

## Review of Water Consumption Forecasts

REVIEW OF WATER CONSUMPTION FORECAST IN  
WYONG SHIRE COUNCIL'S 2008 SUBMISSION TO  
IPART ON PRICES TO APPLY FROM 1 JULY 2009

- Final
- 12 December 2008



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## Contents

|   |           |
|---|-----------|
| <b>1. Executive Summary</b>   | <b>4</b>  |
| 1.1. Forecasting Methodology  | 5         |
| 1.2. Input Data and Assumptions   | 6         |
| 1.3. Consumption Patterns   | 6         |
| 1.4. Water Restrictions   | 6         |
| 1.5. Demand Management  | 7         |
| 1.6. Water Recycling  | 7         |
| 1.7. Water Pricing  | 7         |
| 1.8. Bulk transfers   | 7         |
| 1.9. Forecasted Consumption   | 7         |
| 1.10. Summary   | 8         |
| <b>2. List of Abbreviations</b>   | <b>9</b>  |
| <b>3. Introduction</b>  | <b>10</b> |
| 3.1. Purpose of Report  | 10        |
| 3.1. Background   | 10        |
| 3.2. Report Structure   | 11        |
| 3.3. Potable Water Consumption as part of Integrated Water Cycle Management | 11        |
| <b>4. WSC Water Consumption</b>   | <b>13</b> |
| 4.1. Consumption to date  | 13        |
| 4.1. Summary  | 16        |
| <b>5. Forecasting Methodology</b>   | <b>18</b> |
| 5.1. Background   | 18        |
| 5.2. WSC Method and assumptions   | 20        |
| 5.2.1. Forecast per capita consumption                                      | 20        |
| 5.2.2. Review of historical and forecast population                         | 20        |
| 5.2.3. Demand management programs   | 22        |
| 5.2.4. Water recycling initiatives  | 23        |
| 5.2.5. Unaccounted-for-water  | 26        |
| 5.2.6. Prediction of future water restrictions                              | 28        |
| 5.2.7. Bulk Water Supplies  | 31        |
| 5.2.8. Assumptions  | 31        |
| <b>6. Forecasted Water Consumption</b>                                      | <b>34</b> |
| 6.1. WSC Water Consumption forecast   | 34        |
| 6.2. Assessment   | 37        |



|           |   |           |
|-----------|---|-----------|
| 6.2.1.    | Regression analysis   | 37        |
| 6.2.2.    | Population  | 37        |
| 6.2.3.    | Review of demand management programs                                | 38        |
| 6.2.4.    | Prediction of future water recycling initiatives                    | 38        |
| 6.2.5.    | Unaccounted for water   | 39        |
| 6.2.6.    | Prediction of impact of future pricing changes                      | 39        |
| 6.2.7.    | Prediction of future water restrictions                             | 40        |
| <b>7.</b> | <b>Summary</b>  | <b>42</b> |
| <b>8.</b> | <b>References</b>   | <b>44</b> |
|           | <b>Appendix A Demand Management and Water Recycling Initiatives</b> | <b>45</b> |



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## 1. Executive Summary

The NSW Independent Pricing and Regulatory Tribunal (IPART) is in the process of setting the charges for a range of monopoly services provided by Wyong Shire Council (WSC). These include potable water and recycled water services.

As part of this process, WSC provided their forecast for future water consumption to IPART. This forecast was based on the demand estimated as part of an Integrated Water Cycle Management (IWCM) Study for Wyong Shire, which was completed in mid 2007. The IWCM study's primary purpose is strategic planning for the water utility. It is a requirement of the NSW Department of Water and Energy (DWE) "Best Practice Management of Water Supply and Sewerage Guidelines 2004" and forms part of a range of initiatives by the NSW Government to improve water management for local water utilities.

The IWCM included an assessment of a range of factors and initiatives affecting water consumption rates and patterns. These include recycled water and water reuse programs, stormwater harvesting, residential retrofit programs, community education, water conservation and demand management for high water users, rainwater tank rebate programs and integration of BASIX requirements for new development.

IPART engaged Sinclair Knight Merz (SKM) to undertake an independent review of WSC's water consumption forecasts over the next five years, comment on the suitability and robustness of the approach used to develop these forecasts and provide a report as to the reasonableness of the data and assumptions used.

This report, provided to IPART, contains SKM's views on WSC's forecasting methodology and the reasonableness of estimated water savings from water restrictions and demand management programs.

This report provides qualitative comment on the:

- suitability and adequacy of the approach used for water consumption forecasting
- suitability and adequacy of the data and information used as input
- suitability of the assumptions
- application of the methodology
- the balance between the use of historical trends and key drivers in generating the forecasts



## 1.1. Forecasting Methodology

The WSC forecasting methodology is based on a calculation of per capita water demand that accounts for variations in climatic conditions, water restrictions and demand management initiatives. A regression model was developed for the per capita demand, which is an appropriate approach, but did not include any demographic or socio-economic variables. SKM suggest that a test of the significance of other potential drivers of water consumption should have been carried out, and that inclusion of significant variables could have improved the reliability of the forecast. Other than this, the approach used by WSC to predict future demand, being based on historical daily water production data, is considered to be reasonable.

A regression model was produced to predict the per capita demand data using daily temperature, rainfall and evaporation data as variables. This provided an estimate of the historical per capita potable water demand which is relatively independent of climate variation and water restrictions. Water meter data from a period without water restriction (three years, between Jan 1999 and Jan 2002) was used to calculate a per capita potable water demand. WSC calculated a climate corrected mean per capita demand of 330L/p/d (WSC 2006, p.85). This baseline per capita demand was then used to predict future water consumption based on predictions of population and demand management, including water restrictions. Estimated savings through water restrictions are subtracted from the unrestricted metered consumption forecast in order to arrive at the final estimate of future metered consumption.

The methodology used by WSC to forecast water demand is almost identical to that used by Gosford City Council (GCC) in their 2008 submission to IPART.

SKM found that the methodology used by WSC to forecast demand was generally robust. WSC's modelling methodology was supported by reporting on the model development, calibration, historical demand analysis and on the assumptions made in demand forecasting.

SKM suggest that consultation with high water users on their current and future demand management and water conservation program or initiatives could result in a more robust assessment of the forecast. This would replace the assumption that the commercial demand will have the same annual growth as population.



## 1.2. Input Data and Assumptions

The WSC forecasting methodology is based on population growth rate of 2.0% per annum, which is consistent with that from the NSW Department of Planning (DoP) (DoP 2005). SKM assume the DoP's population projection is a reasonable input for the future growth component of the forecast.

Assumptions that were used in the forecast included:

1. Demographic or socio-economic variables were assumed to be not significant, and so not included in the regression model.
2. Non-residential demand sectors will increase in line with residential population growth and that no new large water users will be established.
3. The trend towards increasing appliance efficiency is anticipated to continue into the future and will result in changes in household water use per account.
4. Proposed price increases will be implemented and an overall price elasticity of -1.2 applies.

## 1.3. Consumption Patterns

In the financial year 2007/08, WSC supplied approximately 10.8 GL of water to a residential population of around 143,000. Recent potable water consumption in WSC has been decreasing due to demand management and water conservation initiatives, including water restrictions, and source substitution from rainwater, stormwater and recycled water.

## 1.4. Water Restrictions

WSC are predicting the progressive lifting of water restrictions, with no water restrictions in place by the end of the determination period. The assumed water consumption reductions through water restrictions are shown in **Table 1**.

■ **Table 1. Current Restriction Guidelines (WSC 2008)**

| <b>Restriction</b> | <b>Initiate Restriction when Total Storage Reduces to</b> | <b>Target Reduction during Restriction Level</b> |
|--------------------|---|--|
| Level 1            | 40%   | 8 %  |
| Level 2            | 30%   | 16 %   |
| Level 2a/ 2b       | 22%   | 24 %   |
| Level 3            | 18%   | 30 %   |
| Level 4            | 14%   | 32 %   |
| Level 5            | 12%   | 38 %   |



SKM is of the opinion that WSC's methodology provides a reasonable assessment of the impact of water restrictions.

### **1.5. Demand Management**

SKM found that WSC have included the influence of demand management initiatives in their forecast. Due to a lack of historical data and effectiveness reporting, WSC were required to assume the resulting reductions in consumption. WSC assumed that a total of 4GL/a is saved through its demand management initiatives. They are, therefore, assuming demand management is reducing consumption by 30% to 40%.

### **1.6. Water Recycling**

WSC quantified the expected savings through existing and proposed water recycling schemes. Details on how these were derived were not included, and so assumed correct.

### **1.7. Water Pricing**

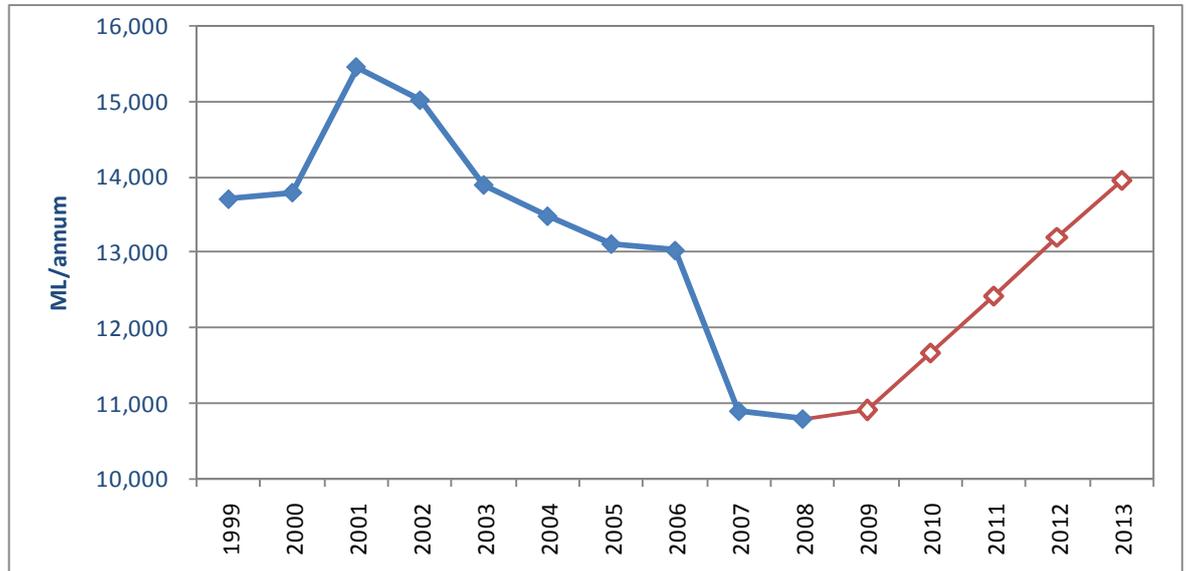
WSC assumed an overall price elasticity of -1.2 to include the predicted effect of their proposed price structures in their water consumption forecast. SKM suggest this may be overestimating the elasticity of demand. SKM suggest a price elasticity of demand of -0.35 would be more appropriate, in line with the median estimate of price elasticities as collected and analysed by Dalhuisen et al. (2003).

### **1.8. Bulk transfers**

The bulk supply to the Central Coast from Hunter Water is climate dependent and can occur in either direction in response to dam storage levels. The current maximum transfer is 12,800 ML/a. WSC did not include transfers from Hunter Water to the Central Coast in their consumption forecast, instead considering transfers as a source of water. SKM estimate that annual transfers are likely to be 2000ML/a to 3000ML/a from Hunter Water to the Central Coast in the next few years.

### **1.9. Forecasted Consumption**

The predicted mean water consumption during the next price determination period is 12.4GL/a. Consumption is predicted to increase as water restrictions are lifted. **Figure 1** shows the metered and forecast water consumption patterns from 1999 to 2013.



■ **Figure 1. Historic and forecast water consumption**

### 1.10. Summary

SKM have found the Council have:

- an awareness of their current storage and annual consumption position
- have developed and calibrated a specific forecast model
- documented the majority of their assumptions
- used the calibrated model reasonably

SKM found WSC's forecast to be reasonable, being within historical bounds. WSC have used a sound methodology which included analysis of historical consumption data for forecasting demand for existing customers, DoP population estimates for forecasting demand through population growth and reasonable account of demand management and water recycling initiatives.

The issues identified around the Council's forecast methodology are relatively minor, and unlikely to significantly impact on the overall consumption forecast. SKM therefore conclude that WSC's forecast is reasonable, being based on a sound methodology, and is within historical bounds.



