Young Shire Council

Demand Management Plan

September 2012

DOCUMENT STATUS AND RELEASE INFORMATION

Client:	Young Shire Council
Project No:	
Document Title:	Young Shire Council Demand Management Plan

Document Status

Rev No.	Reviewer		Approved for issue		
	Name	Signature	Name	Signature	Date
0 – Draft	D Swan		D Swan		
NOW comments addressed	D Swan				
Revision J Bennett (CENTROC – CWUA)	J Bennett	Jennifer Bennett	N. Vonarx	NVonarx	16/10/2012

FOREWORD

The recent prolonged drought has significantly impacted on water availability and water consumption, particularly in the Murray Darling Basin. The impacts of climate change are also affecting the way communities think about and use water. Climate change may also impact on Council in terms of planning for future augmentation works. Restrictions on water use have become commonplace and there is now a strong focus on ways to reduce demand.

The Young Shire Council Demand Management Plan has been prepared to provide options for consideration in addressing and managing water demand.

A range of demand management options are discussed and modelled, leading to a suggested list of actions for Council to consider. Advice from this plan has informed the Centroc Water Utilities' Alliance Regional Demand Management Plan and Young offering Young support from a regional level for options implementation.

The demand management advice in this plan has been based on water production, water consumption and other data as supplied by Young Shire Council.

Note:

This Plan is to be reviewed and revised every two years.
The next review is scheduled for September 2014.

TABLE OF CONTENTS

FIGURES

TABLES

Executive Summary

Introduction

The Young Shire Council Demand Management Plan (YDMP) addresses the NSW Office of Water Best Practice Guidelines for delivering advice regarding:

- demand monitoring;
- demand forecasting;
- demand management planning and
- implementation of a demand management program

In order for Young Shire Council (YSC) to manage demand, it needs to understand its supply, forecast future demand, understand demand management options and determine the best value program for implementation.

Given Young is a member of the Centroc Water Utilities Alliance, a collaborative approach to implementation is commended where further benefit can be gained and accordingly this plan should be read in conjunction with the Centroc Regional Demand Management Plan.

Demand Monitoring

Demand for water is monitored through production, metering and billing.

Young is bulk supplied with Water from Goldenfields and is complying well with NOW Best Practice Guidelines for demand management where:

- All new free standing and multi-unit residential developments (both strata and non-strata) approved after 1 July 2004 must be separately metered;
- All free standing residential premises must be separately metered by 1 July 2007;
- Separate metering of existing multi-unit residential developments is encouraged where cost-effective and
- Community awareness and management of water consummation is promoted through quarterly billing.

Further work needs to be undertaken by YSC in customer classification in accordance with the categories defined in the latest NSW Water Supply and Sewerage Performance Monitoring Report where the 2009/10 categories are:

- Residential;
- Commercial;
- Industrial;
- Rural;
- Institutional;
- Bulk Sales;
- Public Parks, and
- Unbilled.

Building on this work, a better understanding and management of Non Revenue Water is required, much of which is currently included in the commercial classification.

Total water production in Young in 2009/10 was 1,520 ML. Council currently reported to serve a population of 9,200 (4,630 assessments) with water and 8,500 (3,570 assessments) with sewer[1]. In the absence of Council supplied information, a review of census figures suggested lower figures and, based on 2001 and 2006 census figures, the population of Young itself, connected to the water supply was interpreted to be 7,373. Town population figures will require review in a future review of plan in the context of a general review of council data with a view to consistency. This is important for planning purposes as the Shire of Young is currently enjoying above average growth when compared to other NSW lgas, where it grew by 0.9% per annum between the 2001 and 2006 Census[2].

Water losses detailed as part of the Council Water Loss program were estimated to be 5.7%.

Average residential per capita water consumption in Young has been assessed at 608 L/assessment/d, or 243 L/capita/d. This is average by state and national standards[3].

Household water use in NSW in 2007/08 averaged 173 kL per property per year compared with 217 kL in Young. Young consumption decreased to 207kL in 2008/09 and then increased to 222kL in 2009/10. Average consumption in “inland” NSW averaged 230kL for the same period. Young is below regional averages for water consumption in NSW.

Demand Forecasting

Demand forecasting has been undertaken through the use of modelling. Historical records were corrected for the influence of climate, data was screened for errors [i4]and demand forecasts prepared for each customer category as well as for leakage and unaccounted for water (UFW). A summary of the forecasts are shown in the table below.

Business As Usual demand and flow forecasts				
Demand/flow	2011	2021	2031	2041
Annual water demand (ML/y)	1,599	1,667	1,744	1,824

The water demand forecast from the Centroc Regional Water Security Study (CWSS) has been adopted in this study for the purpose of the Business as Usual (BAU) assessment (MWH, 2009). The study utilised the demand side management decision support system [5](DSS) tool to analyse historical demand records and prepare a 50-year demand forecast based on trends in population, household size, uptake of efficient water fixtures and appliances, and demand management initiatives.

Based on the demand management programs currently in place, the average annual water demand for the town is expected to gradually increase from 1,599 ML/year to 1,824 ML/year over the 30-year forecast horizon to 2041. It should be noted however that inconsistency exists between historical water usage datasets provided for the CWSS and this

[1] NOW TBL Summary 2010

[2] ABS Regional Population Estimates 2012

[3] NSW Water Utility Performance Summary, 2009-10

[4] Young IWCM MWH, 2012

[5] Ibid

study. Based on the more recent data provided for the Young IWCM[6], the forecasts could be underestimated by approximately 10%.

The modelling has indicated that:

- YSC has implemented policies in the past which have had significant impacts on water demand. These include the installation of meters throughout the Young water network, including the installation of meters to individual strata units;
- Coupled with this are the implementation of above average volumetric water charges and the implementation of a two tier water pricing model where the step to the higher charge is at 90kL. This step is more commonly between 200kL and 450kL. The implementation of these policies has sent a clear pricing message to the community regarding water demand and conservation;
- Potable water losses used in the modelling have averaged 5.7%. This is considered to be quite low by state wide standards and
- Council has recently introduced permanent level 1 water conservation measures which is the most significant difference between the scenarios modelled.

Demand Management Planning

A range of demand management options is discussed in this plan, including:

- Promoting and enabling water efficiency;
- Using price as a demand driver;
- Universal metering to enable implementation of the pricing policy;
- Operational measures, including leakage detection, repair program and pressure reduction;
- Community education and awareness programs designed to encourage voluntary restrictions and reduction in usage;
- Customer advisory services, the use of incentives for installation of water efficient appliances and gardens/landscapes and/or retrofitting of water in-efficient equipment;
- Regulation of the efficiency of water using appliances especially in new buildings and for garden watering;
- Use of reclaimed water to reduce the reliance on and need for treated water supplies and
- Water restrictions, either on a temporary or permanent basis.

Where each of these options comes at a cost, advice is provided on the best pathway for implementing demand management. Of note is that YSC is an active member of the Centroc Water Utilities Alliance. Advice from this plan has informed the Centroc Regional Demand Management Plan (CRDMP). It should be noted that these options have been considered in the CRDMP and implementation options for YSC include the added benefit of a regional approach bringing economies of scale as well as capacity building for YSC water managers and operators.

[6] Young IWCM MWH, 2012

This assessment considered the following aspects:

- Analysis of the current water production (water treatment) records to estimate Unaccounted for Water (UFW);
- Determination of current water consumption by customer category;
- Analysis of the historical water production records to determine a starting point for water demand forecasting and to estimate the current peak to average demand ratio;
- Development of the business as usual case including climate correction and
- Analysis of the water management options.

Cost/benefit advice has been provided in consultation with YSC stakeholders and in the context of the NOW Demand Side Management Decision Support System. Engagement has been undertaken through the CWSS, IWCM and Demand Plan processes. All this engagement has informed the recommendations for Council to consider.

Implementation

Advice is provided in an implementation schedule where it is noted that YSC has had good success to date with demand management initiatives currently in place, including:

- Implementation of a Water Loss Program;
- Ongoing Level 1 water conservation measures;
- Ongoing development and implementation of a pricing policy aimed at achieving 75% of revenue via usage charges, coupled with a low value step in a 2 tier pricing model;
- Installation of water meters throughout Young including to individual strata units and

Much of the hard work done by YSC in regards to water demand has already been implemented. Further savings can be made and should include the adoption of water conservation targets, using these targets to report to the community the level of water demand reduction being achieved.

Options for reducing demand include:

- WELS;
- BASIX – fixture efficiency with rainwater use and fixture efficiency with dual reticulation;
- Residential washing machine rebate;
- Recycled water scheme for irrigation;
- Community Education;
- Rainwater tank rebates;
- Permanent low level water conservation measures;
- Non-residential water audits;
- Systems water loss management;
- Storm water harvesting and
- Evaporative cooling unit audits.

Based on modelling, existing and intended initiatives in Young, please find the suggested schedule of programming below:

Schedule of recommended action for implementation of the demand management plan		
Existing programming extension		
Action	Steps	Timing
Permanent Low Level Targets for Water Conservation	• Develop targets and promote – consider regional support through the Centroc Water Utilities Alliance (CWUA). • Include in this program advice on water saving targets linked to demand forecasting.	Ongoing
WELS and Basix	Promote - consider regional support through the CWUA.	Ongoing
Community education with Savewater Alliance	Engage in CWUA Savewater programming and give consideration to specific value adding activities in Young.	Ongoing
Council policy review	Recommend to the CWUA a review of policy, procedure and staff training for Council activities with a focus on • Parks, and gardens management; • Verge and round-abouts management; • Management of breaks and repairs and • Water use and retro-fitting for Council facilities.	Ongoing with annual review
Continue and expand the YSC water supply system's current Non Revenue Water (NRW) and leakage volumes	• Undertake a hydrological assessment including pressure testing; • Review/determine the YSC water supply system's current NRW and leakage volumes; • Review consumption records to ensure all metered records are included; • Review customers to ensure all billed unmetered volumes are excluded from the NRW volume (e.g. retirement villas); • Estimate the volume of unmetered consumption; • Estimate the annual leakage volumes by reviewing the annual water balances and • Undertake simple system monitoring e.g. night time flows, to confirm the current level of leakage.	2012 – 2013 2013-2014
New programming		
Action	Steps	Timing
Develop and implement a Council owned infrastructure retrofit program	• Identify priority programming and • Develop a program of implementation referring to the CWUA where possible.	2012 – 2013 2013-Ongoing
Scope the need for water conservation work to be targeted at users of evaporative water air conditioners	• Request a scoping study be undertaken by the Centroc Water Utilities Alliance identifying the usage of evaporative water air conditioners in the region.	2012-2013
Assuring compliance with the NOW best practice guidelines		
Action	Steps	Timing
Ensure data integrity including for population in the township of Young bulk water meter data	• Undertake data collection for the population serves by the reticulated supply and • Ensure metering of bulk water terminal supply.	2012-2013
Ensure all new free standing and multi-unit residential	• Complete the metering backlog for all new free standing and multi-unit residential	2012-2013

developments (both strata and non-strata) approved after 1 July 2004 are separately metered	• developments (both strata and non-strata); • Separately meter the remaining free standing residential premises and • Complete metering of the remaining free • standing residential premises.	
Update customer classifications in accordance with the 8 categories defined in the latest NSW Water Supply and Sewerage Performance Monitoring Report and ensure matching pricing policy.	• Add new customer categories to billing database and review all customers to ensure they have been classified with the correct category; • Report consumption by the 8 customer categories and • Ensure all classifications are considered in pricing policy.	2012-2013
Monitoring and Review		
Action	Steps	Timing
Monitor and review Demand Management Plan effectiveness.	• Implement recommendations associated with monitoring in this Demand Management Plan; • Continue ongoing monitoring of demands and demand management measure activities and • Review the DMP in two years to update demand analysis and forecasts for new information and to ensure that YSC has an appropriate balance between demand and supply-side investment.	Ongoing with review due 2014

A: CONTEXT

A1: YOUNG'S DEMANDS FOR WATER IN CONTEXT

Average residential per capita water consumption in Young has been assessed at 608 L/assessment/d, or 243 L/capita/d. This is average by state and national standards[7].

Household water use in NSW in 2007/08 averaged 173 kL per property per year compared with 217 kL in Young. Average consumption in "inland" NSW averaged 230kL for the 2007/2008. Young's usage decreased to 207kL in 2008/09 and rose to 222L in 2009/10[8]. This shows that Young is already consuming less water than the regional average.

It is now widely accepted that due to increasing urban populations, recurrence of drought and the potential impacts of climate change, there will be increasing pressure to reduce urban water consumption in the future[9]. While Young is doing well in some areas of water conservation, more can be done to reduce water demand further and improve water security for the Young community.

It should be noted, however, that Council may need to structure its pricing policy to accommodate the expected reductions in water use as a result of demand management. It will be necessary to ensure sufficient funds are collected to ensure the capacity to carry out necessary maintenance and repairs, as well as to meet the planned capital works commitments. This should be addressed in Council's Financial Management Plan and 30 year Capital Works Programs. Accordingly, this document forms part of and should be read in conjunction with Council's Integrated Water Cycle Management Evaluation Study.

