers provided by Unitywater and total non-residential consumption by an estimate of the number of non-residential customers. The estimate of non-residential customers was based on supplementary information provided by Unitywater indicating that non-residential customers comprise 7.3% of all customers in Moreton Bay and 10.3% of all customers in the Sunshine Coast.

- **Table 5-8 Unitywater's Implied residential average consumption**

Residential Ave Consumption (LPD)	2010	2011	2012	2013	2014
Moreton Bay	162	144	137	136	136
Sunshine Coast	217	165	156	155	155
Non-residential Ave Consumption (LCD)					
Moreton Bay	910	624	749	743	739
Sunshine Coast	851	919	869	865	863

As indicated earlier in this section, we do not believe that average consumption will continue to fall from 2010 levels. While the fall in 2011 may be explained by the wet weather experienced in SEQ, we are of the opinion that residential average consumption will rise during the forecast period assuming normal weather conditions. We expect that residential customers in Moreton Bay which was subject to water restrictions during the drought will start rebounding from restriction affected consumption levels once normal weather returns. We also expect that, as with other parts of SEQ, based on the Queensland Government's voluntary average consumption level of 200 LPD, average consumption will eventually reach this level. As with the other water utilities in SEQ, we assume that the period over which this rebound will occur is 4.5 years.

Sunshine Coast Residential Consumption

There is more uncertainty with the Sunshine Coast demand projections. Sunshine Coast was not subject to temporary water restrictions when the other parts of SEQ were in drought. However, with the integration of the Sunshine Coast water supply into the rest of the SEQ water grid, Sunshine Coast residents are now subject to the same permanent water conservation measures. as the reset of SEQ Nevertheless, we understand that during the period that the rest of SEQ was subject to temporary water restrictions, residential consumption in the Sunshine Coast also fell in sympathy albeit not to the same extent. This may be explained by the fact that Sunshine Coast residents were subject to the same media and educational campaign targeted at the rest of SEQ. As a result, residents in the Sunshine Coast were likely to have also modified their water consumption behaviour eg having shorter showers and perhaps reducing the watering of gardens and car washing. In addition, Sunshine Coast residents were also able to access the same water saving incentives that were made available to all of SEQ as water storage levels declined. This resulted in structural change eg the installation of water tanks and low flow shower roses which will have a continuing impact. At the same time building codes were changed requiring higher water efficiencies in new homes and major renovations.

At the end of the drought, in 2010, Sunshine Coast residential customers on average consumed 214 LPD. As we have discussed in section 2.1.2, some rebound was apparent in SEQ prior to the advent of wet weather. Whether this was also the case in the Sunshine Coast is uncertain as data is not available to make this assessment.

Average consumption fell to 165 with the wet weather conditions of 2011. With the return of normal weather conditions over the forecast period, and the presence of PWCM, the question is how will Sunshine Coast residents respond? Will consumption rebound straight away back to around the 214 LPD level seen in 2010, rebound immediately to a level somewhere between 165 and 214 LPD and remain there or rebound over a period of time to the 200 LPD level as in other parts of SEQ? We do not however accept that average residential consumption in the Sunshine Coast will continue to fall as proposed by Unitywater. While PWCM may have been introduced to the Sunshine Coast, the restrictions are fairly low level and during our discussions with Unitywater, it was generally agreed that restrictions at the PWCM level are unlikely to make a difference to the behaviour of Sunshine Coast residents who have acted as though restrictions stricter than the PWCM were in place when the rest of SEQ were subject to strict restrictions.

What could explain an ongoing average consumption below the 214 LPD level seen in 2010 is the fact that water efficiency is likely to be slowly improving over the long term as residents replace old water using appliances with more water efficient ones eg washing machines and dish washers. Also as bathrooms are renovated, inefficient water consuming fixtures like shower roses and single flush toilets are likely to be replaced with water efficient low flow shower roses and dual flush toilets. This is likely to slowly improve the average water consumption of the area. Balancing this trend is the likelihood that behaviour that has changed in response to the media and educational campaigns urging reduced water consumption would slowly also creep back to pre-drought patterns eg longer showers and more frequent car washing and garden watering.

We also find that the continued reduction of average consumption for both Moreton Bay and Sunshine Coast from the weather affected consumption level of 2011 is inconsistent with Unitywater’s long term forecast of a return to an average consumption of 230 LPD for planning purposes.