## 2. List of Abbreviations

|       |   |
|-------|---|
| ABS   | Australian Bureau of Statistics             |
| AIR   | Annual Information Return                   |
| BASIX | Building Sustainability Index               |
| DoH   | Department of Housing                       |
| DoP   | Department of Planning                      |
| DWE   | Department of Water and Energy              |
| GCC   | Gosford City Council                        |
| GWCWA | Gosford/Wyong Councils' Water Authority     |
| HWC   | Hunter Water Corporation                    |
| IWCM  | Integrated Water Cycle Management           |
| IPART | Independent Pricing and Regulatory Tribunal |
| LGA   | Local Government Area                       |
| ML    | Megalitre (1,000,000 L)                     |
| SKM   | Sinclair Knight Merz                        |
| STP   | Sewage Treatment Plant                      |
| UFW   | Unaccounted for water                       |
| WSC   | Wyong Shire Council                         |
| WELS  | Water Efficiency Labelling and Standards    |



## 3. Introduction

### 3.1. Purpose of Report

IPART engaged Sinclair Knight Merz (SKM) to undertake an independent review of WSC's metered water sales/consumption forecasts over the next five years, 2009 to 2013. This report provides qualitative comment on the:

- suitability and adequacy of the approach adopted for water consumption forecasting
- suitability and adequacy of the data and information used
- suitability of the assumptions, particularly for water savings from water restrictions and demand management programs
- application of the methodology
- the balance between the use of historical trends and key drivers in generating the forecasts

It should be noted that the intention of this draft report is not to provide an alternative water consumption forecast to WSC, but rather comment on the reasonableness of their forecast, and advise if a revised forecast is necessary.

### 3.2. Background

WSC's forecast of metered water sales have a direct influence on the future revenue that the Council will receive. Specifically, revenue from water sales is a product of usage charges and metered water sales. If the forecast of metered water sales is not reasonable, then the price determination by IPART will result in WSC over or under recovering its required revenue. Furthermore, water consumption has an impact on WSC's capital and operating expenditure. In the pricing review, IPART is concerned with demand (metered consumption) which will be billed to the customers. SKM has therefore concentrated mainly on reviewing forecasts of billed consumption.

Prudent forecasting requires appropriate data on historical water consumption patterns, the development and calibration of a specific and rigorous methodology, the documentation of assumptions, the implementation of a calibrated model, and understanding of the sensitivity of the issues and of the proposed use of the outcomes. *Appendix C of the WSC 2008 IPART submission* contains much of this information. Additional information is provided in other referenced documents and is at times implied.



### 3.3. Report Structure

This report is structured to assist with the efficient review of this information, with the following sections

- Section 1: Introduction
- Section 2: Overview of water consumption
- Section 3: Forecasting methodology and significant aspects
- Section 4: Consumption forecast and assessment
- Section 5: Summary of findings.

### 3.4. Potable Water Consumption as part of Integrated Water Cycle Management

The consideration and implementation of Integrated Water Cycle Management (IWCM) is a developing initiative within society. Previously many utilities used a simple and centralised 'one use' system. This generally consisted of the harvest of surface and ground water, treatment, single use and then release to the environment after further treatment. This system produced many benefits, primarily excellent public health outcomes. However the pressures of reduced yields from traditional supply sources, increased demand and unacceptable environmental impacts have led to the adoption of a more integrated approach.

This approach of IWCM is developing, and has been considered by WSC as documented in reports: *Phase 1: Concept Study – Final Report*, November 2006, *MWH and Sub-Plan – Final Report*, August 2007. The recommended IWCM solution includes:

- water use efficiency initiatives
- alternative sources augmenting existing potable water supplies
- substituting potable water for specific uses where 'fit for purpose' water is available, such as from rainwater tanks.

The water use consequences of the diversity of potential sources, the segmentation of use and the impact on cumulative water use are still being investigated and understood. Most previous models assumed reticulated potable water was used for all urban (residential and non residential) needs. This historical precedent has led to the assumption that segmentation of water use will allow the identification of water use from the various sources. The expectation that the 'sum of the parts is equal to the whole' is still to be confirmed. As this review is about a part of the IWCM, being reticulated potable water, and there is significant reliance on the previous consumption data, it is



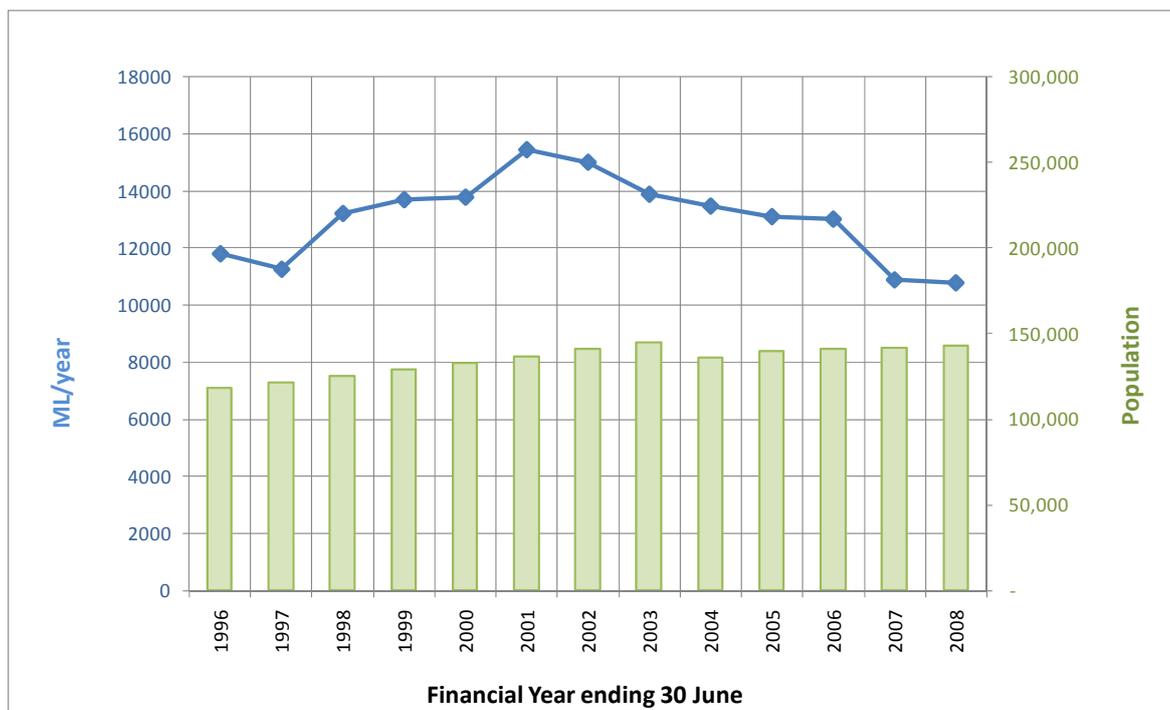
prudent to be cautious of the accuracy of the projections. Notwithstanding that the projection from historical basis requires caution; it is the best available data. The use of segmented end use models (EUM's) is still developing and requires many assumptions, and as such, is not regarded as more accurate. To at least partially resolve these matters, more 'end use' data recording and information sharing is required.



## 4. Water Consumption

### 4.1. Consumption to date

As part of the price review, IPART requested water consumption forecasts from the Council through an “annual information return” (AIR). These were made available to SKM to undertake the review. According to WSC’s AIR, in the financial year 2007/08, WSC supplied approximately 10.8GL of water to a residential population of around 148,000 (WSC 2008a, p.C3, WSC2008b). The Council’s 2008 AIR and submission to IPART indicated that notwithstanding an increase in population served with reticulated potable water, annual demand for water in Wyong Shire has been decreasing for the last 7 years, as shown in **Figure 2**.

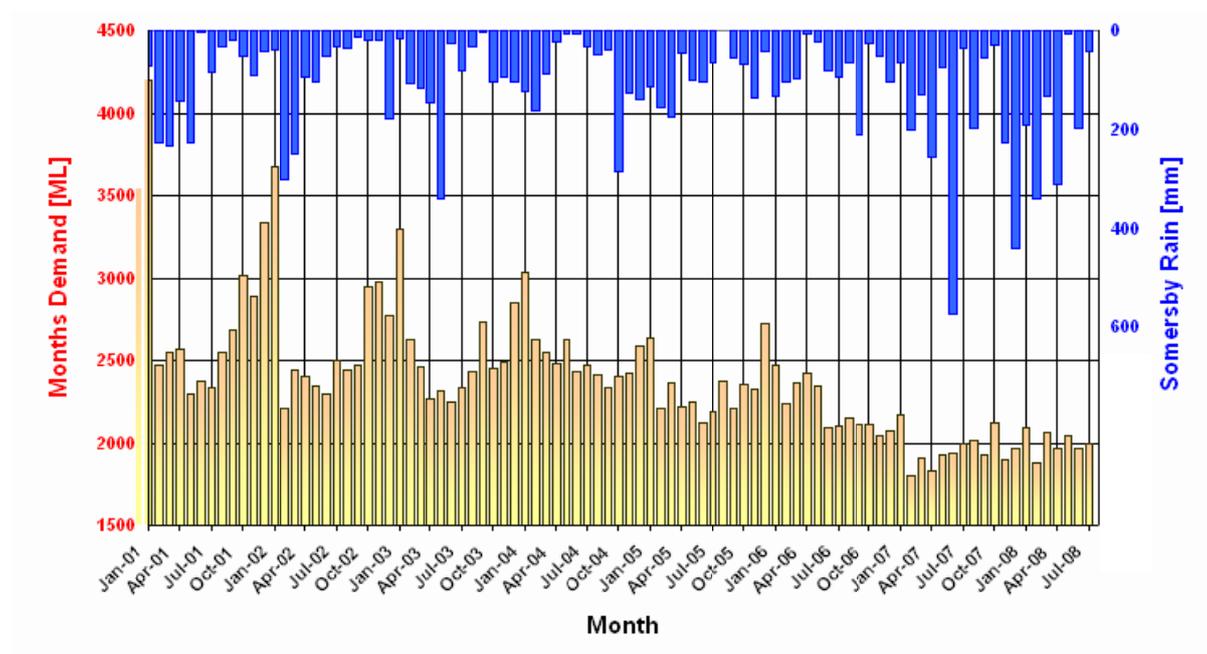


- **Figure 2. Historical water consumption and population served with reticulated water supply in Wyong Shire (WSC 2008a)**

Part of WSC's explanation for this reduction in water sales since 2002 is the introduction and tightening of water use restrictions as dam storage levels have fallen due to a period of lower than average rainfall. The timing of water restrictions in both Gosford City Council (GCC) and WSC’s areas is determined by a joint water authority (Gosford/Wyong Councils’ Water Authority – GWCWA). The reduction in water sales is also an outcome of demand management and water conservation initiatives such as BASIX and efficiency retrofits, wastewater recycling schemes, rainwater tank rebates and community education campaigns.



**Figure 3** shows monthly rainfall and water consumption data from the GWCWA. It clearly shows a trend of increased consumption during lower rainfall periods.



■ **Figure 3. Monthly rainfall and Demand for combined WSC and GCC system (Gosford/Wyong Council's Water Authority 2008)**

Another influence on the water consumption was the implementation of water usage restrictions. The latest restriction guidelines (adopted in July 2006, reviewed in November 2007) are shown below in **Table 2**.

■ **Table 2. Current Restriction Guidelines, from WSC 2008a**

| Restriction  | Initiate Restriction when Total Storage Reduces to | Remove Restriction when Total Storage Rises to | Target Reduction during Restriction Level |
|--------------|--|--|---|
| Level 1      | 40%  | 47%  | 8 %                                       |
| Level 2      | 30%  | 40%  | 16 %                                      |
| Level 2a/ 2b | 22%  | 30%  | 24 %                                      |
| Level 3      | 18%  | 22%  | 30 %                                      |
| Level 4      | 14%  | 18%  | 32 %                                      |
| Level 5      | 12%  | 15%  | 38 %                                      |

The above levels are to be adjusted as follows:

- During March/April, subtract 2% from all levels.
- During September/October, add 2% to all levels.
- At all other times, the nominated levels stand.



The Councils' resolution for adoption of the current restriction guidelines included recognition of the need to consider the application of water restrictions within the overall context of the drought management strategy and other relevant factors influencing risks associated with the security of the supply. The key issues identified to be considered in applying the restriction guidelines were:

- The seasonal outlook (for stream flows, rainfall and temperature).
- Achievement of the current restriction target.
- The timing and risk associated with contingency water supplies

Details were not included on how the target water consumption reduction levels were set, but they do not appear unreasonable.

In response to declining water storage levels, water usage restrictions have been in place on the Central Coast since 2002. A summary of the restriction regime since 2002, including restriction level, target demand reduction and actual demand reduction, is provided in **Table 3** from WSC. **Table 3** suggests the actual effectiveness of water restrictions in reducing average system demand, with actual demand reductions (except in one case) meeting or exceeding target demand reductions at each restriction level.