A2: DESCRIBING DEMAND MANAGEMENT PLANS

Demand management is the implementation of initiatives and measures to control and/or reduce consumption, in this case, water consumption.

Typically, a Demand Management Plan will include a range of management measures, including:

- Cost-reflective pricing;
- Universal customer metering in order to implement pricing measures;
- Operational measures, such as reticulation leakage detection and repair programs and pressure reduction;
- A communication strategy, including a community education campaign;
- Customer advisory services;
- Incentives for installation of water efficient equipment and landscapes and retrofitting of water efficient equipment;
- Reduction of water use by the water utility itself;

[7] NSW Water Utility Performance Summary, 2009-10

[8] Ibid

[9] Various publications, see for example Birrell Rapson and Smith, WASA "Impact of Demographic Change and Urban Consolidation on Domestic Water Use." 2005

- Regulation of the efficiency of water using appliances, especially in new buildings and for garden watering;
- Use of reclaimed water to reduce the need for fresh water supplies and
- Water use restrictions, either on a temporary or permanent basis.

These measures can be short or long term. Initiatives which can be introduced in the short term include:

- Education & awareness programs;
- Water restrictions;
- Pricing and
- Retrofitting programs.

Longer term options include:

- Overall reform of pricing structures;
- Leak detection and water loss correction and
- Water efficiency measures in new buildings.

Implementation of demand management measure provides benefits for customers, the environment and the water utility itself.

Some of these benefits include:

- Deferral of major capital works;
- Protection of water resources;
- Potentially, financial benefits to customers;
- Energy savings and
- Reduced wastewater flows with associated operational cost savings.

A3: DESCRIBING THE YOUNG SHIRE COUNCIL WATER SUPPLY AND SEWERAGE SYSTEMS

Council currently reported to serve a population of 9,200 (4,630 assessments) with water and 8,500 (3,570 assessments) with sewer[10]. In the absence of council supplied information, a review of census figures suggested lower figures and, based on 2001 and 2006 census figures, the population of Young itself, connected to the water supply was interpreted to be 7,373. Town population figures will require review in a future review of plan in the context of a general review of council data with a view to consistency.[11]

Young is a reticulator with a fully treated bulk supply provided by Goldenfields Water County Council. All connected customers to the Young supply system are metered;

The water supply system also includes:

[10] NOW TBL Summary 2010

[11] NOW Annual Performance Reports, 2009/10

- 2 service reservoirs (total capacity: 10 ML);
- 3 pump stations;
- 25 km of transfer and trunk water mains and
- 120 km of reticulated water mains.

The sewerage system comprises:

- One (1) sewage treatment plant;
- Young Sewage Treatment Plant. A Trickling Filter Plant with secondary treatment Capacity of 7000 EP (Equivalent Persons);
- 5 pump stations (2 ML/d);
- 4 km of pressure mains;
- 82 km of gravity trunk and reticulation sewers and
- Treated effluent is discharged to land and river.

B: CURRENT AND FORECASTED WATER DEMANDS

B1: HISTORICAL PRODUCTION

Since mid 2005, water consumption in Young has remained stable, as shown in the following Table 1 and graphed in Figure 1. The increase in consumption in 2006/07 is likely to be because of the severity of the drought at that time, and the imposition of water restrictions in the following year.

Year	05/06	06/07	07/08	08/09	09/10
Production (ML)	1520	1770	1570	1610	1520

Table 1: Young Historical Water Production (Source: NOW Performance Reports)

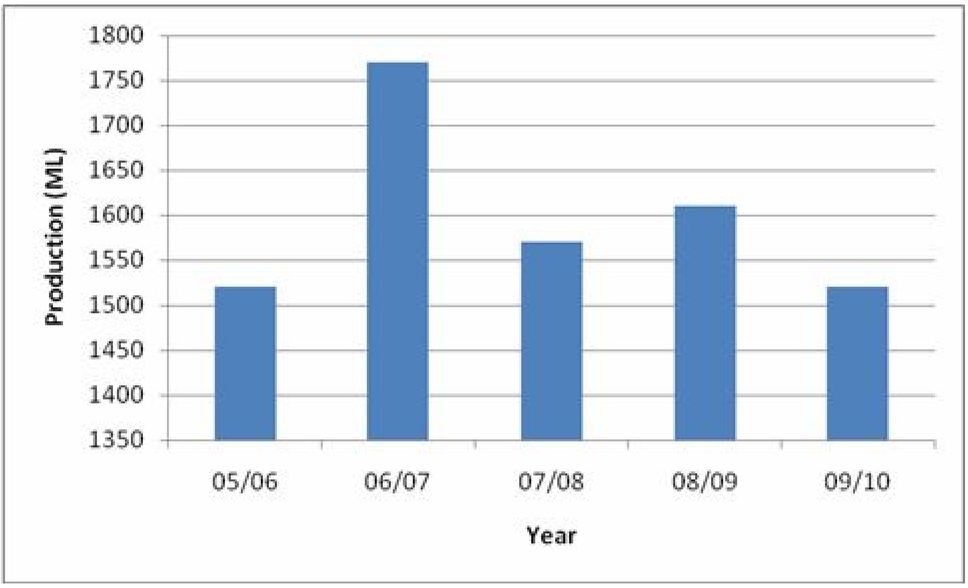

Figure 1: Water Production 2005/06 to 2009/10

B2: POPULATION GROWTH

Accurate and consistent data on historical population figures relating only to the township of Young rather than the LGA as a whole is not available. Figure 2 shows the details of the town population adapted from the various sources quoted.

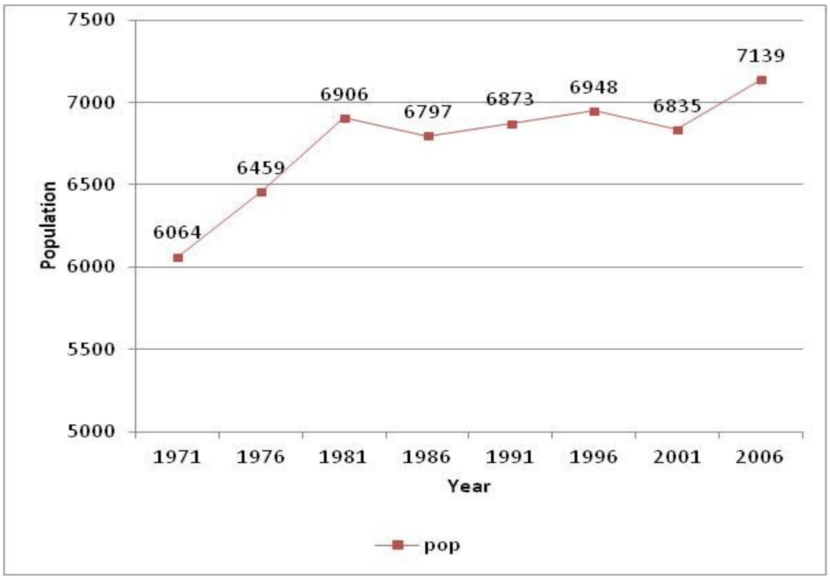

Figure 2: Young Shire Population Growth 1971

In 2007, the Department of Public Works completed Sewerage Treatment Plant Augmentation Concept Report No. 070005 predicting the population growth in Young at 0.9% per annum. This is consistent though slightly lower than ABS Estimated Resident Population for the 2006-2011 showing a 1.1% increase per annum for the Shire. The Centroc Water Security Study (2009) has predicted a positive growth rate of 0.5% pa over the next 25 years suggesting that the higher figure will not be sustained.

More conservative figures such as adopted in the Centroc Population Report 2009 and adopted by the Centroc Water Security Study are in line with current longer term projections at the State and Federal level. Having said that, further work on population using the reticulated Young supply including long term projections is needed to be undertaken.

For the purposes of the modelling carried out as part of this YDMP, a more modest growth rate approaching 0.5% per annum as per the Centroc Water Security Study have been adopted. Based on this analysis, the population figures for Young, over the next 25 years are shown in the table below. An estimation of the population outside the township which have access to water has been included.

Year	Population
2006	7270
2011	7443
2016	7619
2021	777
2026	7900
2031	8018
2036	8131
2041	8240
2046	8343
2051	8442

Table 2: Population Projections

B3: CONSUMPTION BREAKDOWN

B3.1: METERED CONSUMPTION BREAKDOWN

It is important to understand consumption patterns in a community as this will inform targeted activity with significant water users and the value of domestic based campaigns as against more targeted activities.

YSC breaks down its metered consumption into the following categories:

- Residential;
- Commercial;
- Industrial and
- Other.

Accounts break up are estimated as follows:

Account Category	2009 Number Of Accounts
Residential Accounts	4333
Commercial Accounts	43
Industrial Accounts	154
Other Accounts	233
Total Accounts	4764

Table 3: Young Number of Accounts[12]

In terms of percentages, the accounts for Young are as follows and show a significant majority of accounts are residential:

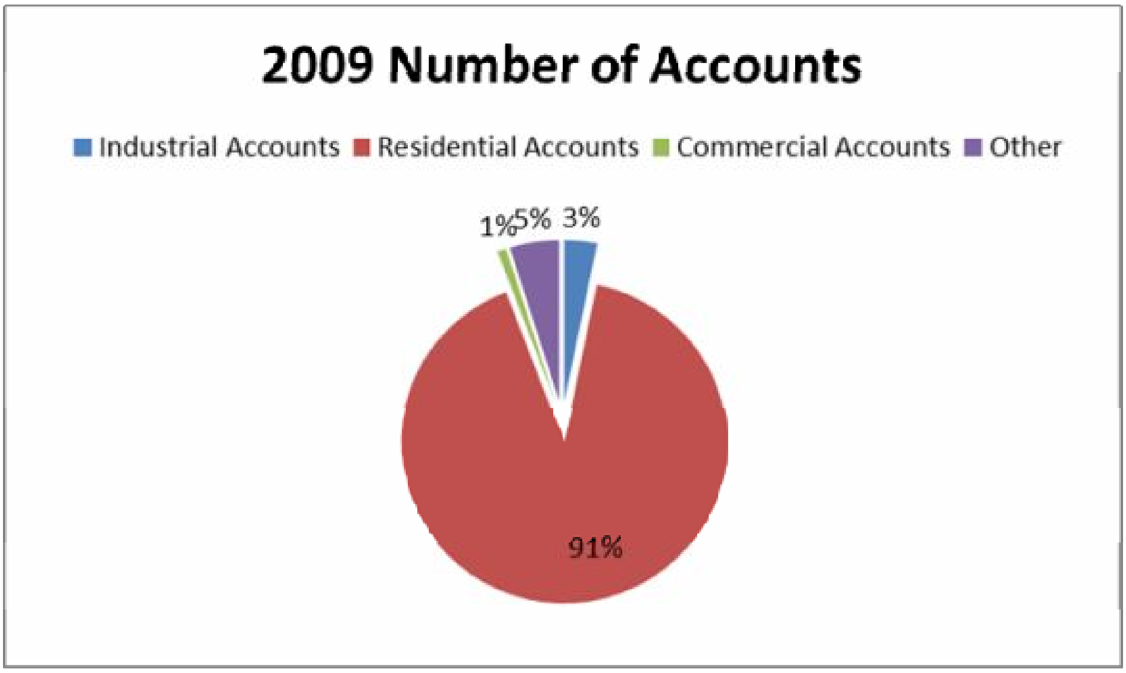

Figure 3: Young Number of Account As Percentage of Total Accounts

[12] Young IWCM , MWH 2012

Production/Consumption	2009 Input/ Assumption
Production (litres / person / day)	601
Losses (% of production)	5.7%
Consumption (litres / account / day)	
Residential (existing)	527
Residential (new)	511
Commercial	12,570
Industrial	4,207
Other	3,021

Table 4: Young Consumption Rates (2009)[13]

The YSC IWCM provides advice on production and consumption as per table 4 above. This dovetails with advice from Young staff on consumption by sector in Figure 4 below.