Overall, we are of the opinion that average residential consumption in the Sunshine Coast is likely to rise from the wet weather affected level of 2011 and settle at around the 200 LPD consistent with the rest of SEQ, somewhat below its 2010 level due to the introduction of the PWCM. We have also continued to assume that this return to more normal consumption will also take the same period as in other SEQ regions although there may be an argument for a faster return in the case of the Sunshine Coast.

Non-residential consumption

The average non-residential consumption levels implied by Unitywater's forecasts are difficult to interpret. As seen in Table 5-8, the implied average non-residential consumption in Moreton Bay fell by 30% in 2011 then is forecast to increase by 20% in 2012 while the same in the Sunshine Coast rose by 8% in 2011 and is forecast to fall by 6.5% in 2012. We do not believe that non-residential water demand would exhibit such large year on year volatility unless non-residential consumption is dominated by a small number of large customers.

Taking the average of the 2010 and 2011 average consumption however produces figures for both LGAs that are fairly close to that forecast by Unitywater for 2012. In the absence of any more historical data, we are unable to present an alternative view of Unitywater's average non-residential consumption and there is no evidence that contradicts its forecast. Forecast for 2013 and 2014 show slight declines consistent with the view that non-residential customers will continue to participate in the WEMP and take cost effective water saving measures despite the ending of the drought.

Based on our assessment of Unitywater's average residential and non-residential consumption, we recommend using the average consumption numbers found in Table 5-9.

- **Table 5-9 Recommended Unitywater's average consumption**

Residential Ave Consumption (LPD)	2012	2013	2014
Moreton Bay	151	158	164
Sunshine Coast	173	180	188
Non-residential Ave Consumption (LCD)			
Moreton Bay	767	767	767
Sunshine Coast	885	885	885

5.5.2. Residential consumption

Unitywater's projection for residential water demand is calculated by applying the historical ratio of residential water use on total water demand shown in Table 5-6. The LGA breakdown of residential water use is shown in Table 5-10.

- **Table 5-10 Unitywater proposed residential water consumption projections**

Residential Water Demand (ML)					CAGR %pa
	2011	2012	2013	2014	2011 – 2014
Moreton Bay	19,590	19,027	19,410	19,854	0.4%
Sunshine Coast	20,160	19,555	19,959	20,428	0.4%
Unitywater	**39,750**	**38,582**	**39,369**	**40,282**	**0.4%**

Our recommended residential water consumption projections may be obtained by applying the recommended average residential water consumption rates found in Table 5-9 to the 2011 population numbers used by Unitywater and applying the most recent low series OESR/PIFU population growth projections. This is shown in Table 5-11.

- **Table 5-11 Recommended residential water consumption projections**

Population	2011*	2012	2013	2014	CAGR 2011-2014
Moreton Bay	372,318	377,940	383,562	389,185	1.5%
Sunshine Coast	334,951	341,112	347,274	353,435	1.8%
Recommended residential water demand					
Moreton Bay	19,590	20,813	22,064	23,342	6.0%
Sunshine Coast	20,160	21,488	22,851	24,249	6.3%
Unitywater	**39,750**	**42,302**	**44,915**	**47,591**	**6.2%**

* Estimated actuals

5.5.3. Non-residential consumption

Similarly Unitywater's projection for non-residential water demand is calculated by applying the historical ratio of non-residential water use to total water demand shown in Table 5-6. The LGA breakdown of residential water use is shown in Table 5-12.

- **Table 5-12 Unitywater proposed non-residential water consumption projection**

Non-Residential Water Demand (ML)	2011	2012	2013	2014	CAGR %pa 2011 - 2014
Moreton Bay	2,403	2,973	3,033	3,102	8.9%
Sunshine Coast	4,583	4,445	4,537	4,644	0.4%
Unitywater	6,985	7,418	7,570	7,746	3.5%

Our recommended non-residential water consumption projection may be obtained by applying the recommended average non-residential water consumption rates found in Table 5-9 to the 2011 non-residential connections numbers implied in Unitywater's demand model and applying the most recent OESR/PIFU dwelling growth rate projections. This is shown in Table 5-13.