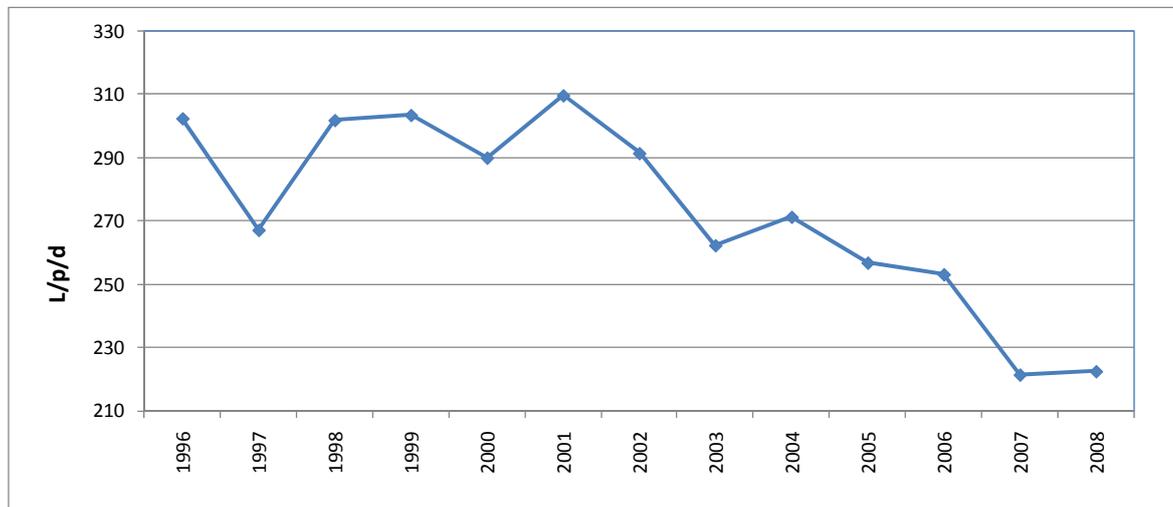
■ **Table 3. Central Coast Water Restriction Summary (WSC 2008, pA5)**

| Restriction level | Date introduced  | Target demand reduction <sup>1</sup> (%) | Actual demand reduction <sup>1</sup> (%) |
|-------------------|------------------|--|--|
| 1                 | 24 February 2002 | 8  | 11.0                                     |
| 2*                | 17 May 2004      | 16                                       | -2                                       |
| 2A                | 1 August 2004    | 16                                       | 20.6                                     |
| 2B                | 4 December 2005  | 16                                       | 21.4                                     |
| 3                 | 3 June 2006      | 30                                       | 29.8                                     |
| 4                 | 1 October 2006   | 32                                       | 32.0                                     |
| 3                 | 30 March 2008    | 30                                       | 35.0                                     |

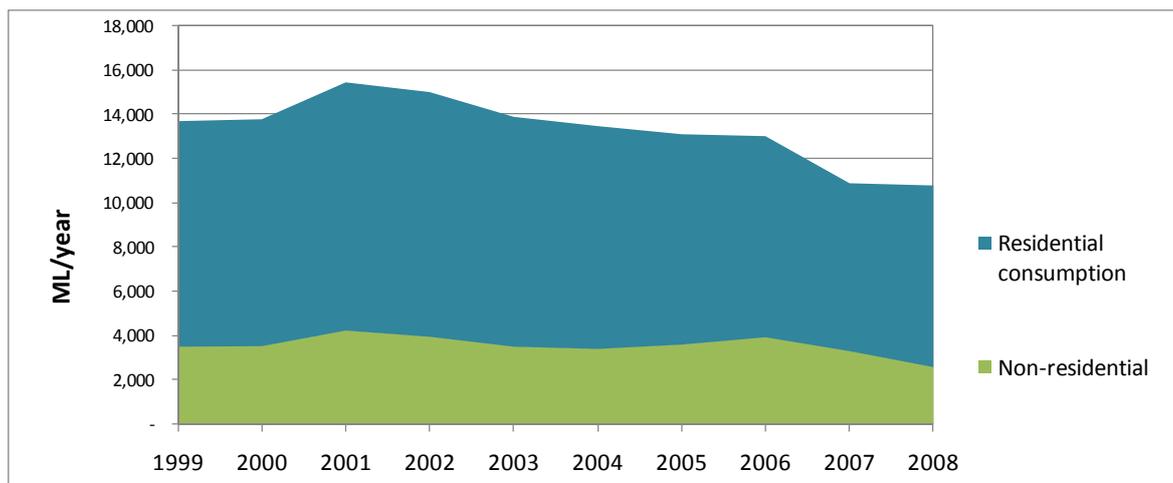
<sup>1</sup> in comparison to unrestricted demand

\* The target reduction for Level 2 restrictions was not achieved as outdoor watering was not completely banned.

**Figure 4** shows the trend in metered consumption per capita per day since 1996. It indicates no clear upward trend in per capita metered consumption prior to 2001, therefore population growth is likely to have been the key driver causing the increasing total metered consumption prior to 2001. The per capita consumption has been decreasing considerably following 2001, which is attributable to water restriction and efficiency improvements.



■ **Figure 4. Per capita average consumption per day for Wyong Shire (WSC 2008b)**



■ **Figure 5. Metered water consumption in Wyong Shire by market segment (WSC 2008b)**

**Figure 5** indicates that the relative importance of residential and non-residential consumption has remained fairly constant over the past decade. This is consistent with the assumptions of the previous price path review.

Sectoral consumption demands were calculated using WSC’s customer accounts database. The quality of this data was not assessed by SKM, but is assumed to be good.

#### 4.2. Summary

Annual demand for water in Wyong LGA has been decreasing for the last eight years despite an increase in the population served with reticulated potable water. It has reduced from a peak of over



15,000ML/a down to under 11,000 ML/a, a reduction of 27%. The reasons for this include recent increases in average rainfall, water recycling and the implementation of demand management programs, including water restrictions, leakage reduction, water management plans for high users and various residential initiatives.



## 5. Forecasting Methodology

### 5.1. Background

Multi-variable regression is currently the most common tool utilised when trying to understand the influence of demand management and other factors on water consumption (DEUS 2006, p3). Models relate annual, monthly and daily water demand to climate variation and other demographic and socio-economic trends. Modelling first requires model calibration against a period of data.

Key drivers of residential consumption include:

- **Population growth.** WSC has forecast population growth of 2.0% for the period.
- **Economic growth rates,** which affect water usage in several ways. High economic growth accelerates trends such as the purchase of more efficient appliances. Conversely, experience shows that higher real incomes brought about by favourable economic conditions result in increased water use through the purchase of more water consuming fittings and appliances.
- **Trends in appliance purchases and usage.** There has been a move towards the installation of larger appliances in residences, such as spa baths, which can 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, low-flow showerheads and front-loading washing machines.
- **Demand management and water conservation programs.** There have been efforts by the Councils to undertake community education, promote the installation of water efficient devices and develop other programs that will reduce demand.
- **Pricing structure and level.** The price structures and levels that IPART determines will have some effect on water consumption. The water usage charge is proportional to the volume of water used, and so the price increase may have a reducing influence on the volume of water consumed.
- **Current and proposed water restrictions.** External water usage is strongly influenced by water restrictions, while internal water usage is affected to a lesser degree. Water restriction policies affect consumption while the restrictions are in place and have a residual effect for a period after the restrictions are lifted. The state of storages at the start of the forecasting period provides an understanding of the likelihood and level of water restrictions to be imposed.
- **Government policies** which have a bearing on water use, for example, the implementation of the BASIX program.



- **Household formation patterns**, such as number of dwellings, dwelling density and occupancy rates, in particular, the shift towards multi-unit dwellings and flats. The proportion of multi-unit dwellings is increasing through urban consolidation and renewal. In addition, the trend towards a lower occupancy rate increases internal water usage on a per capita basis.

Apart from these long-term factors, there are other factors that may result in short-term variations in demand. The most important variable is climate, particularly temperature, soil moisture and rainfall, which can have an impact on outdoor water use, particularly garden watering. Temperature may also impact on water use through evaporative air-conditioning. Tourist numbers will also impact on both short-term and long-term trends in water usage.

Non-residential users include commercial, institutional, industrial and rural potable users. These users have different water demand drivers to the residential users.

Key drivers of non-residential consumption include:

- Business type
- Economic growth
- Irrigation needs
- Process and plant efficiency

Customers in this group are also affected by water restrictions and the increasing awareness of water conservation, and in some cases have been implementing measures to conserve potable water.

It is expected that the selection of variables for inclusion in a forecasting model is accomplished using a progressive selection process, where there is a systematic and incremental integration of variables into the forecasting model, with statistical analysis of the resulting improvement in the prediction against observed data at each step. In a forward selection process, each variable is added in turn. The variable that results in the largest increase in the correlation co-efficient, while passing a test for variable significance, is added to the model. This process is continued until all variables have been added to the model or the variables are determined to be not significant. A t-test is used to determine the significance of individual variables. Variables exhibiting a t statistic higher than the critical t value are deemed significant. Annual data sets are generally used to provide insights into demographic and socio-economic demand drivers because detailed demographic and socio-economic data sets are generally not available on a shorter time series basis.

A model hindcast then provides a check on the regression model. A stable regression model will provide reasonable demand estimates throughout the full period of climate record. This should



include a regular summer/winter demand pattern. An unstable model will predict demands that are well below or above those that can be reasonably expected.

## 5.2. Method and assumptions

WSC and GCC used the above methodology for estimating future water demand for their 2008 submission to IPART.

The forecasting methodology contains significant issues, including those related to

- Per capita reticulated potable water use
- Population
- Demand Management, including high water users
- Substitution of potable water
- Prediction of future water restrictions
- Unaccounted for water

These are discussed separately below.

### 5.2.1. Forecast per capita consumption

The ICWM approach adopted by WSC includes the use of water use efficiency initiatives and substituting potable water for specific use with 'fit for purpose' water (generally recycled water and rainwater). The inclusion of these initiatives will result in a decrease in per capita reticulated potable water use.

As would be expected, this reduction has been allowed for as illustrated in **Table 4**, which is an excerpt of *Table 3-3 Forecast with BASIX/WELS* from the ICWM report.

- **Table 4. Forecast unrestricted water demand (WSC/MWH 2006, p48).**

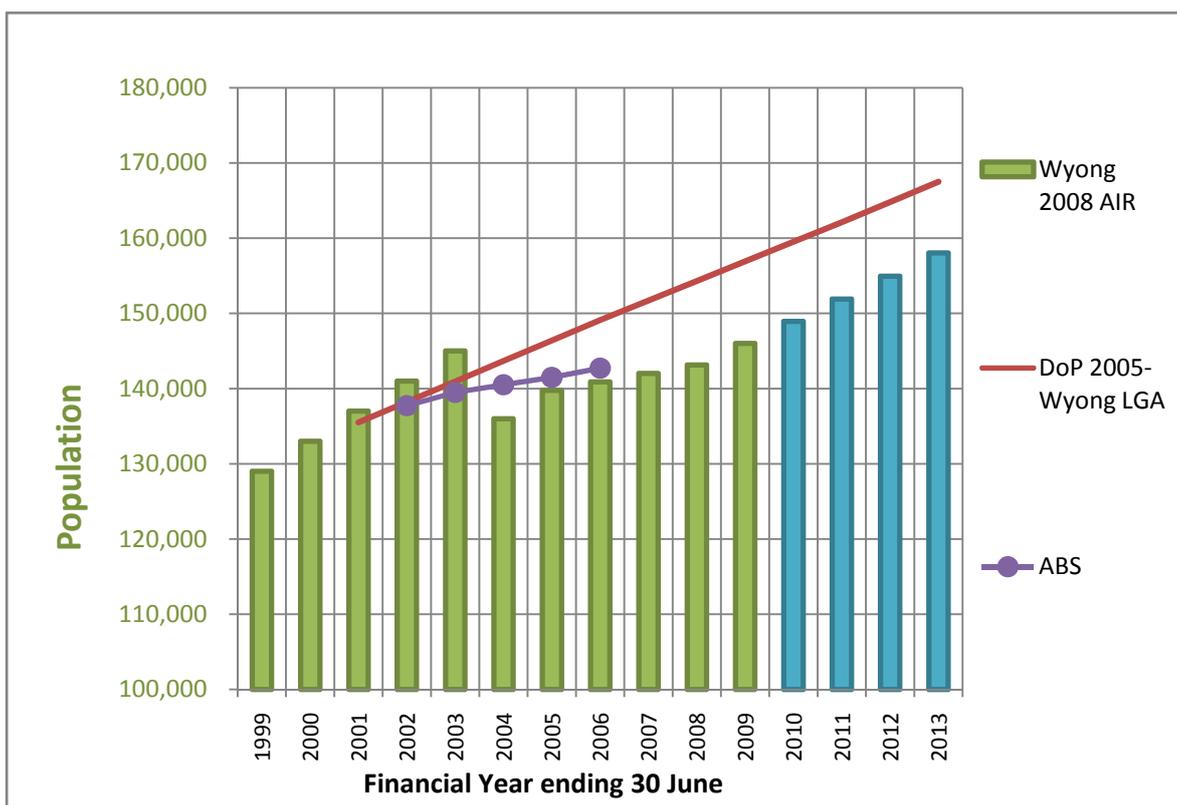
| Year                            | 2005 | 2010 | 2015 |
|---------------------------------|------|------|------|
| Per Capita Water Demand (L/p/d) | 330  | 315  | 306  |

### 5.2.2. Review of historical and forecast population

**Figure 6** shows WSC's historic and forecast population as indicated in the council's 2008 AIR and submission to the Tribunal. It also shows the population projection for the Wyong LGA from the NSW Department of Planning (DoP) and census data from the Australian Bureau of Statistics (ABS). Note that these population estimates from DoP and ABS do not subtract the population within the LGA not served with reticulated water.