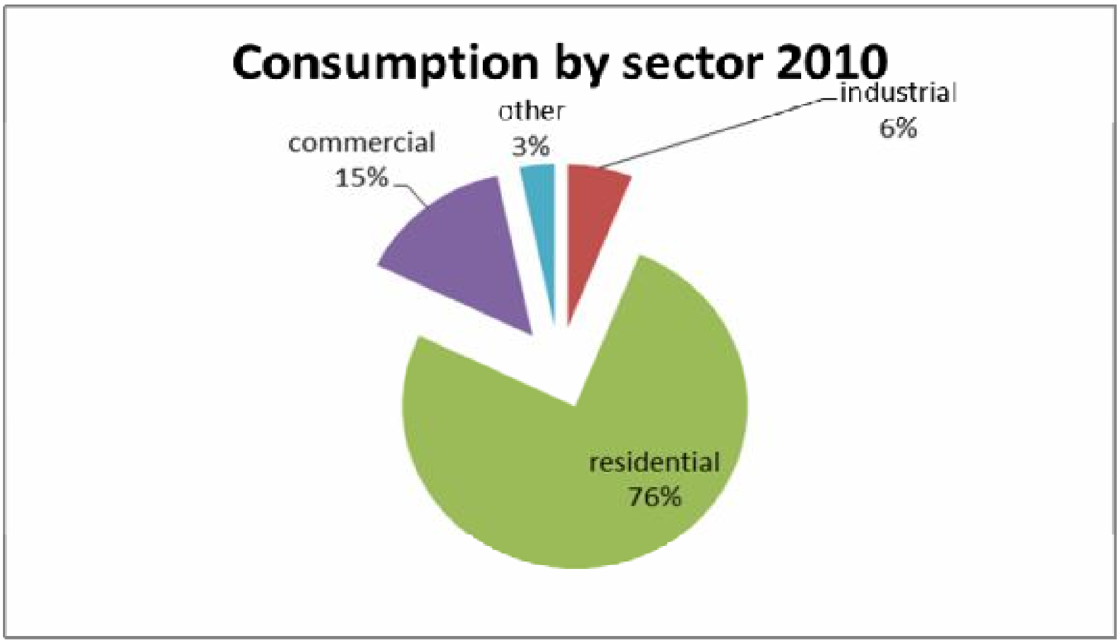

Figure 4: Young Consumption Rates (2010)

Figure 4 supports two activities by YSC. Firstly, a better understanding of consumption through a compliance based use of categories and pricing will help managing demand.

Secondly, it is clear that work with the residential sector on managing demand will be of great benefit.

B3.2: NON REVENUE INCLUDING UNACCOUNTED FOR WATER

Non revenue water is made up of unaccounted for water and water that is provided to consumers under community service obligations.

[13] Adapted from Young IWCM MWH, 2012

Of this, unaccounted for water (UFW) also needs to be understood as this will inform in particular operational works by Council in leaks detection and operations management such as mains flushing.

UFW Component	Comment
Leakage	Young advise is at 5.7%
Unbilled and unmetered eg for mains flushing	Default value is 0.5%
Billed and unmetered	May be some residual shared metering in some developments
Theft	Default value is 0.1%
Customer meter calibration	Negligible. May be some value in being part of a regional survey.

Table 5: Unaccounted for Water

B4: SPECIFIC ADVICE REGARDING RESIDENTIAL WATER USE IN YOUNG

Given that 91% of water customers in Young are residential, specific advice regarding their water use will help inform options for managing demand by this user group.

Water use can be divided into indoor and outdoor use where outdoor use is more elastic and therefore more responsive to demand management strategies such as permanent lower level water conservation measures. The growing use of evaporative air conditioners also affects consumption. Discussion with YSC staff suggests that the use of evaporative air conditioners is an unknown though anecdotally they are being installed as they use less energy than systems using refrigerant. Young is experiencing growth and new housing, so there may be some value in scoping work with evaporative air-conditioning. Table 6 outlines trends in outdoor and indoor water use for Young.

Residential Usage	(L/Acc/Day)	%
Existing Houses		
Internal	325.30	61.8%
External	201.50	38.2%
New Houses		
Internal	309.20	60.6%
External	201.50	39.4%
Air conditioning demand (Litres / unit / day)	Unknown	

Table 6 Indoor and outdoor water consumption per day.[14]

Advice from the Centroc Water Security Study (CWSS) uses the Probabilistic Urban Rainwater and Waste Water Simulator (PURRS) model to better understand water residential water use[15]. In order to determine indoor and outdoor water use at short time steps in a water balance model a diurnal water use pattern is required. A diurnal water use pattern was adopted from previous studies into the performance of rainwater tanks for use in the PURRS Model. The assumed diurnal water use pattern for a household is shown in Figure 5.

[14] Young IWCM MWH 2012

[15] Centroc Water Security Study MWH 2009

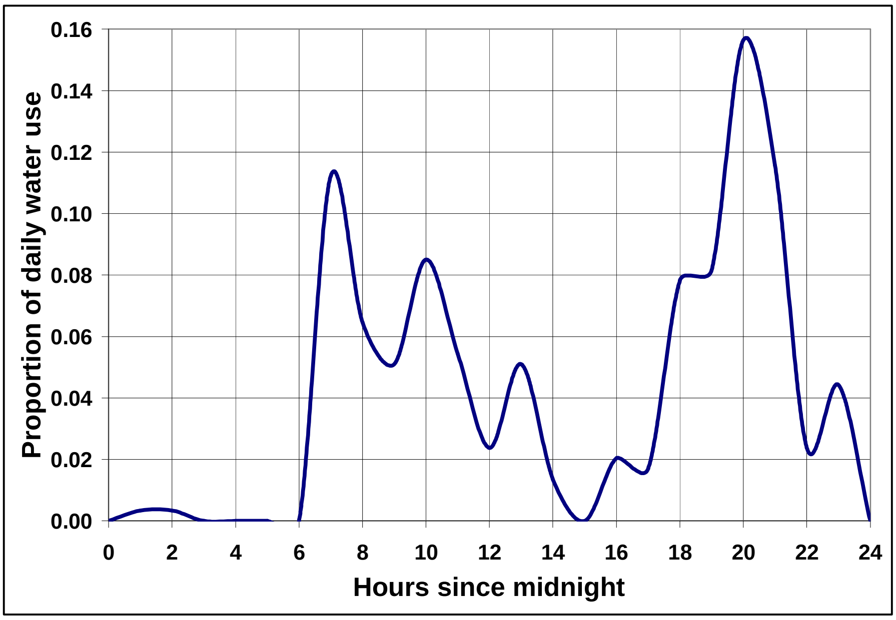

Figure 5: The Diurnal Water Use Pattern at a Household

The diurnal water use pattern shown in Figure 5 has been transformed into a normalised water use (cumulative use/daily use) versus normalised time relationship (Figure 6) to enable the PURRS model to determine diurnal indoor and outdoor water use patterns.

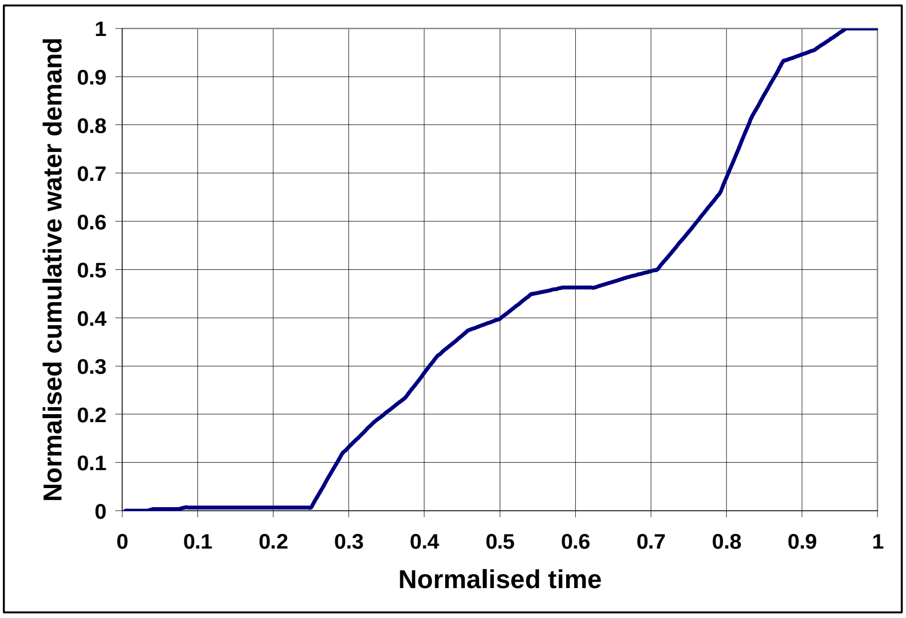

Figure 6: Normalised Diurnal Water Use Pattern used in the PURRS Model

The PURRS model calculates water consumption at six-minute intervals using indoor and outdoor water use patterns established for a particular location, daily water demand algorithms and the normalised diurnal water use pattern shown in Figure 6.

Also important when understanding residential water use is the number of people living in each billable residence. This has been provided in Table 7.

Location	Proportion Of Dwellings (%) Per Household Size (People)				
	1	2	3	4	5
Young	31	34	14	11	9

Table 7: Distribution of Household Sizes Used in this Study

The CWSS has successfully utilised long climate records, socio-economic information, the demand side management decision support system (DSS) and continuous simulation methodologies to generate water demand sequences for input to the network linear program WATHNET. The analysis has incorporated water efficient appliances and rainwater tanks in scenarios that relate to the BASIX legislation and in a scenario with extended demand management efforts.

The results from this analysis show the expected variation of water demands in response to climate variation and climate change or a regional basis that are important for the analysis of water security. This supports the case for a strategy to include water efficient appliances and rainwater tanks in towns, in accordance with BASIX legislation, will make a significant contribution to adapting to the impacts of climate change.

B5: PROJECTED WATER DEMANDS INCLUDING HISTORICAL CLIMATE CORRECTION

This section outlines and discusses the water demand and wastewater flow forecasts adopted for this plan. A summary of the forecasts are shown in Table 8.

Demand/flow	2011	2021	2031	2041
Annual water demand (ML/y)	1,599	1,667	1,744	1,824

Table 8: Business As Usual demand and flow forecasts

The water demand forecast from the CWSS has been adopted in this plan for the purpose of the BAU assessment[16]. The study utilised the DSS tool to analyse historical demand records and prepare a climate-corrected 50-year demand forecast based on trends in population, household size, uptake of efficient water fixtures and appliances, and demand management initiatives.

Based on the demand management programs currently in place, the average annual water demand for the town is expected to gradually increase from 1,599 ML/year to 1,824 ML/year over the 30-year forecast horizon to 2041. It should be noted however that inconsistency exists between historical water usage datasets provided for the CWSS and this study. Based on the more recent data provided for this study, the forecasts could be underestimated by approximately 10%.

The current climate-corrected demand in Young was investigated using NOW's Water Trend Tracking Model[17]. Three basic steps are involved in the analysis:

1. Calibration – the model is calibrated over a short time series to provide a baseline demand.

[16] Centroc Water Security Study, MWH 2009

[17] Young IWCM MWH, 2012

2. Hindcasting – the available climate data is used to project the calibrated model through the full climate record to obtain a statistical understanding of the mean or climate normalised baseline year consumption.
3. Trend tracking – the observed demands are compared with those predicted by the baseline calibrated model and changes in demands relative to the baseline are estimated.

The calibration step utilised monthly bulk water data supplied from the Jugiong System to Young, and monthly average climate data based on daily data from SILO. The period from 1 January 2000 to 31 December 2003 was selected for calibration of the model. Details of water restrictions including levels and periods were not available, but the NSW Performance Reports suggest that restrictions have been in place from 2004 until the end of the available data.

The climate corrected demand from the water trend tracking model is shown in Figure 7. The figure shows the climate corrected demand as well as a comparison between the observed data (the raw non-climate corrected daily bulk water demand records) and the model's hindcast demand. The peak unrestricted per capita demand is approximately 650 L/p/day based on the model.

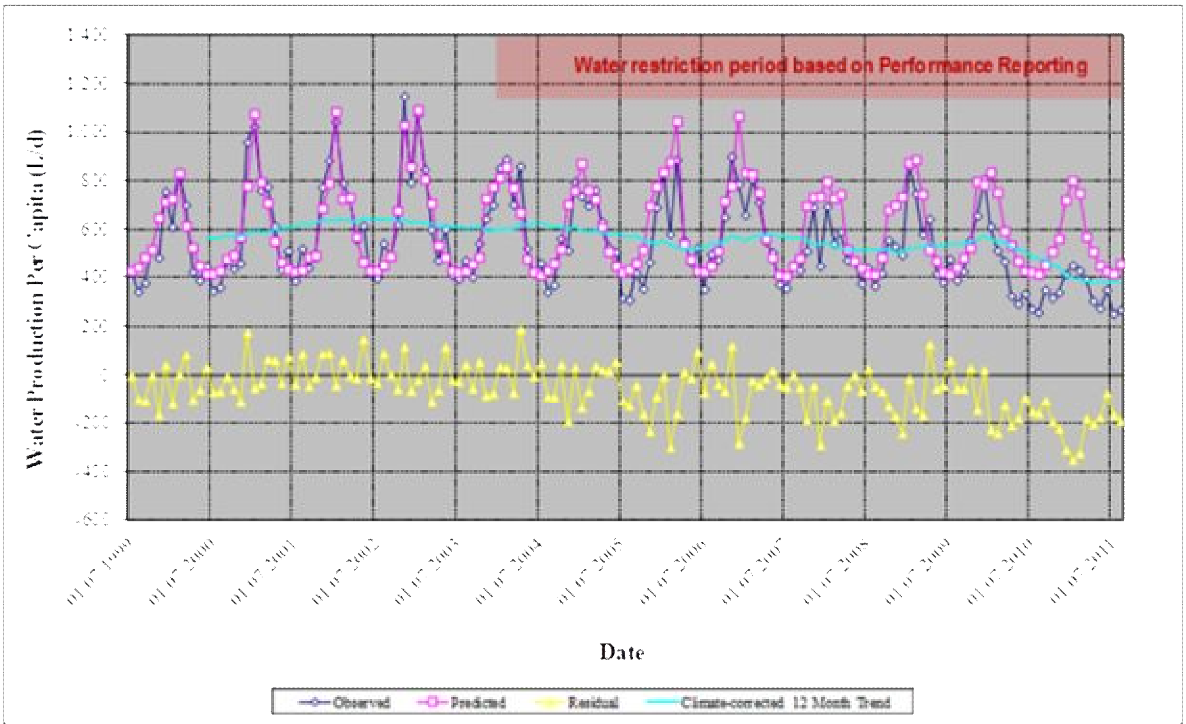

Figure 7: Climate corrected demands

C: DEMAND MANAGEMENT PLANNING

C1: BACKGROUND

YSC's current (2009/10) residential water consumption is 222 kL per property per year. This is about 25% higher than the state-wide median consumption of 175 kL per property but, importantly, about 4% less than the median for "inland" cities and towns (230 kL/property).