- **Table 5-13 Recommended non-residential water consumption**

Non Residential Connections	2011*	2012	2013	2014	CAGR 2011 - 2014
Moreton Bay	10,555	10,808	11,062	11,315	2.3%
Sunshine Coast	13,659	13,959	14,259	14,559	2.2%
Recommended	**Non-residential Water Demand (ML)**				
Moreton Bay	2,403	3,025	3,096	3,167	9.6%
Sunshine Coast	4,583	4,510	4,607	4,704	0.9%
Unitywater	**6,985**	**7,535**	**7,703**	**7,871**	**4.1%**

* Estimated actuals

5.5.4. Total water consumption

The water consumption recommended projection is substantially higher than that proposed by Unitywater. This is largely the result of the assumed rebound that we have adopted. Based on our assessment, total urban water consumption (residential and non-residential) for Unitywater will rise from around 162 LPD in 2011 to 187 LPD in 2014 in Moreton Bay. This contrasts with Unitywater's assumption that average consumption will remain at 153 LPD over the forecast period. Similarly, we have assessed average urban water consumption in the Sunshine Coast to increase from 202 LPD in 2011 to 224 LPD in 2014 in contrasts to Unitywater's assumption of 191LPD. This assessment is shown in Table 5-14.

- **Table 5-14 Recommended Unitywater water consumption**

Population	2011*	2012	2013	2014	CAGR 2011-2014
Moreton Bay	372,318	377,940	383,562	389,185	1.5%
Sunshine Coast	334,951	341,112	347,274	353,435	1.8%
Ave urban consumption (LPD)					
Moreton Bay	162	173	180	187	4.9%
Sunshine Coast	202	209	217	224	3.5%
Total consumption (ML)					
Moreton Bay	21,993	23,838	25,160	26,509	6.4%
Sunshine Coast	24,743	25,999	27,459	28,953	5.4%
Unity	**46,736**	**49,837**	**52,619**	**55,462**	**5.9%**

* Estimated actuals

5.6. Wastewater

Wastewater volume forecasts have not been provided as Unitywater does not charge on the basis of wastewater volume with the exception of non-residential customers in the Maroochydore region of the Sunshine Coast. For these customers, sewerage volume is calculated as a percent of metered water consumption based on set discharge factors ranging from 5% to 90%. This approach to forecasting wastewater volumes is consistent with approaches adopted in other jurisdictions. Rather than actually metering wastewater volumes, assumptions are made on the proportion of a customers' metered drinking water consumption flowing into the sewer. This approach avoids the extensive expenditure that would be required to meter consumption of wastewater services which is forecast to grow at the same rate as water consumption.

Of greater relevance to revenue and pricing are wastewater connection numbers. Unitywater has however not forecast wastewater connections. Instead, as with water, it has forecast an "equivalent base charge" on the same basis as forecasting water where the equivalent charge is based on the access charge of a residential access charge. The sewerage access is generally charged on the number of pedestals.

The annual growth rate is assumed to be the same as the growth rate in the number of equivalent base charge for water. As growth for water is based on dwelling growth projections by OESR, the same rate is used for estimating the number of equivalent sewerage base charge. The total number of equivalent base charge projections is then split into residential and non-residential using the historical ratio.

The proposed wastewater equivalent base charge is shown in Table 5-15.

- **Table 5-15 Unitywater proposed wastewater equivalent base charge**

Wastewater equivalent base charge		2011	2012	2013	2014
Residential					
Moreton Bay		114,017	117,278	120,599	124,026
Sunshine Coast		125,797	129,207	132,451	135,782
Unitywater		**239,815**	**246,485**	**253,051**	**259,808**
Non-residential	% of res				
Moreton Bay	30.2%	34,408	35,392	36,395	37,429
Sunshine Coast	9.0%	11,309	11,615	11,907	12,206
Unitywater	**19.1%**	**45,717**	**47,008**	**48,302**	**49,635**

SKM's view

In the absence of more historical information, we accept that the methodology applied to estimate wastewater volumes for Maroochydore is appropriate. We believe that it would be useful to update the estimate of the discharge factors for each of the industries taking into account the changing nature of these industries as well as changes to drinking water consumption patterns due to the drought and restrictions. It is highly possible that the discharge factors will have changed as behaviour changes due to the increased awareness to reduce water consumption. We would also suggest that monitoring of any changes to the rate of growth of the deemed wastewater volume in Maroochydore be compared with general water volume growth rate in the Sunshine Coast so that future forecasts may have a better basis for projection.

While we accept the method applied by Unitywater, we have recommended an alternative water volume for non-residential customers in the Sunshine Coast which provides for a different volume of wastewater from that proposed by Unitywater. This is shown in Table 5-16.