The difference between the DoP and WSC estimates ranges from a 10,900 higher population in 2009 (7.5% higher) down to a 9,460 higher population in 2013 (6.0% higher). In 2005 and 2006 the ABS estimate is approximately 1,800 more people than the WSC estimate.



■ **Figure 6. Population served with potable water (WSC 2008a, ABS 2008 and DoP 2005)**

WSC states that sustained population growth has occurred over the past decade and is expected to continue over the duration of IPART's determination period because significant reserves of vacant land are available for residential and non-residential development.

WSC could improve the transparency of its forecast if it provided the location and expected number of lots for future residential development which will become occupied within the determination period. Similarly, the transparency of its forecast could be improved if it provided information on the anticipated non-domestic development size, type and location.

WSC has projected a 2.0% p.a. increase in the population supplied with potable water over the determination period. **Table 5** shows the projected average annual population growth for Wyong Local Government Area from the DoP.



■ **Table 5. Projected average annual population growth for Wyong LGA (DoP 2005)**

| Period  | Persons | Projected Growth |
|---------|---------|------------------|
| 2001-06 | 2,720   | 1.9%             |
| 2006-11 | 2,600   | 1.7%             |
| 2011-16 | 2,700   | 1.6%             |
| 2016-21 | 2,500   | 1.4%             |
| 2021-26 | 2,440   | 1.3%             |
| 2026-31 | 2,340   | 1.1%             |

WSC population growth projection is 0.3-0.4% higher than that adopted by the DoP. This is equivalent to approximately 450 people per annum, or additional water sales of 24ML/a.

No explanation is given for the 9,000 person population reduction shown for 2003/04. No equivalent drop in water consumption is obvious, suggesting it may have been due to a correction in the population estimate to bring it closer to the ABS's census figure.

### 5.2.3. Demand management programs

WSC have commenced a number of demand management measures as part of the drought response and ongoing prudent management of water resources. Details on the status of demand management measures and alternative water source options (as at December 31st, 2007) are provided in **Appendix A**.

SKM were not provided with the forecasting model used by WSC, and so could not assess if the identified demand management measures were appropriately accounted for in the water consumption forecast.

The reductions achieved through demand management initiatives will depend upon the level of commitment from residents, businesses, the water agency and other sections of the local government, community groups and the state government. SKM expects levels of commitment to fall if dam storage levels return to levels where restrictions are removed.

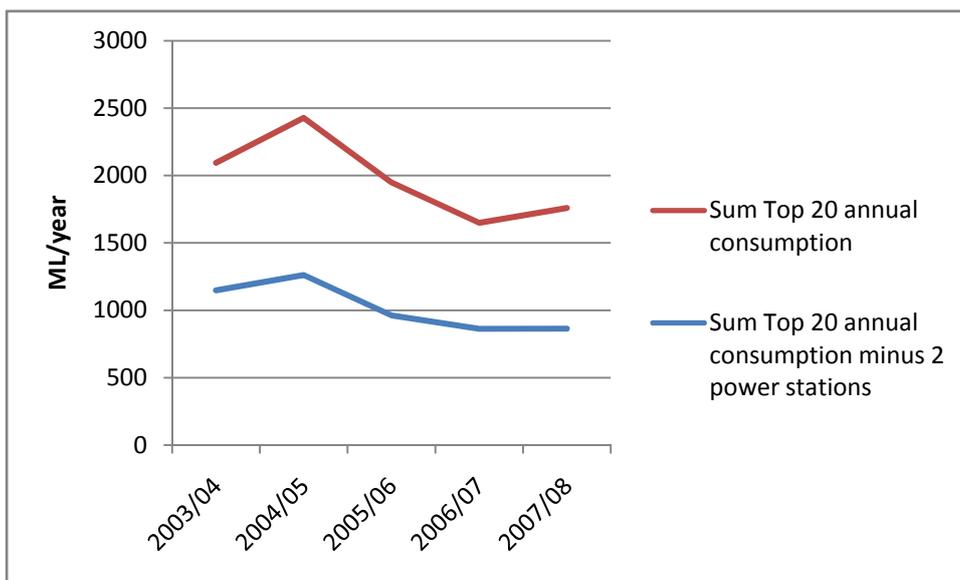
### High Water Users

WSC defines high water users as those with annual water consumptions greater than 6ML/a. The Council has worked with some of its non-residential high water users to develop water management plans for when restrictions are in place, but few details were available. These are an industrial and commercial retrofit and water saving programs. It involves developing strategies to improve plant and process water efficiency. Some high water users may also have their own sustainability programs, which require actions for reduction of water and energy use.



WSC did not provide any detail of outcomes from consultation with high water users, or analysis of trends in past water usage for the high water users.

The council supplied SKM with the consumption history for the top 20 users for the last 5 years, as presented in **Figure 7**. It indicated that the power stations at Vales Point and Munmorah were among the Councils' highest water users.



■ **Figure 7. Top 20 water users' consumption history (WSC billing data 2008)**

Water management plan requirements were initiated in December 2005, and appear to have had the desired effect on reducing the high water users' potable water consumption. Consumption by the high users is expected to increase when restrictions are lifted, but not to the pre-management plan level, since some efficiency measures and water recycling schemes will remain.

#### 5.2.4. Water recycling initiatives

Recycled water schemes reduce potable water consumption but have a biased pricing arrangement. Recycled water charges are lower than potable in order to encourage usage, although recycled water is generally more expensive for the utility to produce.

Nevertheless, these schemes are supported because they:

- Defer water supply augmentation



- Reduce effluent discharge to waterways
- Have higher supply reliability than rainwater or stormwater harvesting
- Contains nutrient, reducing the need for fertilizers in agricultural applications

Water recycling initiatives considered by WSC are listed below. Further details on the status of water recycling initiatives (as at December 31st, 2007) are included in **Appendix A**.

- Effluent reuse (ultimate 355 ML/a) via tankers for Council and contractor for construction and landscape watering from Mannering Park, Charmhaven, Wyong South and Gwandalan STPs
- Effluent reuse (currently 600ML/a) from Bateau Bay STP for landscape watering and/or toilet flushing to:
  - Tuggerah Lakes Golf Course
  - EDSACC
  - Croquet Club
  - Toowoan Bay Caravan Park
  - Swadling Park
  - Toowoan Bay Surf Club
  - Golf Driving Range
  - Bateau Bay Bowling Club
  - Jubilee Oval
  - The Entrance High School
  - The Hind Bowling Club
  - Our Lady of Rosary School
  - Bateau Bay Recreational Centre Amenities Block
  - Shelly Beach Surf Club and Amenities Block.
- Effluent reuse (currently 978ML/a) at Toukley STP
  - Magenta Shores
  - Toukley Golf Course
  - Darren Kennedy Oval
  - Harry Moore Oval
  - Toukley and St Marys Primary School
  - Norah Head Cemetery
  - Toukley RSL Bowling Club



- Toukley Bowling Club
- Amenities Block (Darren Kennedy Oval)
- Amenities Block (Harry Moore Oval – South End)
- Amenities Block (Canton Beach Caravan Park)
- Slade Park
- Halekulani Bowling Club
- Halekulani Club
- Budgewoi Soccer Club
- Effluent Reuse (potentially 708ML/a, currently 473ML/a) for Vales Point Power Station cooling purposes
- Rural Fire Services for training purposes (currently 5ML/a).

The following is from WSC's Technical Advisory Group Report WA013, 2008:

### **Delta Electricity**

The Vales Point Power Station is the largest consumer of water in the Wyong Shire. The 2005/2006 consumption was 716 ML/a. Munmorah power station used 300 ML/a. The combined demand for both power stations totalled 1,016 ML/a in 2005 / 2006.

Delta Electricity has since replaced 208 ML/a of potable water used for bearing cooling with seawater. The resulting demand on the potable water supply system is currently about 808 ML/a.

### **Effluent Reuse Project**

Delta Electricity is pursuing further demand reductions with the use of sewage effluent from the Mannering Park Sewage Treatment Plant for industrial uses at the power stations. This will require tertiary treatment of the effluent involving microfiltration followed by reverse osmosis and disinfection.

Stage 1 of the Delta Electricity project will provide reclaimed water for boiler feed at Vales Point Power Station, resulting in a reduction in demand on the town water supply system of approximately 265 ML/a. Stage 2 of the project plans to provide a supply to Munmorah power station for boiler feed water, resulting in a further demand reduction of approximately 150 ML/a. Stage 3 plans to provide internal piping works at both plants to allow the supply of reclaimed water to various processes, resulting in a further demand reduction of 85 ML/a.



The resulting total potential demand reductions for both power stations is 500 ML/a provided all three stages are implemented, however at this stage Delta Electricity has only committed to Stage 1 of the project. Further stages will be considered after an assessment of the Stage 1 implementation.

Delta Electricity awarded a contract for the construction of Stage 1 in early October 2007. The construction period was estimated at six months, providing for a projected commissioning time of mid 2008.

### **Commentary**

SKM consider it likely that these recycled water schemes will continue, regardless of the dam storage levels, and so the reduction in the per capita unrestricted demand will also remain.

No detail was provided on how the estimated water savings associated with water recycling were calculated, and so were assumed to be correct. Error is possible if the recycled water volumes are based on capacity of the recycled water treatment, rather than the historical potable water consumption, since recycled water may replace current stormwater harvesting or surface water extractions. It may also be used to irrigate areas that would otherwise not be irrigated, resulting in no potable water savings. The estimate of potable water savings also need to consider whether potable water is used as top-up to meet any deficit in capacity of the recycled water system during peak demand periods.

SKM note that WSC's current approach appears to be to use of rainwater tanks to meet BASIX requirements for green-field residential development instead of dual reticulation supplying recycled wastewater for non-potable uses. SKM therefore consider it unlikely any residential dual reticulation schemes larger than that proposed for Magenta Shores will be operating within the determination period.

Details were not included on the feasibility of using dual reticulation to supply recycled water to green-field residential or commercial developments within Wyong Shire. Dual reticulation could potentially save more potable water than rainwater tanks since supply is independent of rainfall, and so require less potable water top-up than rainwater tanks, particularly during extended periods of low rainfall.

#### **5.2.5. Unaccounted-for-water**

Unaccounted-for-water (UFW) is defined as the difference between the bulk water production and total metered consumption. UFW is the total of:

- Apparent losses – caused by under-reading of customer meters
- Unauthorised unmetered consumption – such as water theft



- Authorised unmetered consumption- such as mains flushing
- System losses – such as water main breaks and leakage prior to the property water meter.

It is possible to convert components of UFW into metered consumption, such as improving the accuracy of water meters and readings, metering standpipes, and the introduction of measures to prevent possible water theft. Similarly, metered water consumption could decrease if UFW mitigation measures such as the renewal of water meters are neglected. The incentive for possible water theft will increase with the increasing price of water, but this is not expected to be significant.

WSC estimated UFW using available records from water metering (**Figure 8**). Total water production is based on volumes produced at the water filtration plant, and are compiled on a daily basis. Consumption is based on a twice yearly meter reading cycle, and is annualised for the financial year.

WSC calculation of total UFW on an annual basis varied between -0.9 % and 10.1 %.

Reviewing the data provided, it appears WSC decreased the proportion of UFW in 1998-99. WSC suggested this was done through placing meters on property service lines which were previously unmetered, such as for council parks.



▪ **Figure 8. UFW Total Annual Production, Consumption and Unaccounted for Water – 2002 to 2008 (WSC 2008b)**

WSC suggested that the variation in UFW does not necessarily reflect changes in leakage and may be related to data recording issues, such as lagging or missing data. Also, UFW varies dramatically across the periods of records. SKM suggest that this year to year variation may be due to UFW



being the residual after metered consumption is accounted for, and so the variation reflects inaccuracies in metering of consumption. These are potentially explained by WSC's twice yearly meter reading cycle, and the difficulties in reconciling the differing cycles for the financial year for a large number of properties. The variability in values for leakage could potentially be improved by a shorter meter reading cycle, more frequent or improved meter maintenance, calibration and renewal, or introduction of smart metering.