As the recent drought has shown all regions, the importance of a community which is able to minimise its water consumption is a significant step in ensuring sustainable rural communities. The Young community has clearly adopted this thinking as shown in the above figures. However, there is more that can be done effectively without changing the amenity of living in a rural community.

This Section of the plan (Section C) discusses a range of demand management options which Council may wish to consider in future programs.

Section D presents the results of modelling for this range of options and ranks them in terms of potential water savings and benefit/cost ratio.

C2: STRATEGIC OBJECTIVES

In the context of the recent drought, water authorities and their communities have become more aware of the importance to our survival of water and of its limited availability.

The way in which we address these challenges will govern the delivery of:

- Healthy landscapes and environment;
- Community health;
- Community lifestyle;
- Future growth and development of the Shire and
- Long term sustainability of our water resources.

There are a range of issues which can affect our current thinking about water consumption, such as:

- Water use minimisation in our urban environment;
- Water efficiency options;
- Demand management, including pricing reform and
- Alternative systems and approaches to water use including:
    - Integrated urban water planning;
    - Grey water reuse;
    - Use of rainwater tanks;
    - Recycling water reclaimed from sewage treatment processes;
    - Urban water harvesting;

- o Use of groundwater and
- o Water sensitive urban design and development.

C3: CLIMATE CHANGE CONSIDERATIONS

A 2008 Report on NSW climate change impacts, Future Climate and Runoff Projections (to 2030) for New South Wales and the Australian Capital Territory provides the first detailed projections of the impacts of climate change on runoff and water availability across New South Wales.

The report concludes there is considerable uncertainty in the modelling of rainfall response to global warming in NSW and ACT. Nine out of fifteen of the global climate models (GCM's) show a decrease in the mean annual rainfall including:

- Winter rainfalls are likely to be lower across NSW;
- There is less likelihood of reductions in future summer rainfalls where only five out of the fifteen GCM's indicate a reduction;
- The median or best estimate indicates that mean future rainfall in NSW in 2030 relative to 1990 will be lower by 0 to 20% in the southern parts and
- Averaged across all regions, the median estimate is a 5% decrease in mean annual rainfall[18].

The results of this study/report will be used in NSW to look at the impacts of future flows and river health, aquatic ecosystems and water availability for towns, irrigation and industry.

The Department of Water and Energy in October 2008 provided a list of possible climate change impacts relating to water service planning. For YSC, although the science and modelling are by no means conclusive, the potential impacts of climate change include:

- Reduced rainfall and runoff;
- Increasing rainfall variability;
- Increased maximum temperature;
- Increasing evaporation;
- Possible increase in damage to underground infrastructure, particularly pipelines;
- Increases in water usage and demand;
- The need for water conservation and reuse initiatives (like grey water reuse, effluent reuse etc) and
- Population changes as a result of migration away from rural and particularly irrigation areas.

Impacts on the Water Utility may include:

- Changes to water access licence conditions;

[18] Future Climate and Runoff Projections (to 2030) for New South Wales and Australian Capital Territory

- Greater uncertainty about yield from the existing raw water source;
- Possible increases in damage to underground infrastructure, particularly pipelines ;
- Reduction in sewage volumes;
- Increased retention time of sewage in mains, particularly rising mains;
- Increased concentration of nutrients and chemicals in raw sewage;
- Changing technology and legislation and
- Greater interest and/or need to use low carbon dioxide (green) energy.

Impacts on YSC customers may include:

- Increased total and/or seasonal water usage;
- Increased grey water use;
- Increased use of evaporative coolers and
- Movement of people and industries away from areas of water shortage.

The Centroc Regional Risk Management Plan for Climate Change (2011) identifies the following risks and mitigations regarding demand management and climate change for consideration by Councils. This dovetails with advice in this Plan regarding both taking a regional approach and implementing various options in the recommended schedule.

Climate Change Risks for demand for water in the Centroc Region	
Risk	Mitigation Options
Due to the increase in average annual temperature there is a risk that Council may experience a higher demand for reticulated water	CEP/Drought Mgt Plan. Drought Demand Management Plan, Best Practice Plan in place (subject to continual review) and an Integrated Water Cycle Management Plan. If needed Council could make greater use of recycled water (Raw grey Water). Review IWCMP/DMP and CEP/review pricing. Public education, incentives for onsite water harvesting. Investigate the viability of increasing current storage capacity through infrastructure upgrades.
As a result of a volatility in rainfall patterns there will be an impact on revenue received by Council for water & sewer services	Defer capital works projects to manage cash flow. Additional costs passed on to end users. Give consideration to increases in users' charges. Pursue further opportunities for the use of non potable water. Conduct a water and sewer adaptation study.
There is a risk that with an average annual reduction in rainfall that water storage facilities may experience a decreased supply to unprecedented levels that traditional Council mitigation strategies may not be able to cope with. This in turn could have negative repercussions for the ongoing prosperity and development of the LGA economy.	Integrated Water Cycle Management Plan, Demand Management Strategies including education, pricing and infrastructure, Asset Management Plans, Leak Reduction. There may be a need for Council to participate in more regional approaches to water security as well as increase its capacity to recycle water. Council may also consider the use of raw or recycled water for some functions.
Due to the projected increase in the number of Hot Days experienced within the LGA there is a risk that the electricity supply may become unpredictable e.g. rolling black outs (Overflow from sewerage SPS)	Council may consider investing in a back-up generator. Incident Notification Protocol (INP) under the existing EP (Environmental Protection) licence. Increasing generator back ups and/or Bunding around Sewerage Pumping Stations. Ongoing review of INP
There is a risk that due to an increase in the number of hot days where the ambient temperature exceeds 35° C there will be a significant increase in peak water demand on and/or close to those days.	Integrated Water Cycle Management Plan, Demand Management Strategies including education, pricing and infrastructure, Asset Management Plans, Leak Reduction. Implementation of the Drought Management Strategy (including water restrictions). There may be a need for

	Council to participate in more regional approaches to water security as well as increase its capacity to recycle water. Continue to review and update the Drought Management Strategy

Table 9: Climate Change Risks for Demand for Water in the Centroc region

C4: DEMAND MANAGEMENT OPTIONS

C4.1: INTRODUCTION

Demand management initiatives can provide better value for money for customers as well as improved environmental outcomes.

They aim to:

- assist consumers in using water more efficiently;
- reduce wastage and system losses and
- enable better communication with the community.

A key benefit of demand management is the potential deferment of capital investment in new capital works, as well as reduced operating costs.

C4.2: DEMAND MANAGEMENT OPTIONS

Water demand management involves the adoption of policies and financial investment strategies to ensure efficient water use by all consumers within the community. There is a range of demand management options available including:

- Promoting and enabling water efficiency;
- Cost reflective pricing;
- Universal metering to enable implementation of the pricing policy;
- Operational measures, including leakage detection, repair program and pressure reduction;
- Community education and awareness programs designed to encourage voluntary restrictions and reduction in usage;
- Customer advisory services, the use of incentives for installation of water efficient appliances and gardens/landscapes and/or retrofitting of water in-efficient equipment;
- Regulation of the efficiency of water using appliances especially in new buildings and for garden watering;
- Use of reclaimed water to reduce the reliance on and need for treated water supplies and
- Water restrictions, either on a temporary or permanent basis.

C4.3: BENEFITS OF DEMAND MANAGEMENT

Demand management offers benefits to both customers and Council, including financial benefits, protection of the environment, energy savings, customer service and the reduction of wastewater flows.

Measures such as pricing reform, community education and advisory services aim to enable customers to achieve a balance between expenditure on water supply and the benefits they obtain from the supply.

C4.3.1: FINANCIAL BENEFITS

Well planned and implemented demand management measures can reduce costs significantly, primarily through avoiding or deferring the need for new capital works and also by reducing operating costs associated with pumping and water treatment.

In country NSW, the state-wide median annual residential consumption per property has been progressively reduced over the last 12 years from 300 kilolitres per property per year to 173 kilolitres per property per year in 2007/08. The coastal average residential usage was 150 kL, whilst the inland average, reflecting the generally hotter, drier, conditions, was 230 kL. Although consumption is driven by a variety of factors where communities differ in their use for a variety of reasons, it is noteworthy that Young's current residential consumption is below the inland average, at 217 kilolitres per property per year[19].

C4.3.2: REDUCED DEMANDS ON THE ENVIRONMENT

Reducing water demand reduces the urban footprint and our impact on the environment.

C4.3.3: CUSTOMER SERVICE AND GOOD MANAGEMENT

Demand management is essential for effective and efficient management and can be a way to improve the level of customer service through improved customer contact and advisory services. Increasing the water usage component of the bill and reading meters and billing four (4) times per year enables customers to exercise more control over their water costs. Larger customers' meters are read monthly, with bills also issued on a monthly basis.

Council is currently introducing a pricing regime which currently recovers about 60% of costs via consumption charges and is planning to increase this to 75% over the next two years.

C4.3.4: ENERGY SAVINGS

A significant proportion of energy usage is for heating water for showers, restaurant use, glass and dish washing and washing down food premises. Some estimates are that hot water usage can be reduced by almost one third using cost effective water efficiency measures.

C4.3.5: REDUCING WASTEWATER FLOWS

Implementation of demand management measures will also reduce the volume of flow received by Council's wastewater treatment facilities.

[19] NOW 2009/10 Performance Reports

This will be of benefit by way of potentially deferring augmentation of treatment and re-use facilities resulting in substantial energy savings and therefore reduced greenhouse gas emissions.

The anticipated reductions in sewage flows may also adversely impact on cleansing velocities in gravity sewers, resulting in an increase in flushing frequency. It may also lead to increased concentrations of contaminants in the flows received at the sewage treatment plant which may require monitoring and adjustment of treatment processes.

C5: PROMOTING AND ENABLING WATER USE EFFICIENCY

C5.1: INTRODUCTION

Urban water consumption is a combination of the way consumers use water and the efficiency of the appliances and equipment they use.

In addressing water use efficiency, a number of strategies can be deployed, including:

- Standards and water efficiency labelling;
- Flush toilets;
- Shower heads;
- Flow regulators;
- Taps;
- Urinals;
- Washing machines;
- Dishwashing machines;
- Outdoor water use;
- Grey water re-use;
- Waterless toilets;
- Rainwater tank use and
- Commercial/industrial water use efficiencies.

Each of the above will be addressed in the following sub-sections.

C5.2: STANDARDS AND WATER EFFICIENCY LABELLING

Standards Australia has published efficiency standards for certain water-using equipment under the direction of the Water Efficient Appliances and Plumbing Committee of the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ). These standards form the Water Efficiency Labelling and Standards (WELS) Scheme.

This scheme covers the following products:

- Showerheads;
- Taps;

- Aerators;
- Flow restrictors;
- Dishwashing machines;
- Clothes washing machines;
- Water closets;
- Urinals and
- Domestic garden equipment.

These standards have been developed into a labelling scheme for water-using appliances, similar to that which operates for the energy rating of appliances.

The standards are outlined in a set of guidelines published by the Australian Government (www.waterrating.gov.au/publications). Appliances are rated according to water efficiency, or ratings (e.g. 'A', 'AA' and 'AAA'.), as well as water consumption or flow figures.

C5.3: FLUSH TOILETS

Flush toilets typically use 50 kilolitres of water per household per year which is approximately 16% of residential water use.

The market in flush toilets has been changed considerably in Australia by the introduction of the 6 litre/3 litre dual flush toilet suites. Until the late 1980s the standard flush volume was around 11 litres.

The 6 litre/3 litre toilet has now become the de facto standard in new and replacement installations and is responsible for a substantial improvement in water efficiency.

C5.4: SHOWER HEADS

Shower heads use on average 50 kilolitres of water per household per year. AAA rated shower heads can save more than 25 kL/a for an average household.