- **Table 5-16 Wastewater volume**

Wastewater volume (ML)	2011*	2012	2013	2014
Proposed projections	1,895	1,838	1,876	1,920
Recommended projections	1,895	1,872	1,920	1,968

* Estimated actuals

Similarly, our ability to assess the method for projecting wastewater equivalent base charge is limited by the lack of data. Historical trends, if available, should provide a better indication of the likely changes in future relative to water equivalent base charge. However in its absence we can only apply the same rate of growth and thus accept Unitywater's method. As with water, we would prefer to use the growth rate based on the adjusted updated OESR dwelling projections.

■ **Table 5-17 Recommended wastewater equivalent base charge**

Waste Water equivalent base charge	2011*	2012	2013	2014
Residential				
Moreton Bay	114,017	116,755	119,493	122,231
Sunshine Coast	125,797	128,561	131,325	134,089
Unitywater	**239,815**	**245,317**	**250,818**	**256,320**
Non-residential				
Moreton Bay	34,408	35,235	36,061	36,887
Sunshine Coast	11,309	11,557	11,806	12,054
Unitywater	**45,717**	**46,792**	**47,867**	**48,941**

* Estimated actuals

5.7. Non-revenue water

Non-revenue water is the difference between bulk supply data (water use supplied by the SEQ Water Grid Manager) and billable consumption from residential and non-residential customers. This includes network leakage, water theft and authorised unbilled water consumption (fire-fighting and pipe flushing).

Unitywater has not provided any non-revenue water forecast in the templates supplied to the Authority. However, in its submission, Unitywater estimates that the losses incurred in its network amounted to some 13.8% for 2009/10. This estimate is based on actual losses incurred in Moreton Bay. Indications from 2010/11 actual meter readings (both customer and bulk meter) show lower losses. In their forecasting model provided to SKM, Unitywater has projected that over the forecast period, losses will account for 10.8% of total water demand in Moreton Bay and 11.5% in the Sunshine Coast.

Based on comparing non-revenue water data submitted by Allconnex and QUU, losses of the order suggested by Unitywater are not unreasonable. Allconnex has projected losses of around 9% while QUU losses are around 11%. As a result we recommend that Unitywater's projected loss factor of 10.8% of total water demand be accepted.

5.8. Long Term Projections

Water Demand

Unitywater prepares longer term forecasts for the purposes of long term capacity planning. In contrast to the short term revenue related demand projections, long term forecasts place greater emphasis on a range of other factors such as the desired service standards being delivered by the assets and where demographic changes are likely to occur.

However, the key point of difference between the two forecasts is the relative weight placed on the different input parameters in preparing the forecasts. In the short term, demographic changes are likely to be known and capacity cannot be changed, materially, in the forecast timeframe. The long term forecast however needs to take both demographic changes and Council projected population growth areas into account to inform network capacity planning to ensure that network capacity continues to meet the desired service standards.

Unitywater's current infrastructure planning is based on the current Planning Schemes of each Council, which predate the latest OESR projections. Both Moreton and Sunshine Coast Regional Councils are in the process of developing new Planning Schemes that are consistent with the OESR population projections. Once the development of these Planning Schemes is sufficiently advanced, Unitywater expects to revise the current water and sewerage network master plans.

The desired standard of service defines the operating and design parameters of the network. Factors that impact demand and the desired standards of service that are taken into consideration include PWCM, consumption patterns, the Queensland Building Code, climate risk, non-revenue water (system losses) and mandated operating/design criteria. As a consequence of these considerations, long term demand projections are generally more conservative than the short term revenue related demand forecasts. At the local level, mandatory fire-fighting requirements are usually the most important consideration in designing network capacity rather than customer demand requirements. These requirements stipulate the flow rate at the street level must be at least 15 litres per second in a normal residential area and 30 litres per second in a non-residential area. Under the Building Code, higher requirements are occasionally needed eg for a high rise building, the Building Code may require a 60 litre per second flow rate. In the past, Unitywater's network had allowed developers to connect to the network in areas where the flow rate was sufficient without needing to augment the system or for the developer to put in place assets to increase the water pressure. As a result, Unitywater now has to maintain this flow rate so that the Building Code is not breached.

While there may be a need for broad consistency between the forecasting approach adopted for the short and long term projections, currently, Unitywater's short term forecasts implies declining average residential water consumption (see section 5.5.1). This is not consistent with the Unitywater's long term forecast of average residential water demand which has been based on 276 LPD in Moreton Bay and largely based on 230 LPD in the Sunshine Coast. The higher average consumption assumed for the Moreton Bay represents a 20% loading on the 230 LPD to account for the possibility of rebound beyond the PWCM target. In addition, peak factors are applied in the design of infrastructure. These peaking factors are based on previous network planning studies and take into consideration higher flows than average during the peak demand month (mean day maximum month), maximum day and maximum hour. The peaking factors that are applied are shown in Table 5-18.