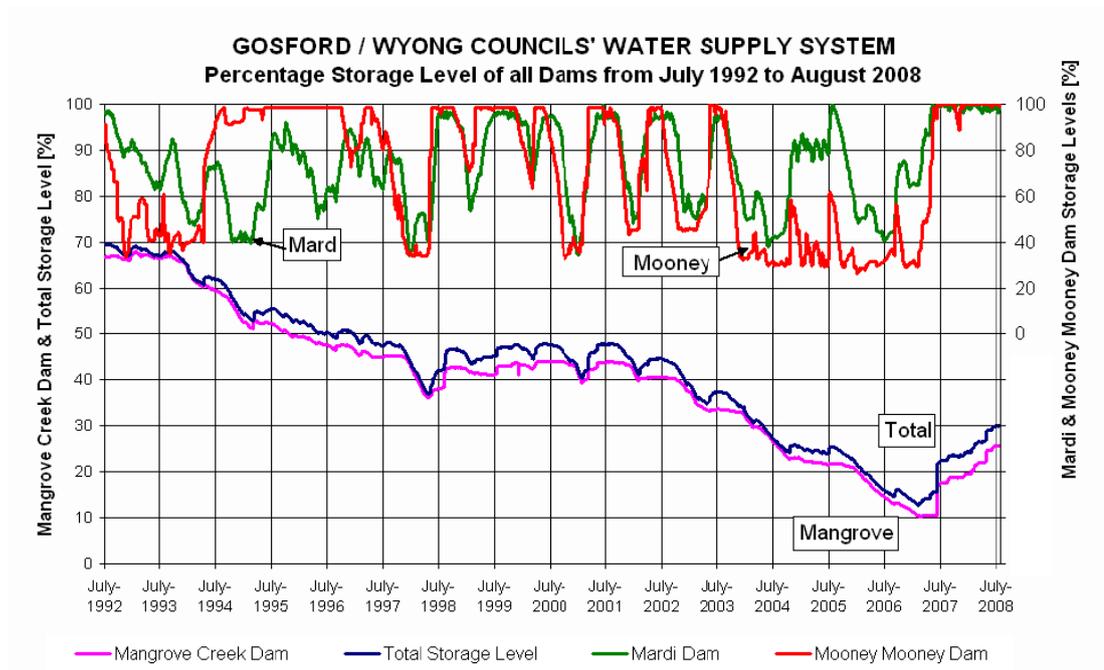
Projections of metered consumption were obtained by assuming a constant value of 8% for the percentage of unaccounted for water. This was obtained by averaging the estimate of UFW for the period 2001 to 2005. This method of assuming a constant UFW percentage is used because of the irregularities in UFW estimates.

Leakage tests carried out in recent years indicate a typical leakage rate of 4.7% of total water produced. Compared with other water utilities, this is quite low. This may be possible considering the water reticulation network is approximately 35 years old, and so in better condition than older reticulation systems. For comparison, leakage tests carried out on the Gosford City Council system in recent years indicate a typical leakage rate of 5% of total water produced. It would be expected that since GCC has a higher average age of its pipeline network, it is expected to have higher losses.

Given that total water produced in 2007/8 was 11,996ML, leakage equates to about 600ML/a.

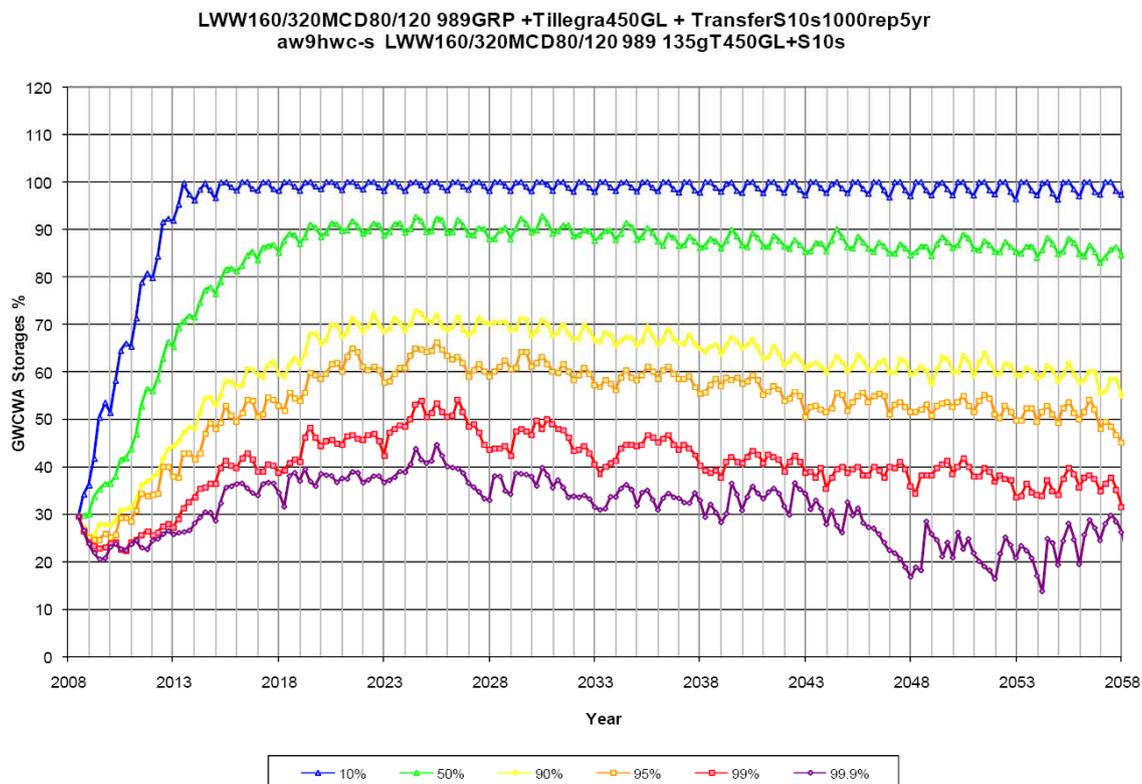
#### **5.2.6. Prediction of future water restrictions**

The implementation and enforcement of water use restrictions has had and will continue to have an effect on the reticulated potable water consumption. Consequently the prediction of their continuation and the level of restriction is a key issue for the period being considered. When considering the likelihood of restrictions being tightened or reduced WSC needs to consider current storage levels, predicted yield and future consumption. WSC have predicted a return to unrestricted usage by the end of 2012/13. **Figure 9** illustrates the historic storage levels in the Central Coast dams.



■ **Figure 9. Historic storage levels**  
 (GWCWA, 2008- online- [www.gwcwater.nsw.gov.au](http://www.gwcwater.nsw.gov.au), accessed on 03/11/2008)

The prediction of the response of dams to future rainfall was estimated by WSC via a stochastic assessment using 1000 time series replicates, as shown in Figure 10. Details of this assessment are included in *Appendix C of the WSC 2008 submission to IPART*. The assessment indicates the probability of the storage levels exceeding a storage volume. The stochastic analysis includes recent system upgrades and assumes proposed system upgrades will be implemented.



■ **Figure 10. WSC stochastic analysis of storage levels (WSC 2008a, pC7)**

The probabilities included are 10% 50%, 90% 95%, 99% and 99.9%. WSC have chosen to use the 50% probability to determine the recovery period to 47% storage, which is when restrictions are scheduled to be removed. WSC have assumed a linear response for the intermediate timeframes.

It should be noted that under the 90% scenario, restrictions would continue throughout the determination period. IPART is required to reach its own conclusions regarding what is an appropriate probability scenario to use in setting prices.

IPART has previously taken the position that consumers should not face increased prices because of temporary restrictions. However, in the case of GCC and WSC, restrictions have been in place since 2002 and water restrictions could remain in place until at least 2012/13. Therefore, for the purposes of this determination, water restrictions could be considered a fixed feature.

SKM also consider it may have been appropriate to include in this analysis an allowance for the higher probability of a lower than average rainfall year following a lower rainfall year. This is further detailed in the SKM report on review of the yield estimates. IPART may require the generation of an independent stochastic analysis to better appreciate the significance of this approach.



### **5.2.7. Bulk Water Supplies**

#### **Transfers between Hunter Water and the Central Coast**

HWC has been supplying water to the Central Coast since 2004/05 due to very low levels in the Gosford/Wyong's dam storages. In December 2006, the link between HWC and the Central Coast was augmented to transfer up to 27 ML per day and again in March 2008 to provide capacity to transfer up to 35 ML per day. This provides capacity to transfer up to 12,700ML/a between the two systems. The amount of water transferred each day is determined by the relative storage levels in the two systems (HWC 2008a, p.45). Transfers to and from the Central Coast are made according to the following rules:

- Water is transferred from the Hunter to the Central Coast if the GWCWA storages are lower than the HWC storages. Opportunistic transfers to the south occur if the GWCWA storages are less than 70% and more than 2.5% below the HWC storages. More water is transferred to south if the GWCWA storages are less than 60% and more than 7.5% below the Hunter storages and Mardi Dam is less than 80%.
- Transfers to north occur if the HWC storages are below the GWCWA storages. Opportunistic transfers to north are made if water is spilling at Lower Wyong and HWC storages are below 70% in order to delay the onset of HWC restrictions. Water is transferred to north if the Hunter region is under restrictions and GWCWA storages are more than 7.5% higher than the Hunter storages.
- There is a 5% no transfer gap when the HWC and GWCWA storages are close to, or equal to one another, in order to avoid frequent transfers.

Based on modelling undertaken by Afton Water Solutions, it is estimated that annual transfers to the Central Coast are likely to be 2,000 ML/a to 3,000ML/a for the period 2009-2013.

WSC did not explicitly include transfers between itself and Hunter Water in its water consumption forecast. Hunter Water is considered as a water source, rather than a potential customer. A reversal in the direction of transfer may occur in the future, but this is not expected to occur within the determination period.

### **5.2.8. Assumptions**

The following is a summary of the key assumptions made by WSC:

1. The size of the population supplied with potable water was calculated based on the number of potable water billing accounts and estimates of housing occupancy and vacancy rates.



2. Assumed annual growth in population of 2%.
3. It is assumed that housing occupancy rates will fall to below 2.5 occupants per household
4. Water meter data from a period without water restriction (three years, between Jan 1999 and Dec 2001) was the used to calculate a per capita potable water demand (L/p/d).
5. WSC used a 3 year calibration period for the daily model, in a period without the influence of restrictions.
6. A regression model was produced to predict the per capita demand data using daily maximum temperature, rainfall and evaporation data as variables. This provided an estimate of the historical per capita potable water demand which is relatively independent of climate variation and water restrictions.
7. No demographic or socio-economic variables were included in the regression model.
8. No details were included on the interpolation technique used to fill data gaps.
9. There is no allowance for climate change in the water consumption forecast. Natural variability in weather is expected to dominate any variation in rainfall and evaporation due to climate change within the determination period. It would nevertheless be appropriate to look at the full range of historical meteorological data and select high and low periods of rainfall, maximum temperature and evaporation for use as upper and lower bounds for consumption forecasting.
10. WSC calculated a climate corrected mean per capita demand of 330L/p/d (WSC 2006, p.85). This baseline per capita demand was then used to predict future water consumption based on predictions of population and demand management, including water restrictions.
11. Estimated savings through water restrictions are subtracted from the unrestricted metered consumption forecast in order to arrive at the final estimate of future metered consumption.
12. When the Consumer Price Index is considered, relative incomes in Wyong Shire have generally remained constant. As such, household income was not anticipated to be a strong driver for increasing water demands at this time
13. The number of holiday houses on the Central Coast is decreasing. Changes in the annual number of tourist are contained in the decreasing residential vacancy rate, representing the change in holiday houses to permanent dwellings, and so do not require separate consideration.
14. The non-residential demand sectors will increase in line with resident population growth and that no new large water users will be established.
15. The trend towards increasing appliance efficiency is anticipated to continue into the future and will result in changes in household water use.
16. WELS and BASIX will further increase the uptake of water efficient fixtures and appliances, particularly showerheads and washing machines. As the WELS and BASIX



programs are mandatory, their influence on demand forecasts should be included in the baseline forecast. Assumptions in the IWCM study were:

- The WELS will increase the uptake of efficient washing machines by 10%, low flow showerheads by 10% and efficient tap fixtures by 10%. Participation of 5% for new accounts and 1% per annum for existing accounts.
  - It was assumed that the WELS scheme will have a negligible impact on toilets sales. The rationale was that the current standard for toilets in Australia is the 6/3L dual flush toilet and that efficiency labelling for toilets was almost universal under the voluntary scheme.
  - It assumed that the BASIX requirement of a 40% water use reduction will be satisfied through the use of efficient taps/sinks (90% of new residential accounts), efficient showerheads and rainwater tanks (90% of new residential accounts).
17. Central Coast Water Festival Public Education- 50% of all customers will be influenced by the program. Those influenced result in 1 to 5% reduction in all uses except outdoor use, which achieves an 8% reduction. WSC do not explain how they arrived at the assumption that 50% of customers will be influenced by the program.
  18. IWCM Education Program. A stepped-up education program could achieve an extra 2% reduction in outdoor use.
  19. Currently planned price increases will result in a 4% demand reduction.
  20. Residential retrofit of taps and showers- Replacement rate of 3% per annum for four years for all types of taps and sinks. Replacement rate of 8% per annum for all types of shower heads. 10% savings for taps and sinks.
  21. Washing machine rebate - Annual replacement rate assumed to be 12%.
  22. Dual flush toilet retrofit - Annual replacement rate assumed to be 5% per annum for three years.
  23. High water user management plans for existing customers - 1% of non-residential customers per annum. 10% savings in all targeted water uses except for leakage. Temporary (3 year life) 50% leakage saving applied.
  24. Landscaping/native planting controls - 2% of all customers will be influenced by the program, 10% external saving.
  25. Pressure reduction and leak repair - 40% of the reticulation system covered by pressure reduction and 29% reduction in leakage.