The flow rate, or water efficiency of a shower head is not the only important criteria in its use. The 'feel' or user-comfort of a particular shower head and water pressure combination is important. The water efficient shower heads vary in spray pattern from those that provide a misty spray pattern from those that provide a misty spray to a needle-like spray. Others have a pulsating 'massaging' flow.

The factors that affect the comfort of a shower are:

- The velocity of the spray;
- The evenness of the annular spread of the spray and
- The difference in temperature of water from the top to the bottom of the spray.

C5.5: FLOW REGULATORS

Flow restrictors are devices which can be inserted as a disc or threaded fitting in the shower arm connection. Flow restrictors are in fact often used on shower heads to reduce the flow, and most water efficient shower heads rely upon a flow regulator to reduce the flow and the shower head design to improve the spray pattern for user comfort.

This means that if a flow regulator is not matched to an appropriate shower head, a poor quality shower can result. This will depend on the shower head design, the pressure, the flow rate of the regulator and user preferences.

Flow restrictors are a less expensive alternative to a water efficient shower head. However, performance may result in them being removed after a short time, which reduces the impact of the demand management measure and creates customer resistance to the use of other measures.

C5.6: TAPS

Taps can be used either in a flow or volume situation. Examples of a flow situation are when a tap is used for hand washing or teeth brushing in which case the flow rate is not a major consideration and may be restricted without loss of convenience. In a volume situation where the tap is used for delivering a volume of water as quickly as possible, as in a laundry tub or bath, a flow regulator is not appropriate.

The simplest flow regulator is a tap aerator, incorporated in the tap spout, which mixes air with the water stream, providing the same level of service with the flow reduced by an amount dependent on the aerator. Most taps currently on the market are fitted with aerators. It is now possible to purchase aerators which incorporate a flow regulator.

Other types of flow regulators can be incorporated in the valve seat itself. Some companies have developed programs which involve the installation of such flow regulators in all water outlets in, for example, a hotel, hospital or other commercial or industrial installation. Although the main aim of such a program is to balance the pressure and flow rate in all the outlets, the water and energy savings can be substantial. These flow regulators often need to be installed by trained personnel.

In public places, slow release push button taps or centre return taps can help to reduce the water wasted through taps being left on. Knee, elbow or foot actuated taps are also common and overcome the usage difficulty of centre return taps. They are useful in circumstances where hygiene is a priority.

Many installations such as hospitals and nursing homes install thermostatic mixing valves to reduce the risk of scalding. These valves also help to reduce the unnecessary water use that occurs during temperature adjustment. These fittings are now being sold into the domestic market.

The use of electronic taps and electronic mixing valves with pre-set temperatures is not widespread but they are of potential use in hotels, hospitals or similar installations.

C5.7: URINALS

Urinals can be operated in a variety of ways, from cyclic flush, through to the traditional pull cord or button operation, to the 'demand-responsive' type controller which can sense the number of people visiting the toilet area or using the urinal.

Cyclic flush urinals are still in use in a number of places, and they can be one of the largest single water consuming devices in a commercial installation. A cyclic flush urinal, supplied by two 12 litre cisterns which are operating 24 hours a day, as many still do, can use nearly 2 ML/a. They should be the first target of any commercial and industrial advisory strategy, since many building owners and managers are unaware of the volume of water being wasted.

Many authorities have banned their use in new and replacement installations, and others have required all existing premises to install or retrofit demand-operated cisterns.

In many cases the motivation for installing a cyclic flush cistern is the belief that it results in reduced smell from the urinal in circumstances where users neglect to flush e.g. in hotels or public buildings. The low price of water has also been a factor. The smell problem is often splash related, and is not adequately solved by cyclic flushing in any case, but can be addressed by signs, deodorising, frequency of cleaning and 'smart' controllers in high usage situations where the cost can be justified.

Aside from the pull cord operated cistern, urinal controllers come in various types:

- A pressure operated controller, which detects a drop in the supply pressure resulting from a nearby tap or cistern being activated and passes a pre-set amount of water into the cistern;
- A counter operated controller, operated by either an electrical or pneumatic door switch or a beam across the door, counts the number of people entering the toilet and allows a pre-set amount of water into the urinal for each count. These systems have the advantage that they can be retrofitted to existing cisterns, but they do require some cabling or piping work and installation of control equipment. These systems also do not distinguish between those people entering the toilets to use the urinal as distinct from the pans or hand basins;
- Sensor-operated systems use infra-red or microwave sensors to determine whether a person is using the urinal. There are also sensors which are operated by the salt content of the urine in the bowl and
- Waterless urinals are now available and are readily installed onto existing plumbing. They operate using replaceable sealed cartridges containing a fluid lighter than urine which provides an atmospheric barrier to the sewage system. This allows urine to pass through to the sewage system without relying on water for flushing. Cleansing is achieved by spraying with disinfectant.

C5.8: WASHING MACHINES

The water efficiency of clothes washing machines is expressed in terms of the volume of water required to wash and rinse a dry kilogram of clothes. Rinsing efficiency is a large factor in the overall water use efficiency.

Front loading machines are considerably more efficient than top-loading ones. Typically, a top loading machine uses 150 litres per wash and a front loading machine 100 litres. At an average frequency of use of 6 times per household per week, this amounts to a saving of about 15 kilolitres per household per year. Ownership of top-loading automatic machines outnumbers front-loading machines by over 10 to 1, and top-loaders also have the largest share (90%) of new sales, with front-loaders at 3-4%. The market resistance to the purchase of front loading machines is because they are generally more costly.

C5.9: DISHWASHING MACHINES

The water efficiency of dishwashing machines is expressed in terms of the litres of water required to wash and rinse a standard place setting in a standard wash cycle. Water consumption in dishwashers varies between 1.6 litres and 4.8 litres per place setting. The machines which use less water have a more efficient spray pattern during the wash and rinse cycle.

C5.10: OUTDOOR WATER USE

Outdoor water use is typically about twice that of domestic water use. A great deal of outdoor water use is not efficient, either through wasteful practices, poor design of landscapes, inefficient equipment or a combination of these.
Typical outdoor water uses include:

- Garden and lawn watering;
- Washing of cars, houses, pathways and garden tools and
- Maintenance and filling of pools and other recreational uses.

Hoses fitted with a nozzle use less water, use the energy of the water more efficiently and generally allow greater control of where and when water is used. Use of fire hoses for outside water use must be discouraged.

Garden mulch is a means of reducing water use by reducing evaporation, moderating soil temperatures, discouraging weed growth and preventing soil compaction. Re-use of grass clippings for this also recycles the nutrients removed from the lawn. Alternatively, allowing grass clippings to remain on the lawn also has this effect.

Windbreaks are worthwhile in open locations as the wind plays a large part in the losses from evaporation.

C5.11: GREY WATER RE-USE

Grey water reuse systems collect and re-use water from the bath, hand basin, shower and laundry. There is a large variety of possible designs and systems. The processes involved can vary from a simple diversion valve from the laundry sink waste pipe, to sophisticated systems which store, treat and disinfect grey water for re-use as toilet flushing water or for irrigation.

Grey water re-use is covered more extensively in Section B7.

C5.12: WATERLESS TOILETS

Waterless toilets, which include composting toilets and vermiculture (worm-based) systems for treating and processing human wastes, are experiencing renewed interest from the community and from various government authorities. Their main application has been in circumstances where no reticulated sewerage system is available and where septic systems are not considered suitable.

As for grey water treatment and re-use, the regulatory and research environment for these technologies has historically been inadequate, although this is improving. As overseas and some Australian experience indicates, they have an important role as an appropriate waste treatment technology with very low environmental impact and zero water use.

C5.13: RAINWATER TANKS

It has been common in rural areas for many years to provide water for domestic purposes from tanks fed from roof catchments. For reasons of personal preference tank water supplies are also used in some Towns in conjunction with reticulated potable water supply. Such tank supplies are secondary sources and require a lesser security of supply than the primary source.

The use of rainwater tanks and the requirements applying to situations where a potable supply is provided are covered in Section C9.

C5.14: COMMERCIAL/INDUSTRIAL WATER USE EFFICIENCY

In many commercial premises the types of water using appliances are similar to those in a domestic situation, but the usage patterns may be different. For example, a motel has toilets, showers; hand basin taps but also has large kitchen facilities and possibly a laundry. An office building has toilets; hand basin taps and kitchen sink taps, but may also have urinals. A school may have a significant outdoor water use for irrigation.

The types of equipment and efficiency of the appliances already discussed in this Section have relevance to these customers in most cases. Often the financial benefits that accrue to commercial customers from the installation of water efficient equipment are greater than that for domestic customers as a result of higher marginal water prices for such customers. The magnitude of the water savings is often greater due to the more intensive use of equipment.

C6: USING PRICE AS A DEMAND DRIVER

C6.1: INTRODUCTION

Implementation of an appropriate pricing policy and structure is arguably, the most critical aspect of any demand management strategy as the price of water is a strong driver in controlling the water used in a community. To facilitate pricing, universal metering is needed. This has been implemented by YSC.

C6.2: CURRENT PRICING STRUCTURE

The pricing system currently used by Young Council is a two-part, inclining block tariff. A two-part tariff implies an access charge and a usage charge based on the volume of water used, as measured at the customer's meter.

An inclining block tariff, as applied to the usage charge, is a set charge per kilolitre up to a certain limit and then a significantly higher charge per kilolitre is applied. The aim is to reward low water users and discourage use above a pre-determined reasonable level.

Charges applying in Young 2011/12 are:

1. Access Charges: Vary with size of connection with the Base Charge based on 20mm service being $155.
2. Residential Usage Charges for Filtered Water:

    - up to 90 kL: $1.80/kL
    - > 90 kL: $2.70/kL

The state-wide median residential water charge or first tier charge was $1.30/kL per property in 2009/10. This is a weighted median and is based on a percentage of connected properties, across the State. The median, based on a percentage of Local Water Utilities was $1.10/kL.

As the charges are above the NSW median, YSC has already put in place usage charges designed to drive down consumption. Further, the introduction of the second tier charge is at 90kL which is considerable less than other Councils where figures are reported as closer to 300kL. These two pricing mechanisms together provide a strong message to consumers about water conservation.

C6.3: OBJECTIVES OF A PRICING POLICY

As shown by YSC, typically, a sound pricing policy aims to satisfy the following objectives:

- To allocate resources efficiently by properly reflecting the cost of supply and
- To generate sufficient revenue for the business, including covering the cost of the following:
    - Operations;
    - Maintenance;
    - Administration;
    - Depreciation of existing assets;
    - A return on investment for existing capital assets;
    - A return on equity to the Council as owner of the business and
    - Community service obligations (e.g. pensioner rebates).

The pricing policy should also:

- Be simple to understand & administer and
- Reflect variations in system costs.

YSC needs to undertake some work in this area, which should include both a review of it pricing categories. During this review, pricing policy with regard to each category needs to be assured, for example for any consumers for whom Council intends no charge, transparent policy should be provided. To comply with NOW Best Practice Guidelines, a review needs to be undertaken to ensure a fit with the NOW categories of:

- Residential;
- Commercial;

- Industrial;
- Rural;
- Institutional;
- Bulk Sales;
- Public Parks and
- Unbilled.

C6.4: UNITS AND FLATS

In the case of strata title units, the ideal is to meter supply to each unit. If this is not possible, then each strata title unit should be treated as a single residential assessment with a 20mm service connection. The water consumption for each unit should be calculated as the total consumption for the block of units divided by the number of units in the block. As a result, each unit within the block will receive the same water supply bill.

In the case of a Community Title or a Company Title property, then each such property must be disaggregated into the appropriate number of units and treated as described above for strata title units.

This is required in order to avoid the imposition of excessive water usage charges for such properties.

YSC has implemented separate water meters for each strata title unit for new housing. A review of metering to identify back-log issues will need to be undertaken to give residents better consumption management.

C6.5: NON-RATEABLE PROPERTIES

The decision as to whether or not to provide a community service obligation (CSO) to non-rateable properties such as schools, hospitals, churches, etc. is a matter for determination. Some Authorities provide a CSO for all non-rateable properties. However, over 70% of Authorities in NSW provide no water supply CSO's to non-rateable properties.

If a CSO is provided to non-rateable properties, it is recommended that the CSO be only provided to reduce water supply access charges. Consideration may also be given to reducing the 2nd tier consumption charges for these customers, for example through the use of a uniform consumption charge. This would need to be closely monitored to ensure that there is no wastage and are efficient water use is encouraged.

- Community education and awareness programs designed to encourage voluntary restrictions and reduction in usage;
- Customer advisory services, the use of incentives for installation of water efficient appliances and gardens/landscapes and/or retrofitting of water in-efficient equipment;
- Regulation of the efficiency of water using appliances especially in new buildings and for garden watering;
- Use of reclaimed water to reduce the reliance on and need for treated water supplies and

- Water restrictions, either on a temporary or permanent basis.