- **Table 5-18 Water infrastructure planning peaking factors**

	Peaking Factors (times Average Day Flow)		
	Moreton Bay	**Sunshine Coast**	**Applied to**
MDMM	1.2	1.5	For sizing of trunk supply mains and reservoirs
Max Day	1.6	1.9	For sizing of trunk supply mains and reservoirs
Max Hr.	4.3	4	For sizing of larger reticulation mains

Unitywater is currently undertaking a review of flowmeter data in the reticulation network to identify the impact of drought and post-drought conditions on peaking factors. However, rather than rationalise the differing Moreton Bay and Sunshine Coast Standards of Service, Unitywater , together with the other SEQ utilities are working to produce a new SEQ Design and Construction Code which is expected to include revised planning parameters.

SKM's view

For Unitywater, we have recommended an average residential consumption projection increasing to 200LPD as an average for SEQ after 4.5 years, consistent with the QWC's target average consumption level. For Unitywater, this translates to average consumption for both Moreton Bay and the Sunshine Coast that are lower than the average SEQ level. Our average consumption expectations for Unitywater are higher than that assumed by Unitywater in the short term. However, when compared with Unitywater's long term projections, our forecast average consumption level is still short of Unitywater's long term planning assumption where the network capacity is designed to meet 230 LPD of residential consumption. Whether the long term planning criteria should be lowered to reflect the likely lower average rate of consumption is however an issue to be debated given that changing the 230 LPD long term forecasting consumption target will require an explicit change to the desired service standard used to determine infrastructure capacity. We understand based on our discussion with Unitywater that there is a project currently under way in SEQ to review this standard and to determine if the reduced average consumption warrants a reduction in the long term planning criteria.

Also under review are the peaking factors. The current peaking factors used are similar to those used by the other water utilities in SEQ. However, these peaking factors have been in place since before the drought and resulting restrictions. The strong media campaigns that had been run to educate the water consumers to reduce their use of water has not been factored into these factors. It is thus appropriate for Unitywater to conduct a study to understand how the behaviour of water consumers had changed since the current peaking factors had been implemented and as the GHD study[20] in the Gold Coast showed, it is likely that peaking factors have been reduced and it may be appropriate to consider this in its long term planning.

Wastewater

While there is some information on non-residential wastewater demand, information on residential wastewater is sparse although this component is significantly larger than for the non-residential sector.

Given the lack of information on residential wastewater volume, we consider that it should be a priority to collect such wastewater volume information since residential wastewater is one of the key drivers of capital expenditure. However, we understand that a significant amount of wastewater capital is also driven by wet-weather overflow requirements within the network and at the

[20] GHD, *Gold Coast Water, Desired Standards of Service Review 2008*, October 2009

Wastewater Treatment Plants. We understand that peak flows during wet weather periods can be many multiples of average volume flows. Given that charging for residential wastewater services is unlikely to be volume based in the near future, it is likely that understanding the peak demand volumes for wastewater network capacity purposes is more important than estimating average wastewater volumes.

Appendix A Price Elasticity of Demand

There are a few recent papers published on the elasticity of demand for water using data from Australian municipalities, Abrams et al (2011), [21]Hoffman et al (2006)[22], Grafton and Kompas (2007)[23] and Grafton and Ward (2008)[24]. Each of these papers provides estimates for the elasticity of demand for water based on econometric modelling.

Abrams, Kumaradeven, Sarafidis and Spaninks (PED=-0.05)

This study focuses on the responsiveness of residential households to water usage prices. Short and long-term responses were estimated for households in owner occupied houses, tenanted houses and housing units. The study analysed a sample of around 95,000 individual households and 3,300 blocks of housing units through time. At a water usage price of $1.20 per kL (in $2009-10 dollars), the estimated immediate and long-term real price elasticities for the demand for water are were estimated for each of these households. The short term weighted average PED was -0.05 while over the long term, the PED was found to be -0.11.

Abrams et al (2011) notes that the weighted average long-term price elasticity found in this study was generally lower than previous studies for Sydney. One reason given for the difference is that studies based on bulk water demand often attribute changes in demand to price that were really due to other factors. The authors noted that the results are specific to Sydney and remain valid as households continue to maintain the water use patterns established during drought related water restrictions.