SKM suggest the methodology could be improved by inclusion of sensitivity testing for some of the above assumptions, but the resulting impact on the overall demand forecast is unlikely to be significant.



## 6. Forecasted Water Consumption

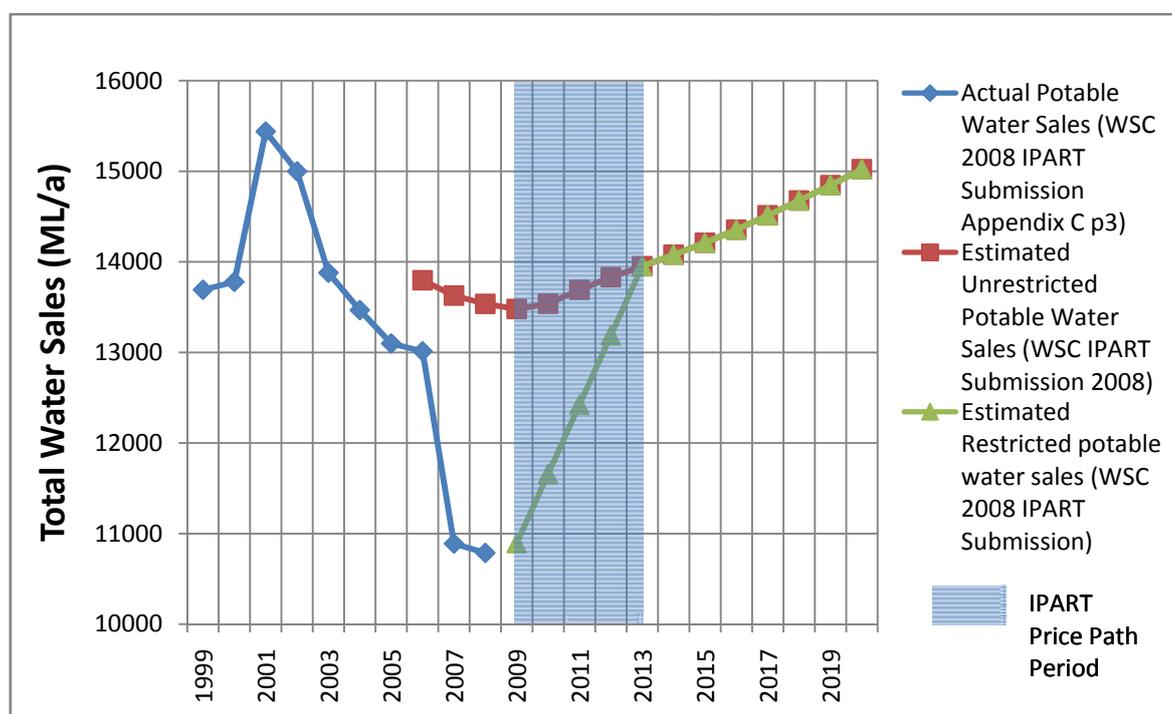
### 6.1. Water Consumption forecast

The resulting forecast is shown in **Table 6**. Water demand over the approaching determination period of 2009-13 is expected to range from 10,893 ML/a to 13,952 ML/a,

■ **Table 6. Predicted Water Sales (WSC 2008a, p25)**

| Year      | Estimated Metered Sales * (ML) | Estimated Unrestricted Metered Usage (ML) |
|-----------|--------------------------------|---|
| 2008/2009 | 10893                          | 13479                                     |
| 2009/2010 | 11657                          | 13538                                     |
| 2010/2011 | 12422                          | 13691                                     |
| 2011/2012 | 13187                          | 13830                                     |
| 2012/2013 | 13952                          | 13952                                     |

These projections are illustrated together with the consumption to date and the projected unrestricted consumption data in **Figure 11**.



■ **Figure 11. Historical and forecast water sales (WSC 2008b)**



**Table 7**, with values from WSC's 2008 AIR, provides a comparison of the past forecast and actual consumption values, as well as a breakdown of the current forecast by customer type.

It shows consumption over the last 4 years was approximately 17% lower than that predicted in the previous IPART determination. This suggests WSC may have previously slightly overestimated the potential demand.

**Table 7** shows WSC predict per capita residential consumption to increase from a low of 159L/c/d up to 220L/c/d as water restrictions are lifted.

■ **Table 7. Comparison of the past forecast and actual consumption, and breakdown of the current forecast by customer type (WSC 2008b)**

| Source                             | Financial Year Ending 30 June (ML 000's) |         |         |         |         |         |         |         |
|------------------------------------|--|---------|---------|---------|---------|---------|---------|---------|
|                                    | Units                                    | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | 2013    |
| Billed Metered Consumption         |  |         |         |         |         |         |         |         |
| <b>WSC Submission 2007-09</b>      | ML/a                                     | 13,594  | 13,879  | 14,164  |         |         |         |         |
| <b>IPART Determination 2007-09</b> | ML/a                                     | 12,939  | 13,128  | 13,245  |         |         |         |         |
| <b>Actual Outcome 2007-09</b>      | ML/a                                     | 10,889  | 10,786  | 10,893  |         |         |         |         |
| Variation from IPART Determination |  | -15.8%  | -17.8%  | -17.8%  |         |         |         |         |
| <b>WSC Submission 2010-13</b>      | ML/a                                     |         |         |         | 11657   | 12422   | 13187   | 13952   |
| Residential Consumption            | ML/a                                     | 7,568   | 8,184   | 8,280   | 8,860   | 9,440   | 10,022  | 10,603  |
| Non Residential Consumption        | ML/a                                     | 3,321   | 2,602   | 2,613   | 2,797   | 2,982   | 3,165   | 3,349   |
| <b>Total</b>                       | ML/a                                     | 10,889  | 10,786  | 10,893  | 11,657  | 12,422  | 13,187  | 13,952  |
| Population                         |  | 142,045 | 143,150 | 146,010 | 148,930 | 151,910 | 154,950 | 158,050 |
| Residential Connections            |  | 56,322  | 58,022  | 59,000  | 59,925  | 60,850  | 61,775  | 62,700  |
| Non Residential Connections        |  | 3,914   | 3,157   | 3,220   | 3,290   | 3,360   | 3,430   | 3,500   |
| <b>Total Connections</b>           |  | 60,236  | 61,179  | 62,220  | 63,215  | 64,210  | 65,205  | 66,200  |
| Household consumption              | kL/property/<br>a                        | 134     | 141     | 140     | 148     | 155     | 162     | 169     |
| Per capita Residential Consumption | L/c/d                                    | 146     | 157     | 155     | 163     | 170     | 177     | 184     |
| Per capita Total Consumption       | L/c/d                                    | 210     | 206     | 204     | 214     | 224     | 233     | 242     |
| Non Res Consumption per property   | kL/property/<br>a                        | 848     | 824     | 811     | 850     | 888     | 923     | 957     |



## 6.2. Assessment

SKM have reviewed the provided information and note the following:

### 6.2.1. Regression analysis

The use of regression analysis is appropriate for this assessment. However SKM believe the modelling methodology could be improved through inclusion of more variables. **Table 8** shows which of the potential influences on the per capita demand for water were included in WSC's regression modelling. Additional variables could be tested for impact, with significant variables included and insignificant variables discarded. The impact of all factors would then be transparent.

- **Table 8. Potential variables to be tested for significance in regression modelling of per capita demand**

| Potential Driver                                  | Tested |
|---|--------|
| Temperature                                       | Yes    |
| Evaporation                                       | Yes    |
| Rainfall  | Yes    |
| Housing Occupancy Rates                           | No     |
| Measures of commercial and industrial development | No     |
| Consumption trends for high water users           | No     |
| Water pricing                                     | No     |
| Number of rainwater tank rebates                  | No     |
| Restrictions                                      | No     |
| Economic indicators, such as per capita income    | No     |

The additional significant variables, if included, would still result in the forecasts being considered as indicative only, as the limitations on development of accurate models include

- lack of good data for many variables,
- high correlation exhibited between some of the explanatory variables and
- unpredictability in short-term weather variables.

### 6.2.2. Population

Generally, when compared to the DoP population projection, WSC is underestimating the population served, but slightly overestimating the future growth rate.



Historically the DoP population projection has exceeded the data from the ABS. SKM view the ABS data as more reliable, being based on the census. SKM therefore accept the WSC population forecast as reasonable.

### **6.2.3. Review of demand management programs**

SKM carried out a qualitative evaluation of demand management programs, initiated by either WSC or state or federal government, which would have potential to affect the demand over the forecasted period. Due to a lack of data upon which to base predicted reductions, the actual reductions achieved through the various initiatives may differ from those assumed. It is suggested that household specific initiatives, such as retrofits and rainwater tank rebates, be included in the customer database together with the water consumption to allow analysis of actual reductions.

The range of demand management initiatives appears reasonable, not being overly ambitious or neglecting to include likely initiatives.

We qualitatively considered the implications of the demand management program on consumption forecasts, and checked the allowance for reduction in consumption that have been included in the agencies' forecast. The total estimate of potential volume of potable water saved through these water recycling and demand management initiatives is 4.1 GL/a. Considering the total unrestricted demand estimate is of the order 10-14 GL/a, this volume is significant.

The reductions achieved through these initiatives will depend upon the level of commitment from residents, businesses, local government, community groups and the state government. SKM expects levels of commitment to fall if dam storage levels return to levels where restrictions are removed, but this is not expected to significantly affect the accuracy forecast, as it has been somewhat allowed for in the reduction in consumption through restrictions.

### **6.2.4. Prediction of future water recycling initiatives**

SKM reviewed WSC's recycled water programs. SKM could not check this volume of water was appropriately accounted for in the consumption forecast as the model was not supplied by WSC.

SKM consider it likely that existing schemes will continue, regardless of the dam storage levels, and so the reduction in the per capita unrestricted demand will remain.

SKM consider there is increasing public acceptance and even encouragement of water recycling schemes, and so the extent of recycling schemes is likely to increase over time, it does not appear that this trend has been allowed for in the unrestricted demand forecast. WSC may therefore be overestimating the volume of water they will sell during the determination period.



WSC's current approach appears to be to use of rainwater tanks to meet BASIX requirements for green-field residential development sites instead of dual reticulation supplying recycled wastewater for non-potable uses. SKM considers it unlikely any significant residential dual reticulation schemes will be operating within the determination period.

No details were provided by WSC of the feasibility of using dual reticulation to supply recycled water to green-field residential or commercial developments within Wyong Shire. Dual reticulation could potentially save more potable water than rainwater tanks since supply is independent of rainfall, and so require less potable water top-up than rainwater tanks, particularly during extended periods of low rainfall.

### 6.2.5. Unaccounted for water

Leakage tests carried out by WSC indicate a leakage rate of 4.7% of total water produced for WSC. This equates to about 600ML/a. Compared with other water utilities, this is quite low, and so is potentially an underestimate. This is not expected to significantly affect the accuracy of the forecast, since with such a low leakage rate there is little scope for leakage to be converted into metered consumption.

Unrealistic UFW values may indicate metering inaccuracies, which may need addressing through improvement of water meter calibration and maintenance programs.

### 6.2.6. Prediction of impact of future pricing changes

The price of water can impact on use of water. **Table 9** shows the proposed increase in price from *Table 3.2 of WSC's 2008 IPART submission*.

#### ■ **Table 9. Price increase from 2008/09 charges (WSC 2008a, p19).**

|   | 2009/2010 | 2010/2011 | 2011/2012 | 2012/2013 |
|---|-----------|-----------|-----------|-----------|
| Proposed Increase in Water Usage Charge | +2.5%     | +3%       | +3.5%     | +3.5%     |

WSC predicted that this proposed price structure would reduce consumption by 4%. This equates to a demand elasticity of approximately -1.2. No rationale, such as the historical impact of pricing changes, was provided for this estimate.