YSC does not provide free water though has given consideration to reduced charges to its abattoir and does not charge Council's General Fund for water use on for example parks and gardens. As part of it review of classifications, pricing policy should be included.

C7: OPERATIONAL MEASURES, INCLUDING LEAK DETECTION, REPAIR PROGRAM AND PRESSURE REDUCTION

Improving the operations of Council in water efficiency is an obvious starting point and particularly important should the Council be going to the community suggesting it reduce its water consumption.

Included in operational measures are:

- Ensuring Council buildings are either fitted or retrofitted with water conserving measures such as dual flush, flow regulators and the like;
- Ensuring Council policy, procedure and staff training for example in parks and gardens management and in the management of breaks and repairs, gives consideration to water conservation;
- Ensuring water leakage from the system is below 6% and
- Pressure testing of the system to ensure there isn't any greater water usage from higher pressures.

C.7.1: COUNCIL BUILDINGS RETROFIT PROGRAM

When going to the community with education programs and offers for retrofit, to reduce the likelihood of adverse community feedback, "leading by example" and having a Council owned building retrofit policy and implementation plan is recommended.

Stakeholder feedback to YSC under the Integrated Planning and Reporting process has identified the need for policy and activity in this area.

C.7.2: COUNCIL POLICY, PROCEDURE AND STAFF TRAINING

There are a variety of areas Council can give consideration to when managing its own demand. These include:

- Parks, and gardens management;
- Verge and round-abouts management;
- Management of breaks and repairs and
- Water use and retro-fitting for Council facilities

Support for a review of policy, procedure and staff training in these areas in the context if a general policy review in demand management is recommended in the Centroc Regional Demand Management Plan.

C.7.3: LEAK DETECTION

NOW expectations for leakage from LWUs on NSW is 6%. Young is below this figure at 5.7%. Having said that, current work being undertaken with CCTV and asset condition rating may provide advice regarding a program of works that Young may wish to participate in. It is understood a regional approach to leak detection and repair is being considered through the CWUA.

C.7.4: PRESSURE REDUCTION

In some places the water supply pressure is greater than is required for normal requirements. In hilly areas as is the case in Young, substantial local variations in pressure can occur.

Increased water supply pressure will result in an increased demand for water through increased leakage and also through greater flow rate through certain fixtures used in a flow rather than volume mode (hand basin taps and most shower heads). Excess pressure also reduces the efficiency of many sprinkler heads and other irrigation systems unless they have been set up and designed for the high pressure. Other problems relate to increased leakage through hot water system pressure relief valves, and the reduced life of solenoid valves.

YSC has identified the need to undertake hydrological work including pressure studies.

C8: COMMUNITY EDUCATION AND AWARENESS PROGRAMS DESIGNED TO ENCOURAGE VOLUNTARY RESTRICTIONS AND REDUCTION IN USAGE

Through the Centroc Water Utilities' Alliance, YSC is a member of Save Water Inc. Please go to the Save Water website at savewater.com.au for further advice regarding their considerable support to community education and capacity building in reducing water consumption.

This membership provides Young with both the support of regional programming with its added value in procurement and program management as well as being able to access programing at an individual Council level.

C9: WATER TANKS

C9.1: OVERVIEW

In country areas, rainwater tanks are often the main, or in some cases, the only, source of water for domestic purposes.

The quality of the water collected in rainwater tanks can be variable, and may contain harmful contaminants. However, provided that the rainwater is clear and has little taste or smell, it is probably safe for use and unlikely to cause illness. In some cases, where a treated supply is not available, rainwater tanks may provide better quality water than surface water or groundwater (bore water) supplies.

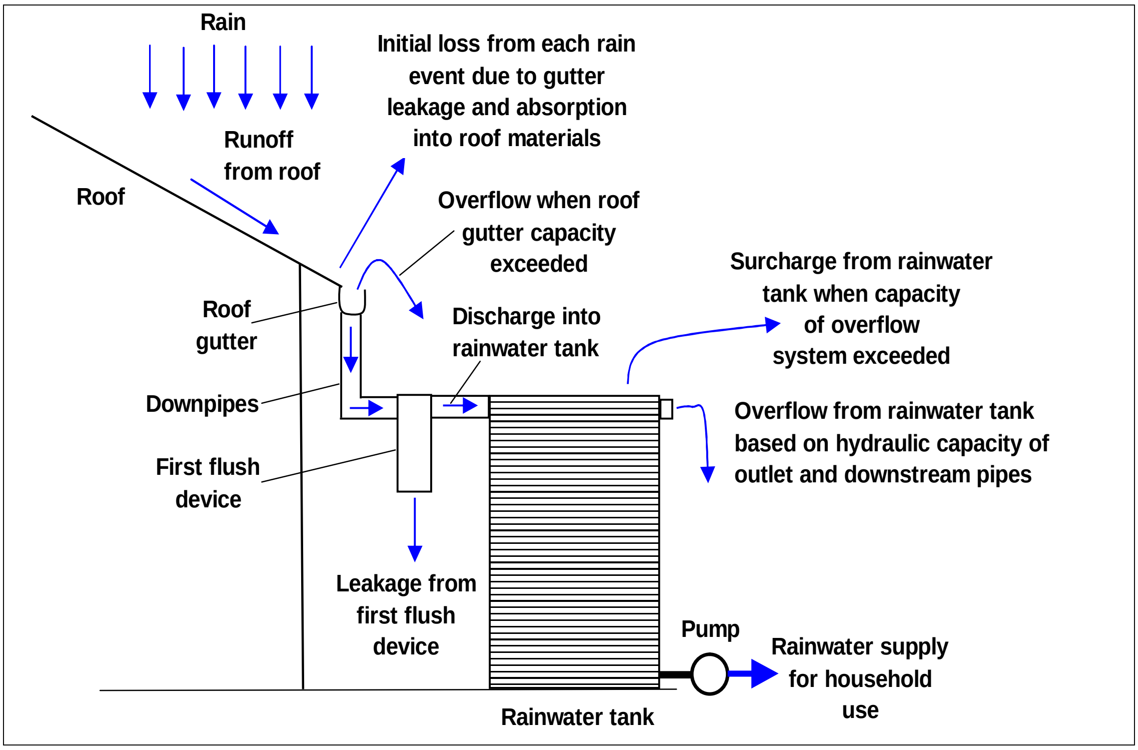

Figure 8: Schematic of the Roof Runoff to Rainwater Tank Processes in PURRS

With a growing community awareness of the benefits of water conservation, particularly during the recent drought, rainwater tanks are increasingly being seen as an alternative source of water:

- With lower environmental impact than reticulated supplies;
- Utilisation of a water source that is currently "wasted" and
- An alternative, chemical free, supply for garden watering.

As part of the New South Wales Government's commitment to sustainable resource management, the installation of rainwater tanks in urban areas has been approved for the following purposes[20]:

- Garden and lawn watering;
- Toilet flushing;
- Washing machine cold tap use;
- Washing cars;
- Filling ornamental pools and
- Topping up swimming pools

However, where there is a reticulated drinking (potable) water supply available, NSW Health does not recommend the use of rainwater for:

[20] NSW Health; "Rainwater Tanks where a Public Water Supply is Available", 2007

- Drinking;
- Cooking or other kitchen purposes and
- Personal washing, such as baths, showers, hand basins and bidets

Reliable analysis of water use and the performance of rainwater tanks depend on the use of realistic water demands and local rainfall sequences. The physical processes involved in rainwater harvesting, including collection of roof runoff in tanks and rainwater supply to households, is most accurately modelled by using sub-daily time steps and the longest available rainfall records.

Advice from the Centroc Water Security Study (CWSS) regarding water tanks in the region includes daily rainfall and temperature records obtained from the Bureau of Meteorology (BoM) containing greater than 10 years of data including the recent drought, for locations throughout the Centroc region.

A total of 72 daily rainfall and 13 pluviograph records were identified and some of these records were used to derive long synthetic pluviograph records at each location.

Location	BOM Station	Start	Finish	Length (years)	Average annual rainfall (mm)
Young	73056	1/1/1876	31/12/2007	132	654

Table 10: Daily Rainfall Records from BOM used in the Study

Location	BOM Station	Start	Finish	Length (years)	Average daily temperature (°C)
Young	73056	1/1/1965	31/10/1991	27	22.3

Table 11: Daily Temperature Records from BOM used in the Study

In the CWSS, a synthetic pluviograph rainfall record with a length of 137 years and average annual rainfall depth of 832 mm was constructed for the Orange region using daily rainfall from Orange and pluviograph rainfall from Orange, Wellington, Oberon and Rylstone. This was applied across the region including over Young.

Roof systems are relatively impervious and are not subject to significant evapo-transporation or infiltration losses. More accurately, these systems are subject to losses that are based on leakage from roof gutter systems and overflows from roof gutter systems when the capacity of gutters and downpipes is exceeded.

Monitoring studies by the author has revealed that initial gutter losses range from 0 to 0.8 mm of roof runoff with the average initial gutter losses being about 0.5 mm (Coombes (2002) in CWSS). This study has employed an initial gutter loss of 0.5 mm.

The CWSS findings support the further implementation of the NSW Government's BASIX (Building and Sustainability Index) program, which is designed to ensure that homes are built to be more energy and water efficient. BASIX requires the installation of rainwater tanks at all new homes(and where alterations & additions valued $50,000 more are carried out (www.basix.nsw.gov.au). The aim of the BASIX program is to bring about a 40% reduction in water use.

C9.2: INFORMATION INCLUDING FOR REBATES

A Rainwater Tank Rebate and other rebates may be available as they have been in the past. Suggested sites for further information are:

- www.environment.nsw.gov.au
- CUPDR Circular No.18 Guidelines for Plumbing associated with Rainwater Tanks in Urban Areas.
- NSW Health, Guide to Rainwater Tanks. : www.health.nsw.gov.au/policies/gl/2007

C10: RESIDENTIAL GREYWATER REUSE

C10.1: OVERVIEW

The re-use of grey water in domestic situations is becoming more common of late in light of the recent drought situation. There appears to be a general community wide expectation that Councils should not only allow, but should encourage the use of grey water.

Current requirements of NSW Health for Grey water Re-use are contained in the document "Grey water Re-use in Sewered Single Domestic Premises".

In simple terms, grey water is the wastewater generated in the bathroom, kitchen and laundry. That is, those components of domestic wastewater (sewage) which have not originated from the toilet.

Given the need to conserve our treated water, there are obvious advantages in using alternate water sources, like grey water, for use in watering lawns and gardens. This will reduce the demand on the Council's potable supply.

Reuse of grey water should, therefore, be supported and encouraged by Council to help conserve water.

However, this has to be accomplished without adversely impacting on community health, the environment or the amenity of residential areas and must be completely in accordance with requirements set down by NSW Health.

Grey water can contain pathogenic micro-organisms including bacteria, protozoa, viruses and parasites at levels sufficient to present a health risk. Therefore, caution must be exercised when considering the use of grey water. This can be achieved by avoiding human contact with grey water, or treating and disinfecting it to remove and/or destroy harmful micro-organisms.

It should also be noted that grey water contains oils, fats, soaps, detergents, heavy metals, nutrients, salts and particles of hair, food and lint which can adversely affect the operation of a grey water irrigation system as well as potentially harming soil structures[21].

[21] NSW Guidelines for Grey water Re-use in Sewered, Single Household Residential Premises, DEUS, 2007

C10.2: CHARACTERISTICS OF DOMESTIC GREY WATER

The characteristics of grey water produced by a household will vary according to the number of occupants, the age distribution, lifestyle, health status and water usage patterns.
There are essentially three different grey water streams, they are:

- Bathroom grey water (bath, basin and shower) contributes about 55% of the total grey water volume. Bathroom grey water can be contaminated with hair, soaps, shampoos, hair dyes, toothpaste, lint, body fats, oils and cleaning products. It also has some faecal contamination (and the associated bacteria and viruses) through body washing;
- Laundry grey water contributes about 34% of the total grey water volume. Wastewater from the laundry varies in quality from wash water to rinse water to second rinse water. Laundry grey water can have faecal contamination with the associated bacteria and viruses, lint, oils, greases, chemicals, soaps, nutrients and other compounds and
- Kitchen grey water contributes about 11% of the total grey water volume. Kitchen grey water is heavily polluted with food particles, cooking oils, grease, detergents, and other cleaning products such as dishwashing powders. The detergents and cleaning products may be alkaline and contain chemicals that are harmful to soil structure, plants and groundwater. The solid food particles and fats can solidify and are not readily broken down by soil organisms. This can result in blockages in the land application system. It can also cause the soil to become water repellent. It is for these reasons that kitchen wastewater is not suited for reuse in grey water treatment systems and is not approved by NSW Health for grey water systems.

C10.3: HEALTH AND SAFETY CONSIDERATIONS

All forms of grey water are capable of transmitting disease.

Pathogens from grey water may spread by direct contact (i.e., touching grey water or inhaling infectious water droplets) or indirectly by consumption of contaminated food or water.