Hoffman, Worthington and Higgs (PED = -0.59)

Hoffman et al (2006) estimate the elasticity of demand for water from quarterly data for residential water customers and report values for their elasticity estimate of -0.588 in the short-run and -1.442 in the long-run. These estimates imply that water demand in Brisbane is relatively sensitive to price in the long-run.

The Hoffman et al (2006) estimate is based on data that is specific to the SEQ region. This paper uses quarterly level data derived from customer bills, aggregated at the suburb level for residential customers in Brisbane. The climate variables included are the number of rainy and warm days in the quarter. They model demand on both a linear and a logarithmic basis. Lagged demand is included as an explanatory variable.

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[21] Abrams, B., Kumaradevan, S., Sarafidis, V. and Spaninks, F. (2011) *The Residential Price Elasticity of Demand for Water*, Joint Research Study, Sydney, February

[22] Hoffman, M., Worthington, A., and Higgs, H. (2006) Urban water demand with fixed volumetric charging in a large municipality: the case of Brisbane, Australia, *Australian Journal of Agricultural and Resource Economics*, vol. 50, pp. 347-359

[23] Grafton, R. Q. and Kompas, T. (2007) Pricing Sydney water, *Australian Journal of Agricultural and Resource Economics*, vol.51, 227-241.

[24] Grafton, Q. and Ward, M. (2008), 'Prices versus Rationing: Marshallian Surplus and Mandatory Water Restrictions', *Economic Record* 84, September: S57–65.

Grafton and Kompas (PED = -0.35)

Grafton and Kompas (2007) report an estimated elasticity of demand for water of -0.352. They state that this is a short-run elasticity of demand. This is the elasticity of demand estimated from their model under real prices. While the analysis in Hoffman et al (2006) focussed on residential demand, Grafton and Kompas (2007) model total water demand, including both residential and non-residential usage.

Grafton and Kompas employ daily water use in Sydney for the years 2001 through 2005. Quantity data was derived from system data and is the total water demanded by all customers, residential and non-residential. The variables included in their econometric modelling include daily rainfall, temperature, real and nominal prices, and lagged consumption.

The paper by Grafton and Kompas, in contrast to the paper by Hoffman et al (2006), does not have as its primary goal the estimation of the elasticity of demand for water. Instead, the goal of the Grafton and Kompas (2007) paper is to focus on the overall water demand/supply balance in Sydney under differing pricing and rainfall scenarios. Their estimation of the elasticity of demand is just an intermediate step.

The time period of the Grafton and Kompas (2007) study is from 2001 to 2005. During this period there was a single marginal price for water in Sydney. Inclining block tariffs were introduced in October 2005 and Grafton and Kompas (2007) does not include this period in their model. Water restrictions were introduced in Sydney in 2003.

The consumption data that Grafton and Kompas (2007) use is utility data from Sydney Water. Utility data from Sydney water is total consumption for all customers and is available on a daily basis. Grafton and Kompas (2007) use daily water consumption. Note that, while Hoffman et al (2006) focus on the residential sector, Grafton and Kompas (2007) estimate the elasticity of demand for the entire water market in Sydney. Given that daily water consumption is available, Grafton and Kompas (2007) also utilise daily climate variables. The two climate variables included in their econometric model are daily rainfall and temperature.

The other independent variables in the Grafton and Kompas (2007) model are the marginal price and the lagged dependent variable. They explicitly limit their analysis to the time period before the introduction of inclining block tariffs for water in Sydney. As in Hoffman et al (2006) the lagged value of demand is included as a dependent variable. Grafton and Kompas (2007) claim that their estimates of the demand elasticity are short-run estimates, but they appear to apply their elasticity over a four year period in their analysis of water supply modelling[25]. This is roughly equal to an adjustment of -0.10 per year.

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[25] Grafton and Kompas (2007) , page 235.

Grafton and Ward (PED = -0.17)

Grafton and Ward (2008) also consider the Sydney context. In their paper they estimate aggregate per capita daily water demand, as a function of real residential water prices, temperature (current and lagged), rainfall (current and lagged) and water restrictions. Quantity, price and temperature variables are represented in natural logarithm form, and all other variables are untransformed. The sample period is January 1, 1994 to September 30, 2005, a period that coincides with a single tier volumetric water price which was uniform for all customers, but which varied over time.

The estimated real price elasticity of demand is -0.17.

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