SKM suggest a more appropriate assumption would be an increasing reduction over time in line with the increases in cost. SKM also suggest the predicted reduction of 4% is an overestimate,



considering the maximum price increase is only 3.5%, and much of a typical household's water use is non-discretionary.

SKM suggest a price elasticity of demand of -0.35 would be more appropriate, in line with the median estimate of price elasticities as collected and analysed by Dalhuisen et al. (2003).

### **6.2.7. Prediction of future water restrictions**

WSC has developed their forecast based on the 50% exceedance line for the stochastic assessment to a storage level of 47%, which is where the restrictions are removed. The use of stochastic exceedance modelling is regarded as appropriate and contemporary practice. However SKM have identified the following issues with the prediction approach:

- The lack of allowance for climate change
- WSC's use of a linear interpolation, for intermediate forecast, notwithstanding that intermediate data was produced from the same assessment
- The use of the 50% exceedance line, based on its use and impact on the pricing.

WSC's consumption forecasts take into account an estimate of future restriction regimes which, to a large extent, are dependent upon future rainfall. While this inherently has a considerable level of uncertainty, the above estimates are considered reasonable for the following reasons:

- SKM agree with WSC's assertion that its water supply system is not sensitive to single rainfall events and it will take several years of average or above average rainfall before the storages recover to a point that restrictions can be fully removed.
- The only event that would lead to restrictions being lifted early would be sustained wet weather. Associated with such an occurrence would be reduced water consumption due to continued low levels of outside watering. Therefore, it is unlikely that such an event would lead to increased water sales.
- It is also agreed that the communities' water usage habits change slowly when restrictions are eased. As such, it is anticipated that there will be a gradual return to increased water usage as restrictions are eased rather than a series of stepped changes which occurs when restrictions are introduced. Only physical influences, such as periods of high rainfall, could produce step changes in consumption. Many of the demand reductions, such as through the previous installation or rainwater tanks, efficient appliances, BASIX and recycling schemes, will remain.



- BASIX and water efficiency improvements (such as water efficient washing machines) will continue to progressively penetrate the area, and this will have the effect of reducing the per-capita demands, and therefore unrestricted demand.
- It is agreed that based on the above, and a relatively low population growth rate, it can be reasonably expected that metered water sales will be less than pre-restriction levels for at least the next 3-5 years.

Should measures such as the construction of the Mardi Dam to Mangrove Creek Dam link not restore storage levels, water restrictions may remain in place, and WSC may be overestimating the volume of water they will sell. This could lead IPART to set the price for water too low, resulting in WSC not earning a sufficient revenue stream over the determination period.



## 7. Summary

This section summarises the issues that SKM has identified in the WSC water consumption forecast.

The approach used by WSC to predict demand is considered reasonable and is an improvement on their previous IPART submission. It is to be noted that the forecast is a secondary outcome of an IWCM, which required many assumption to be made due to appropriate input data not being available.

SKM have found the council have:

- an awareness of their current storage and annual consumption position
- have developed and calibrated a specific forecast model
- documented the majority of their assumptions
- used the calibrated model reasonably

SKM identified the following issues in relation to WSC's water consumption forecasts:

- More information on the operation of the model would improve the transparency of their modelling work.
- Fuller explanations of their recycled water volume calculations and how the values were incorporated into the overall consumption prediction would improve transparency of their predictions.
- More drivers in the regression model development and sensitivity testing of some of their assumptions could improve the reliability of the forecasts.
- Consultation with the Council's high water users regarding their expected growth and changes in business type or process could be included in the water demand forecasting process
- Details on how the water restriction target water consumption reduction levels were set were not included, but the targets do not appear unreasonable, and are close to the reduction achieved under their influence.
- Climate change in the water consumption forecast was not undertaken but this is acceptable due to the short term nature of the projection.
- WSC's estimate of UFW seems quite low, but may be feasible given the young age of the WSC system. The calculated values for leakage were also somewhat variable, and so



could be potentially improved by a shorter meter reading cycle, improved meter maintenance and calibration or use of smart metering.

- WSC has used a realistic estimate for achievable savings under a combination of water restrictions, price increases and demand management activities. The estimate of savings for demand management could be improved through comparison of meter data for properties with and without the various initiatives.
- The method used to generate the stochastic analysis of dam storage may not be conservative enough, but IPART must reach its own conclusions if this is the case.

These above issues are relatively minor, and unlikely to significantly impact on the overall consumption forecast. SKM therefore conclude that WSC's forecast is reasonable, being based on a sound methodology, and is within historical bounds.



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## Appendix A Demand Management and Water Recycling Initiatives

| Programme   | Estimated Water Savings (ML/a)  | Status as at<br>31/12/2007  |
|---|---|---|
| Residential Refit Programme<br><br>(Incorporating residential and Department of Housing programs) | Estimated savings of 81.6 ML/a achieved to date   | <p>This programme provides subsidies for the retrofitting of water efficient appliances i.e. AAA showerheads, hose trigger nozzles and tap aerators</p> <p>As of 31<sup>st</sup> December 2007 a total of 8,507 residential properties have been fitted in the Gosford and Wyong area of operations.</p> <p>On 5<sup>th</sup> November 2007 the Department of Housing (DoH) refit program commenced. This program will see water efficient devices fitted to the 4000 DoH properties on the Central Coast. It is anticipated that the program will be completed by March 2008.</p>  |
| Water Usage Audits of Non Residential Properties  | 50 ML/a<br><br>Ultimate<br><br>(Based on 5% reduction in water usage by top 15 water users) | <p>This programme funds audits of major non-residential water users to identify and implement water savings</p> <p>The following properties have been audited and reports issued:</p> <ul style="list-style-type: none"> <li>• Tuggerah Lakes Memorial Club</li> <li>• Toukley RSL</li> <li>• Masterfoods</li> <li>• Sanitarium</li> <li>• Mingara Club</li> <li>• Nareen Gardens Nursing Home</li> <li>• Wyong Leagues Club</li> <li>• Lake Haven Shopping Centre</li> <li>• Ourimbah University</li> <li>• Westfield Tuggerah</li> <li>• Wyong Tafe</li> <li>• Berkley Vale Private Hospital</li> <li>• Chittaway Shopping Centre</li> <li>• Swan Hydroponics</li> <li>• Beachcomber Resort</li> <li>• Caltex F3 Service Centres</li> </ul> <p>The Non Residential Water Audit programme has been phased out in lieu of the Water Management Plan Programme which was implemented in late 2005.</p> |
| Reduced Water Flow at Fish Tables (3)   | 1 ML/a<br><br>Estimated   | Completed   |



| <b>Programme</b>  | <b>Estimated Water Savings (ML/a)</b> | <b>Status as at<br/>31/12/2007</b>  |
|---|---------------------------------------|---|
|   | achieved                              |   |
| Disconnect showers at beaches & hose facilities at boat ramps                                   | 10 ML/a<br>Estimated<br>achieved      | Completed   |
| Provide water efficient facilities in Council buildings and Caravan Parks                       | 1 ML/a<br>Estimated<br>achieved       | Completed   |
| Provide rainwater tanks to Council properties (Stage 1)   | 2 ML/a<br>Estimated<br>achieved       | Complete. Stage 1 of this programme has retrofitted 49 rainwater tanks at 30 sites including depots, preschools etc.  |
| Provide rainwater tanks to Council properties (Stage 2)   | 1.5 ML/a<br>Ultimately                | <p>This is an enhancement to the Stage 1 Programme. This will see the rainwater tank programme extended (an additional 42 tanks) to Senior Citizens Centres, Surf Lifesaving Clubs etc.</p> <p>As at December 31<sup>st</sup> 2007. 30 tanks had been installed at various Rural Fire Service Sites and the Bateau Bay Community Centre.</p> <p>Installation of the remaining 12 tanks was to have been undertaken in the fourth quarter of 2007. Due to the higher priority work absorbing available resources, the installation of the remaining 12 tanks will now be undertaken in the first quarter of 2008. Additional resources have been arranged to facilitate this work.</p> |
| Amendments to operational procedures to reduce water losses during reservoir and mains cleaning | 10 ML/a<br>Estimated<br>achieved      | This involves directing flushed water from pipes and reservoirs into tankers for re-use.  |
| "Red Alert" for reported main leaks   | 2 ML/a<br>Estimated<br>achieved       | <p>Crews are required to provide a rapid response (24 hrs per 7 days) for all reported water leaks. All leaks are treated as high priority.</p> <p>Sufficient resources have been made available to achieve this.</p>   |
| System Leakage Reduction Programme  | 150 ML/a                              | <p>This programme was designed to identify and reduce the level of leakage in the water supply system</p> <p>All system pipes were previously checked in 2004/05.</p>   |

SINCLAIR KNIGHT MERZ



| Programme  | Estimated Water Savings (ML/a)                       | Status as at<br>31/12/2007  |
|--|--|---|
|  |  | <p>All system pipes are rechecked as part of a “whole of system” survey every 3 years.</p> <p>As part of the 3 year cycle, the system leakage reduction programme will be undertaken in 2007/08. Further investigations are being undertaken to identify ‘at risk’ areas at which stage a contract works package will be tendered.</p>  |
| Effluent Reuse via tankers for Council and contractor construction and landscape watering (Stage 1 – Disinfected only)                   | 0 ML/a<br>(Programme has been superseded by Stage 2) | <p>This programme involves Council and contractors drawing water from Charmhaven or Wyong South STW for the purpose of sub-division construction.</p> <p>Both facilities have now been phased out following commissioning of tertiary treatment facilities at Wyong South and Charmhaven STP.</p>   |
| Effluent Reuse via tankers for Council and contractor construction and landscape watering (Stage 2 – Advanced Treatment and Disinfected) | 355 ML/a<br>Ultimate                                 | <p>This is a programme for supplying tertiary treated effluent from sewage treatment plants for use in watering of landscaped areas such as traffic islands, medium strips, etc.</p> <p>The facilities involve (at each treatment plant) a “package” tertiary treatment plant and associated pipework including provision for loading to water tankers.</p> <p>Facilities were to be installed at Mannering Park, Charmhaven, Wyong South and Gwandalan STW. All facilities are now complete and operational.</p> <p>This programme replaces Stage 1.</p> |
| Effluent Reuse at Bateau Bay STW   | 600ML/a<br>(current demand)                          | <p>This programme involves the treatment and distribution of tertiary treated effluent (from Bateau Bay STP) for non-drinking purposes.</p> <p>This scheme is operational with connections to:</p> <ul style="list-style-type: none"> <li>• Tuggerah Lakes Golf Course</li> <li>• EDSACC</li> <li>• Croquet Club</li> <li>• Toowoan Bay Caravan Park</li> <li>• Swadling Park</li> </ul>  |



| Programme | Estimated Water Savings (ML/a) | Status as at<br>31/12/2007 |
|-----------|--------------------------------|----------------------------|
|-----------|--------------------------------|----------------------------|

- Toowoong Bay Surf Club
- Golf Driving Range
- Bateau Bay Bowling Club
- Jubilee Oval
- The Entrance High School
- The Hind Bowling Club
- Our Lady of Rosary School
- Bateau Bay Recreational Centre Amenities Block
- Shelly Beach Surf Club and Amenities Block.

|                               |                             |   |
|-------------------------------|-----------------------------|---|
| Effluent Reuse at Toukley STP | 978ML/a<br>(current demand) | This programme involves the treatment and distribution of tertiary treated effluent (from Toukley STP) for non-drinking purposes in the Toukley area and the Mirvac Development at North Entrance |
|-------------------------------|-----------------------------|---|

This section is now operational with connections completed to:

- Magenta Shores
- Toukley Golf Course
- Darren Kennedy Oval
- Harry Moore Oval
- Toukley and St Marys Primary Schools
- Norah Head Cemetery
- Toukley RSL Bowling Club
- Toukley Bowling Club
- Amenities Block (Darren Kennedy Oval)
- Amenities Block (Harry Moore Oval – South End)
- Amenities Block (Canton Beach Caravan Park)
- Slade Park (June 2008)
- Halekulani Bowling Club (June 2008)
- Halekulani Club (June 2008)
- Budgewoi Soccer Club (June 2008)

While previously deferred tenders for the upgrade of treatment capacity of the Toukley effluent reuse scheme will now be considered by Council in January 2008. Subject to Council awarding a contract it is expected that work will commence in the first quarter of 2008.