To minimise the risk to public health and prevent a nuisance from grey water reuse, the following requirements apply:

- Grey water systems (including bucketing) must dispose of grey water below the ground surface unless treated and disinfected to an appropriate standard;
- Sufficient land area must be available for the safe and confined re-use of grey water;
- The system must be designed and operated to exclude human and animal contact with the grey water except as required to maintain the system;
- No cross connection with the potable water supply is allowed;
- Grey water must not be allowed to enter any stormwater drainage system;
- Grey water shall not be used in a manner that will result in direct contact with vegetables or other edible plants. It may be used to irrigate fruit plants where the fruit does not make contact with the grey water;

- No opportunity for mosquito breeding is to exist in any part of a grey water system, i.e. in conveyance, treatment, storage, soil application and
- If irrigated via sub-strata drippers or above ground sprays each irrigation area shall have signage along the boundaries of disposal areas effectively cautioning those entering the area that grey water is being use for irrigation.

It is generally accepted that householders, unless dedicated to wastewater reuse practices, do not usually maintain the systems adequately.

It is essential; therefore, that Council applies its on-site wastewater management strategy (adapted to consider the impacts of grey water reuse) and rigidly enforces operating licences by way of regular inspection and audit.

C10.4: ENVIRONMENTAL CONSIDERATIONS

To minimise negative impacts on the environment from grey water reuse, the following applies:

- Grey water must be contained within the confines of the premises on which it is generated and not be permitted to runoff onto neighbouring properties;
- Only products with very low phosphorus content should be used. Phosphorus content can range from a low content of 0.05% up to 10% in various detergents. Native plants (not all) are sensitive to additional phosphorus. Plants of the Proteaceae family (such as grevillea, hakea, banksia and silky oak) are susceptible to excess phosphates. These plants are not ideally suited to grey water reuse;
- Grey water tends to be slightly alkaline, with a pH range of typically between 6.5 and 9.0, and the extensive use of grey water for irrigation could cause the soil to become progressively more alkaline. Shade loving and acid loving plants do not like the alkalinity of grey water. These include azaleas, camellias, gardenias, begonias, and ferns;
- Washing powders that contain sodium salts as bulking agents should be used sparingly. High levels of sodium can produce saline grey water. Sodium can damage soil structure, reducing the air space, giving it a greasy texture and poor drainage capability. Products which use potassium salts or liquid concentrates should be used as they produce better quality, less saline grey water;
- Detergents and powder cleansers contain boron and should be used sparingly, as boron can be toxic to plants in high concentrations and can also be toxic to animals. The USA Environmental Protection Agency (1992) recommends the maximum concentration of boron be 0.75g/L for long term use on sensitive plants and
- Try to avoid the use of:
  - bleaches or softeners;
  - detergents that advertise whitening, softening and enzymatic powers and
  - detergents with ingredients which include: boron, borax, chlorine, bleach, sodium perborate and sodium trypochlorite (salts), acids etc.

The following materials should not enter a grey water system:

- Paints, automotive oils and greases etc;

- Any matter designated as trade waste or industrial liquid waste;
- In sandy soils where the phosphorus retention index (PRI) of the soil is less than 5 the grey water systems should be installed more than 100 metres away from a wetland, stream flow (including stormwater drains) or other water sensitive ecosystems and
- System flow rates on coarse sandy soil/gravel should be carefully designed to avoid grey water leaching into groundwater or surface water bodies.

C10.5: GREY WATER REUSE OPTIONS

Grey water reuse methods can range from low cost methods such as the manual bucketing of grey water from the laundry trough or bathtubs, to primary treatment methods that coarsely screen oils, greases and solids from the grey water before irrigation via small trench systems, to more expensive secondary treatment systems that treat and disinfect the grey water to a high standard before irrigating via micro-drip or spray systems. The choice of system will be dependent on a number of factors including whether a new system is being installed or a disused wastewater system is being converted because the property has been connected to sewer.

C10.6: GREY WATER IRRIGATION OPTIONS

The appropriate grey water irrigation method is dependent on the level of treatment provided.

Table 12 below sets out the available reuse options:

Treatment	Grey Water Reuse Application
Untreated Grey water	Bucketing Sub-surface disposal recommended
Coarsely filtered untreated grey water (excluding kitchen grey water) - Greywater Diversion Device (Primary Treatment)	Sub-soil irrigation Sub-surface irrigation
Treated and disinfected grey water (to a standard of 20 mg/L BOD5, 30 mg/L SS and 30 cfu thermotolerant coliforms / 100 mL - Greywater Treatment System (Secondary Treatment)	Sub-soil irrigation Sub-surface irrigation Surface irrigation
Treated and disinfected grey water (to a standard of 20 mg/L BOD5, 30 mg/L SS and 10 cfu thermotolerant coliforms / 100 mL) - Greywater Treatment System (Enhanced Secondary Treatment)	Sub-soil irrigation Sub-surface irrigation Surface irrigation Toilet flushing Laundry use

Table 12: Water Reuse Option[22]

[22] NSW Health

C11: STORMWATER COLLECTION AND RE-USE

C11.1: INTRODUCTION

Urban stormwater is runoff from urban areas, including major flows during and following rain, as well as "dry" weather flows.

"Dry" weather drainage flows generally originate from groundwater, garden watering, wash down, leaking pipes, and illegal discharges. In some instances, overflows from the sewerage system or from septic tanks may also form part of the stormwater flow.

In most cities, urban stormwater runoff is considered a nuisance - to be disposed of as quickly as possible. Drainage systems have typically been developed to minimise the risk of flooding.

It is now becoming more accepted that a new approach to stormwater management is required - one that considers issues of stormwater quality & aquatic ecosystem health, as well as stormwater quantity.

This implies an approach which recognises the environmental impacts of urbanisation, the linkages between land & water management & the importance of community needs & values.

C11.2: ISSUES TO CONSIDER

In contemplating the re-use of harvested stormwater, there are a number of issues to consider, including:

- Water quality. The same issues relating to grey water re-use and/or use of tank water apply to stormwater re-use river flow objectives. Contemporary approaches to stormwater management also include ensuring that water supply systems allow for environmental flows in streams; the sustainable management of extractions for irrigation and the "mimicking" of natural flow regimes in managed streams. These approaches recognise that stormwater management needs to identify both the environmental values of streams as well as the opportunities to utilise stormwater as it passes through the urban water cycle;
- Flood mitigation. It is crucial to ensure that any works associated with harvesting & re-using stormwater do not adversely impact on the primary requirement of flood control;
- Public health & safety. Management plans to ensure that public health & safety are not compromised need to be developed as part of any re-use strategy;
- Integrated water cycle management. Consideration should be given to development of schemes which combine the re-use of, say, stormwater, treated effluent & even groundwater;
- Economic sustainability. The capital and on-going operation & maintenance costs of proposed schemes need to be carefully considered to ensure not only affordability, but also economic sustainability and
- Other issues; which may need to be considered include the potential for rising water tables and salinity problems.

C12: RE-USE OF RECLAIMED WATER

C12.1: INTRODUCTION

Over half of the water supplied to urban areas ends up as wastewater. As a source of supply wastewater is the most reliable source available. It is the last to be impacted by droughts and it is the only source of supply that increases with population.

Wastewater re-use provides a number of benefits including:

- Improving the reliability of water supply;
- Increasing the available capacity of water supply and/or wastewater systems;
- Deferring or avoiding the need for augmentation of water supply systems;
- Allowing lower standards of treatment than required for discharge;
- Allowing the quantity and quality of water supplied to closely meet that required for an intended use;
- Reduction in nutrient loads to waterways;
- Potential to improve baseline flows in waterways, if reclaimed water is used to substitute for riparian extractions and
- Facilitating decentralisation of water supply and wastewater management.

Reclaimed water reuse also has drawbacks which include high cost (separate delivery systems are required and additional treatment may be needed, depending on the use), potential harmful effects of non-potable water on industrial equipment and products, and the need to prevent contamination and human contact with reclaimed effluent.

C12.2: ENVIRONMENTAL AND PUBLIC HEALTH FACTORS

It is important to ensure that reuse options themselves do not have significant adverse environmental effects or cause health risks that the community might not consider acceptable.

Effluent used for irrigation of public areas such as sporting fields and golf courses, or used for irrigation of food crops, must meet appropriate microbiological standards to protect public health. Better knowledge of health risks due to improved methods for detecting viruses and parasites, is resulting in a more stringent level of design of reuse systems, including a higher cost to install more effective disinfection systems.

Better knowledge of health risks has also led to concerns regarding public liability and difficulty in securing public liability insurance.

Section 60 approval from the Department of Water and Energy is required for all proposed reuse schemes. Applications for approval are required to include full details of the proposed scheme(s), risk assessment in accordance with the National Guidelines, demonstration that treatment processes will achieve the required log reductions for pathogens (bacteria, virus and rotifers) for the reuse situation (for example, more stringent log reductions are required for residential non-potable reuse than, say, for agricultural reuse) etc.

C12.3: GUIDELINES, STANDARDS & APPROVALS

The public health issues associated with the use of reclaimed water for irrigation, industrial use and domestic non-potable use are covered by guidelines set out by the National Water Quality Management Strategy. Relevant NSW Guidelines also include:

- Management of Private Recycled Water Schemes, DWE, 2008 and
- Use of Effluent by Irrigation, DECC, 2004.

C12.4: USES AND MARKETS FOR RECLAIMED WATER

The key uses for reclaimed water are:

- Agricultural irrigation;
- Urban landscape irrigation;
- Industrial applications;
- Recreational and environmental uses;
- Non-potable urban uses;
- Groundwater recharge;
- Potable re-use and
- On site re-use.

C12.4.1: AGRICULTURAL IRRIGATION

Reclaimed effluent can provide a reliable supply of water for irrigators, especially during drought periods, and can be used to substitute for river extractions, thus improving base stream flows. The nutrients in effluent can provide a source of fertiliser.

Irrigation demands for reclaimed water have high seasonal variability. Demand is a function of crop type, growing period, evapo-transporation and rainfall.

Re-use schemes need to be designed around these parameters to avoid possible soil degradation and contamination of nearby surface water or groundwater and damage to crops and soil structure from excess nutrients and salts.

In general, secondary treated effluent, with appropriate disinfection, provides a suitable quality for irrigation purposes.

C12.4.2: URBAN LANDSCAPE IRRIGATION

The main urban landscape markets for reclaimed water reuse are parks, public gardens, racecourses, golf courses, school grounds, roadway median strips and cemeteries. However, as with agricultural irrigation, demand has high seasonal variability, the market is located closer to sources of effluent, and these applications typically have a high dependence on town water.

For reclaimed water to supply this market, two supply options are available:

- Provide seasonal storage to match the constant supply of treated effluent with highly variable demands, (this is not normally cost-effective); or
- Supplement reclaimed water with Town water during peak demand.

As with agricultural irrigation, secondary treated and disinfected effluent is adequate for this market. The level of disinfection used depends on whether the public may come in contact with the effluent during irrigation.

C12.4.3: INDUSTRIAL APPLICATIONS

Industry could provide an important market for non-potable reclaimed water as it typically provides a constant demand for water of a quality equal to or lower than that required for river discharge. Major water uses for industry include:

- Cooling system make-up;
- Process water and boiler feedwater;
- Once through cooling;
- Wash down water and
- Miscellaneous use, such as site irrigation, mine site revegetation and dust control

The potential for industrial water re-use lies with those applications that can tolerate a lower than potable water quality. Cooling tower make-up can account for 50 percent of the water use of many industries. For secondary treated sewage effluent to be used for this application, some on-site treatment may be needed to control biological growth, scaling or corrosion.

C12.4.4: RECREATIONAL USES

Recreational use markets might include:

- Recreational impoundments and
- Fisheries.

Human health is the main factor to be considered for this use.

C12.4.5: ENVIRONMENTAL USES

Environmental use markets include:

- Lakes and ponds;
- Wetland enhancement and
- Stream flow augmentation.

Development of algae is the main factor to be considered for such uses.

C12.4.6: NON-POTABLE URBAN USES

Non-potable reclaimed sewage effluent can be used for a range of urban and residential applications including:

- Toilet flushing;
- Outdoor use such as garden watering and car washing;
- Air conditioning and
- Fire protection.

For residential non-potable re-use, outdoor use has a high seasonal variability while toilet flushing provides a constant demand.

C12.4.7: GROUNDWATER RECHARGE

Recharging groundwater aquifers with treated sewage effluent can be used to replenish groundwater reserves, control salt water intrusion and provide subsidence control. Aquifers may be recharged either by infiltration or injection.

Secondary treated effluent is generally suitable for recharge via infiltration as the infiltration process provides further filtering. As recharging by injection does not receive this pre-treatment of infiltration, it requires treatment to near drinking water quality. Possible contamination of ground water is an important issue to be considered.

C12.4.8: POTABLE RE-USE

Health authorities in Australia do not favour potable reuse due to concerns about the risk to public health. Potable reuse has not been approved by Australian health authorities and there is currently no clear process for such an approval to take place. Therefore, potable reuse is regarded as a future opportunity, rather than a presently available option.