| <b>Programme</b>                             | <b>Estimated Water Savings (ML/a)</b>   | <b>Status as at<br/>31/12/2007</b>   |
|--|---|--|
| Effluent Reuse at Wyong South STP            | Not considered viable at this stage   | <p>Council has been investigating options for distributing tertiary treated sewage effluent from Wyong South STP to local consumers (in the Tuggerah area) for non-drinking uses.</p> <p>A draft report was prepared for this proposal. This report considered the use of tertiary treated effluent for reuse.</p> <p>Review of the draft report has concluded that distribution of treated effluent to local consumers is not viable at this time due to concerns over level of potential usage.</p>  |
| Effluent Reuse for Vales Point Power Station | <p>473 ML/a (Stage 1)<br/>708 ML/a<br/>(all 3 Stages)</p> <p>(Includes savings from using salt water from the lake to cool bearings.)</p> | <p>Delta Electricity originally called tenders for development of an effluent reuse scheme (to replace town water) for boiler feed purposes at Vales Point Power Station. This development will constitute Stage 1 of 3 Stages.</p> <p>Following delays in the tender assessment process a contact was awarded to "Veolia Water" in the December quarter. Completion is not expected until late 2008.</p> <p>The timing of Stages 2 and 3 have not yet been advised by Delta Electricity.</p>  |
| Ground water programme for non drinking uses | 32 ML/a   | <p>This programme provides for ground water to Council reserves and playing fields</p> <p>The following progress has been made:</p> <ul style="list-style-type: none"> <li>• Sohier Park - Complete</li> <li>• Halekulani Oval – Complete</li> <li>• Kurraba Oval – Complete</li> <li>• Taylor Park - Complete</li> <li>• Northern Pat Morley Oval - Complete</li> <li>• Southern Pat Morley Oval – A holding tank has been constructed at this site for storage of stormwater and groundwater for non portable use. The final connection of the tank to groundwater has not been undertaken as supplies via stormwater have been found to be adequate. It is anticipated that the oval will be completed by June 2008.</li> </ul> |
| Rural Fire Services                          | 5 ML/a<br>Estimated<br>achieved   | This is a proposal for use of tertiary treated effluent by the Rural Fire Service for training purposes. This proposal has been implemented and is ongoing.  |



| <b>Programme</b>                        | <b>Estimated Water Savings (ML/a)</b> | <b>Status as at<br/>31/12/2007</b>  |
|---|---------------------------------------|---|
| Provision of Rainwater Tanks to Schools | 0.91 ML/a to date                     | <p>This is a programme where Council provides an 11,000 litre rainwater tank (free of charge) based on an application from the school and where the school has demonstrated a commitment to water saving.</p> <p>The tanks cost approximately \$3,000 each to install. To date, tanks have been installed at:</p> <ul style="list-style-type: none"> <li>• Berkeley Vale Public School</li> <li>• Bateau Bay Public School</li> <li>• Brooke Avenue Public School</li> <li>• Lake Munmorah High School</li> <li>• Gwandalan Public School</li> <li>• Wyong Public School</li> <li>• Wadalba Community School</li> <li>• Wyong High School</li> <li>• Mannering Park Public School</li> <li>• Toukley Public School</li> <li>• St Marys Toukley</li> <li>• St John Fisher Tumbi</li> <li>• Our Lady at Rosary The Entrance</li> <li>• Kanwal Public School</li> <li>• Cynthia Street Community Centre</li> <li>• Northlakes Primary School</li> <li>• Northlakes High School</li> <li>• Chittaway Public School</li> <li>• Ourimbah Public School</li> <li>• Tumbi High School</li> <li>• Tuggerah Public School</li> <li>• Tacoma Public School</li> <li>• Blue Haven Public School</li> <li>• CCEN (Ourimbah University)</li> <li>• Wyong Outreach Centre (Installed in quarter)</li> <li>• Tuggerawong Public School</li> </ul> <p>In the December quarter a rainwater tank was installed at Tuggerawong Public School.</p> |
| Retrofit Rainwater Tanks (Residential)  | 237 ML/a to date                      | <p>This programme subsidises the retrofitting of rainwater tanks, on existing (as at January 1, 2003) residential properties, for non-drinking purposes. To date, from inception of the Programme, 6,867 tanks have been approved for subsidy.</p>  |



| Programme   | Estimated Water Savings (ML/a) | Status as at<br><br>31/12/2007  |
|---|--------------------------------|---|
|   |                                | In the quarter a total of 471 tanks were approved for subsidy.  |
| Roof water for non-drinking uses at Commercial/Industrial Sites         | 150 ML/a to date               | <p>This programme is based on the use of roof water (from industrial sites) for non-drinking purposes.</p> <p>The Woolworth's development in Warnervale now uses roof water for non-drinking uses i.e., toilets, hosing and watering of gardens. This installation has been commissioned.</p> <p>Up to 100 ML/a of roof water will be able to be used at the Woolworths site.</p>   |
| Roof water for non-drinking uses at Commercial/Industrial Sites (Cont.) |                                | Rainwater harvesting for non potable purposes has now been extended to the Warnervale Business Park and surrounding industrial / commercial areas. This will provide an opportunity to save up to an additional 200ML/a.  |
| Rainwater Tanks for new homes   | 78 ML/a to date                | <p>Since January 1, 2003 DCP100 required that all residential properties with DA approval incorporate a rainwater tank for non potable purposes. DCP 100 was subsequently replaced by BASIX in July 2005.</p> <p>To date 2240 rainwater tanks have been installed and signed off on as part of Council's final property inspection.</p> <p>In the quarter 118 tanks were installed.</p>   |
| Public Education  | 1 ML/a achieved                | <p>Council has an on-going commitment to public education on water issues and funds education programmes in schools etc, and the annual Central Coast Water Festival.</p> <p>In the quarter the joint Wyong and Gosford Councils' one day "Watertight" water conservation education programme was held at the following schools in Wyong Shire:</p> <ul style="list-style-type: none"> <li>• Tuggerah Public School</li> <li>• Mary McKillop College, Warnervale</li> </ul> |
| Water Management Plans (Level 2b restrictions)                          | 300ML/a Ultimate               | <p>Was introduced with Level 2b water restrictions requiring water users with &gt;6ML/a water usage to implement water usage reduction Programmes.</p> <p>Such water users typically include clubs, industrial and chemical plants, nurseries, hospitals etc.</p> <p>Water Management (Reduction) Plans and Programmes submitted by water users have been assessed by Council.</p>  |



| Programme                                     | Estimated Water Savings (ML/a) | Status as at<br><br>31/12/2007  |
|---|--------------------------------|---|
|   |                                | <p>Auditing (by Council) of the implementation of these Programmes was completed in the June Quarter.</p> <p>A review of audit results was completed in the quarter. This review includes verification of the implementation (by water users) of Council requirements (e.g. water efficient devices) arising out of the water management plan proposals.</p>  |
| Washing Machine Rebate                        | 35 ML to date                  | <p>The washing machine rebate programme came into effect on the 24<sup>th</sup> May 2006. The programme offers a \$200 rebate on 5A or 4 star (WELS) washing machines.</p> <p>The programme was originally expected to issue 1,960 rebates per year for both councils, which would save approximately 18.8ML/a across the region.</p>   |
| Washing Machine Rebate (Cont.)                |                                | <p>This programme has been very successful to date with from inception of the programme, 3678 rebates being approved by Wyong Council</p> <p>In the quarter a total of 514 rebates were approved by Wyong Council.</p>  |
| Water Management Plans (Level 3 restrictions) | 250ML/a Ultimate               | <p>The introduction of Level 3 water restrictions has seen the level 2b programme extended to include water users (&gt;3.5ML/a) and hotels and motels etc.</p> <p>The type of water users included exhibit a similar profile to those under Water Management Plans (Level 2b restrictions) however, Water Management Plans (Level 3 restrictions) also include all public pools, all caravan parks, hotels and motels.</p> <p>Council has required water users under the programme to submit Water Management Plans. By the end of the June quarter all Water Management Plans had been received.</p> <p>Finalisation of the auditing phase has been delayed due to available resources being diverted to higher priority operational works.</p> <p>It is now anticipated that auditing will be completed in the 2<sup>nd</sup> quarter of 2008. Additional resources to complete the audit process are being arranged.</p> |
| Stormwater Harvesting Projects                | 1 ML/a                         | Stormwater harvesting specifically for irrigation of cricket pitches is being developed at:   |



| Programme   | Estimated Water Savings (ML/a) | Status as at<br>31/12/2007   |
|---|--------------------------------|--|
|   |                                | <ul style="list-style-type: none"> <li>• Bill Sohier Park – Work Complete</li> <li>• Baker Park – Work Complete</li> <li>• Taylor Park – Work Complete</li> <li>• Harry Moore Oval – Work Complete</li> <li>• Kanwal Oval – Work Complete</li> <li>• Halekulani Oval – Works to be completed in February 2008 (Delayed by wet weather)</li> <li>• Kurraba Oval – Work Complete</li> </ul>  |
| Stormwater Harvesting and Effluent reuse / Water Saving Projects<br><br>(NSW Government Water Savings Fund Round 1)         | 36 ML/a                        | Council in applying for funding under Round 1 of the NSW Government Water Savings Fund has been successful in obtaining funds for the following stormwater harvesting projects with current status as indicated: <ol style="list-style-type: none"> <li>1) Stormwater Harvesting at –               <ul style="list-style-type: none"> <li>• Taylor Park (additional to Council funded programme) for general oval irrigation - Complete</li> <li>• Baker Park (additional to Council funded Programme) for general oval irrigation - Complete</li> <li>• Tunkuwallin Oval – Complete</li> <li>• Wadalba Community School / Oval – In the September quarter a development application was submitted. As at December 2007 the development application was still being processed by Council. It is anticipated that work will commence in March 2008.</li> </ul> </li> <li>2) Increasing irrigation efficiency at Council ovals – This programme involves the auditing of current facilities and provision of efficiency improvements. Audits are now complete. Implementation of actions identified in the audits including rain sensors will be completed by end of January 2008.</li> </ol> |
| Stormwater Harvesting and Effluent reuse / Water Saving Projects<br><br>(NSW Government Water Savings Fund Round 1) (Cont.) |                                |  |
| Stormwater Harvesting and Effluent reuse / Water Saving Project<br><br>(NSW Government                                      | 84 ML/a                        | The successful applicants for Round 2 were announced in the June quarter.<br><br>These are:  |



| Programme  | Estimated Water Savings (ML/a) | Status as at<br><br>31/12/2007  |
|--|--------------------------------|---|
| Water Savings Fund – Round 2   |                                | <ul style="list-style-type: none"> <li>• Central Coast Hockey Inc.</li> <li>• Doyalson / Wyee RSL</li> <li>• Mingara Rebels Baseball Club</li> <li>• Mingara Recreation Club</li> <li>• Northern Lakes Power Junior AFC</li> <li>• Northern NSW Christian Soccer Association</li> <li>• The Entrance Cricket Club</li> <li>• Wyong Rugby League Club</li> <li>• Wyong Wildcats Baseball Club</li> <li>• Gwandalan Public School</li> </ul> <p>A total of \$467,000 funding was awarded to the successful applicants. Council has been managing these projects in partnership with each applicant.</p> <p>Previously in the September quarter development applications for the following projects were submitted to Council;</p> <ul style="list-style-type: none"> <li>• Doyalson / Wyee RSL</li> <li>• Mingara Rebels Baseball Club</li> <li>• Mingara Recreation Club</li> <li>• Northern Lakes Power Jnr AFC</li> <li>• Northern NSW Christian Soccer Association</li> <li>• The Entrance Cricket Club</li> <li>• Wyong Wildcats Baseball Club</li> <li>• Gwandalan Public School</li> </ul> |
| Stormwater Harvesting and Effluent reuse / Water Savings Project (NSW Government Water Savings Fund – Round 2 (Cont.)) |                                | <p>Currently the following development applications have been approved</p> <ul style="list-style-type: none"> <li>• Central Coast Hockey Inc.</li> <li>• Wyong Rugby League Club</li> </ul> <p>Agreements with these organisations are currently being prepared.</p> <p>All DA's and agreements will be finalised for all the clubs</p>   |



| Programme  | Estimated Water Savings (ML/a) | Status as at<br>31/12/2007   |
|--|--------------------------------|--|
| Stormwater Harvesting and Effluent reuse / Water Savings Project (NSW Government Water Savings Fund – Round 2 (Cont.)) |                                | <p>in the 1<sup>st</sup> quarter 2008.</p> <p>It is anticipated that these projects will be commencing in the 1<sup>st</sup> quarter of 2008.</p> <p>Further to the Round 2 grants, there has been various projects approved for funding under Round 3;</p> <p>These include:</p> <ul style="list-style-type: none"> <li>• Gorokan High School</li> <li>• Mannering Park Oval</li> <li>• Mingara Bowling Club</li> <li>• Toukley Golf Club</li> <li>• Toukley Pool</li> <li>• Wyong Pool</li> <li>• Wyong Rugby League Club</li> </ul> <p>A Program for implementation for these projects will be reported to the May Board meeting.</p> |