C12.4.9: ON-SITE RE-USE

Where an activity generates wastewater and has a market for reclaimed water, the most logical point for treatment is on-site. This provides the water users with the dual benefits of saving on raw water costs and on sewage discharge costs.

C12.5: CONCLUSIONS

There are a range of benefits that can accrue by the judicious re-use of water reclaimed from Wastewater Treatment processes, including economic returns from irrigated agriculture and the potential conservation of potable water supplies via urban re-use.

C13: GROUNDWATER USE

C13.1: INTRODUCTION

Many communities and rural properties would not exist without adequate, reliable groundwater.

Groundwater in the broad sense is all water which occurs within the 'hydrologic cycle' below the land surface. It is a pervasive resource, interacting with the land surface, streams and lakes, but because it occurs below the earth's surface, its occurrence and movement are generally poorly understood.

Groundwater plays a significant role as a resource which is necessary to sustain life; either as a source of water for human use or as water which helps sustains life in surface waters such as streams and wetlands in dry periods. In the broader context, it also forms a major component of many water supply systems where aquifers are used as sole water supply sources or to balance surface water surpluses and deficiencies. Underlying each of these uses is the economic value of groundwater, particularly where it forms a resource which would need to be replaced, at some cost, should that groundwater become polluted.

C13.2: GROUNDWATER AS A WATER SOURCE

Groundwater is commonly used as a source of domestic, recreational, rural and industrial water in Australia. Groundwater availability is for many rural people the reason for their existence in their current location and enterprise.

For example, many agricultural industries have developed in isolated areas due to the availability of good groundwater sources. These industries vary from pastoral activities in western Queensland to grape growing in South Australia. The development of these parts of the Australian landscape is directly linked to groundwater.

In fact, about 18% of Australia's total water use is derived from groundwater sources.

C13.3: SOME FEATURES OF GROUNDWATER

- The extent of the resource is often difficult to specify;
- The quality of groundwater can be directly affected by overdrawing on the aquifer's water;
- The flow of contaminants to an aquifer may take years or decades before being noticed;
- The cleansing of the water in aquifers is often slow and contaminants can accumulate quickly and
- The cost of cleaning up groundwater, once polluted, is often extremely high, if indeed it is technically possible

C13.4: GROUNDWATER CONTAMINATION SOURCES

Typical groundwater contamination sources include:

- Industrial effluent and manufacturing wastes;
- Leaking underground storage tanks and pipelines;
- Landfill stockpiles or contaminated soil producing leachate;
- Intensive agricultural fertiliser and pesticide use or waste generation;
- Contamination from septic tanks and from sewage and wastewater lagoons;
- Mining industry processes and wastes;
- Contamination from wells;
- Urban stormwater;

- Atmospheric fallout;
- Inter aquifer contamination by alteration of flow;
- Fire fighting accidents;
- Emergency response wastes during and after chemical fires and
- Energy generation and town gas sites

In addition, contamination incidents due to accidental spillage are a concern throughout Australia.

C13.5: GROUNDWATER USE CATEGORIES

Groundwater may be used beneficially for a number of purposes, including:

- Ecosystem protection;
- Recreation and aesthetics;
- Raw water for drinking water supply;
- Agricultural water and
- Industrial water

C13.6: GROUNDWATER QUALITY

The quality of water in aquifers can be highly variable. Contaminants can include:

- Salinity (measured as Total Dissolved Solids);
- Iron (and other heavy metals);
- Pesticides and herbicides;
- Petroleum hydrocarbons;
- Nitrates;
- Ammonia;
- Sulphur compounds and
- Solvents.

C14: WATER SENSITIVE URBAN DESIGN

C14.1: INTRODUCTION

Water sensitive urban design (WSUD) is an integrated approach to incorporating water management systems into buildings, urban transport routes and public open spaces.

It is based on the principles of water efficiency and reuse, and, more importantly, it treats water as a resource rather than a waste product.

The aim is to combine land use planning with water cycle management during the planning stage of a project, as opposed to at the end of the planning process.

WSUD can create new solutions and efficient systems that are more attractive to prospective purchasers, increase the value of adjacent land and avoid or defer expensive new infrastructure or augmentation costs.

C14.2: DESIGN FEATURES & OBJECTIVES OF WSUD

New urban developments should be based on water sensitive design principles; aimed at minimising the impact of the development on the total water cycle and maximising the multiple use benefits of the stormwater system.

Objectives & associated design features of WSUD can include:

- Preservation of existing topographic & natural features, including water courses & wetlands;
- Protection of surface water & groundwater resources;
- Integration of public open space with stormwater drainage corridors, maximising public access, passive recreational activities and visual amenity;
- Balancing the water demands of a site/development with the available water supply;
- Managing the water balance - utilising grass swales, absorption pits, infiltration trenches, retention/retention basins;
- Maintaining or enhancing water quality - utilising gross pollutant traps, oil & grit separators, water pollution control ponds, sediment traps, wetlands etc;
- Encouraging water conservation - by utilising rainwater tanks, stormwater reuse, grey water/effluent reuse;
- Protecting & enhancing natural water systems - utilising trash racks, constructed wetlands etc and
- Improving aesthetic design elements, incorporating social & ecological objectives - using grass swales, reed beds, constructed wetlands etc

Typical urban designs increase stormwater runoff by 30% or more, because of the high proportion of impervious surfaces. WSUD provides a balance between infiltration & runoff which is closer to the pre-development balances. WSUD & building design, which better control & manage the flow & retention of stormwater in the urban landscape will reduce garden & landscape water use needs, at little or no extra cost.

C14.3: PRINCIPLES & TECHNIQUES

The broad principles of water sensitive urban design include:

- Minimising impervious areas;
- Minimising use of formal drainage systems (e.g. pipes);
- Encouraging infiltration (where appropriate) and
- Encouraging stormwater reuse.

Water sensitive urban design principles can be adopted at a range of development scales, including:

- The overall extent of proposed development areas;
- The road and block layout within a development and
- Development forms on individual blocks.

Potential water sensitive design techniques include:

- Inclusion of natural habitats (e.g. watercourses) within the development area, primarily within open space areas. This includes the provision of buffer zones adjacent to watercourses and other water bodies;
- Integration of major (above ground) stormwater systems as positive features within the urban design rather than purely functional elements to be 'hidden' (e.g. avoiding back fences adjacent to drainage reserves);
- Adoption of water sensitive road development standards. These can include reduced pavement widths and the use of grass swales in place of kerb and gutter and piped stormwater drains;
- Use of compact development forms. For example, reducing individual block sizes and increasing communal open space (and stormwater drainage) areas to achieve the same density as a standard residential development and
- Water sensitive car park design. This can include substitutes for impervious surfaces such as pavers or reinforced grass, particularly in infrequently used parking areas. Runoff can also be managed by grass swales instead of kerb and gutter and piped drainage systems. Infiltration of runoff can also be considered.

D: DEMAND MANAGEMENT IMPLEMENTATION

The advice in Section C above provides detail on options for Council to consider when implementing a program of demand management.

Given YSC is well into this work, advice regarding the cost benefit of further activity and a recommended implementation schedule is below.

D1: OPTIONS ASSESSMENT FOR FURTHER ACTIVITY – COST BENEFIT ANALYSIS

D1.1: METHODOLOGY

Each of the options outlined in Table 14 has been rated in terms of social, environmental, economic and governance where a rating of 1 is low and a rating of 5 is high. Explanations for each ranking are provided. Ratings have been undertaken in consultation with staff at YSC. Governance has been included given that LWU in NSW have a leadership role in their communities as they are typically imbedded in the community through the local Council. This is the case with YSC.

Rankings for social, environmental, economic and governance were determined using the following criteria:

- Social: community acceptance, savings to the community, building community capacity and resilience;
- Environmental: reduction in water and energy use, increase in storm water run-off and water back to the environment;
- Economic: reduced costs to Council in terms of energy use and the environment as well as consideration of the expenditure of the suggested option and
- Governance: the option demonstrates YSC is leading by example and or acting, is engaging with its community and or is demonstrating leadership as a manager of water and sewerage operations including through compliance with State and Federal legislation and initiatives.

D1.2: ASSUMPTIONS REGARDING COSTS, SAVINGS AND MARKET PENETRATION OF OPTIONS

It should be noted that the Demand Side Management Modelling Guidelines developed by NSW Office of Water provide guidelines values regarding costs, savings and market penetration regarding options to reduce demand. These guidelines are provided in Table 14. These have been discussed with stakeholders at Young Shire Council in the context of the experience particular to the lga and this advice then informs the cost benefit analysis below in Table 15.

Description	Assumed Market Penetration	Assumed potable water Savings	Assumed Implementation Costs
Residential Retrofit Program Upon request, a Council approved plumber would install a retrofit kit in existing family residential housing. The kit could contain a low-flow showerhead, tap flow restrictors, and a cistern weight for older style toilets. Leaking taps would be repaired.	15% of residential customers over a three year period.	For showerheads: Based on average use volumes for each type of shower 5% of participants in the program are free-riders. For taps: 20% reduction in Taps/Sink uses per account. For leakage: %5 reduction lasting for 5 years.	For showerheads: $100 cost to utility per showerhead retrofitted. For leakage: $5 cost to utility per account.
National Mandatory Water Efficiency Labelling Scheme 2005 saw the introduction of a mandatory Water Efficiency Labelling Scheme (WELS) for toilets, washing machines, shower roses, taps, urinals and dishwashers.	Assumed to impact on SFR and MFR customers only: Increase the uptake of efficient washing machines by 5% and low flow showerheads by 15%. No impact assumed on toilets because the level of participation in the existing voluntary scheme is high.	Based on average use reductions of: 20% for taps; 30% for dishwashers; 30% for washing machines; and 30% for efficient showerheads.	Costs to utility - to enhance and promote scheme: Setup - $3,000 plus 20 cents for each person in the supply area. Annual outlay - $500 plus 5 cents for each person in the supply area.
Rainwater Tanks on all new Residential Development All new residential development would fit a rainwater tank. Rainwater to be supplied for toilet flushing, cold water to the washing machine and outdoor use.	100% of new residential customers from 2006. 10 year pump life.	60% reduction in targeted water uses under average conditions, zero under peak conditions.	Cost of installation is $2,500 per account (utility or household). $30 per year per customer for operation.
Dual Reticulation for New Subdivisions All new subdivisions to be fitted with dual reticulation systems with recycled water to be used for toilet flushing and irrigation.	90% of all new residential developments (assume 10% are infill and therefore not suitable for supply with dual reticulation).	100% reduction in targeted end uses.	$3,000 net per account for additional costs of dual reticulation.
BASIX – Fixture Component The NSW Government's BASIX program will be implemented.	90% of new residential accounts complying.	20% reduction in use in showers, taps and sinks and outdoor use. The DSS then has two options for meeting the BASIX requirements – dual reticulation on all new development or rainwater tanks on all new development (see above).	Costs to utility: Setup - $10,000 plus 20 cents for each person in the supply area. Annual administration/enforcement $3,000 plus 5 cents for each person in the supply area. Cost to community (excluding rainwater tank and/or dual reticulation costs): $10 additional for low flow showerhead. $10 for tap flow regulators. $100 for water efficient planting/landscaping.
Community Education Council would provide materials, training and technical	20% of all customers in each customer category influenced	Water savings vary dependent on the customer category and end use.	Costs to utility: Setup - $10,000 plus 20 cents for each person in the

assistance to implement a comprehensive ongoing community education program.	by the community education effort.		supply area. Annual administration, $3,000 plus 5 cents for each person in the supply area.
Permanent Restriction on Water use Council would introduce a water waste regulation that would: prohibit irrigation during the times of the day with the highest evaporation; mandate the use of trigger nozzle when washing cars; and prohibit irrigation that fell on hard surfaces or hosing down of footpaths or driveways.	50% of all customers would adhere to the regulation.	10% reduction in external use in participating customers.	Cost to utility: Setup - $10,000 plus 20 cents for each person in the supply area. Annual administration/enforcement - $2,000 plus 5 cents for each person in the supply area.
Inclining Block Water Pricing Structure Council would introduce an inclining block tariff for single family residential customers. The increase would result in an effective 50% increase in price for residential external use and no change in price for internal use.	All customers would be affected.	Price elasticity for external use is – 0.2.	Costs to utility: Setup only - $5,000 plus 20 cents for each person in the supply area.
Active Leak Detection and Repair Instead of more passive approaches where leaks are fixed when reported, councils would take a more active role by actually searching for and repairing leaks in the supply system.	Leakage assumed to be half of all NRW. One third of the system targeted each year for leak detection and repair.	Reduces leakage by 75% in targeted areas upon completion of work. Impact of leakage reduction effort will last 3 years.	Leak detection and repair assumed to be carried out over 10% of system each year. $280/km detection cost. $230/km repair cost.
Non Residential Water Audits This measure allows for water audits for non-residential customers.	10% of non residential customers participating.	10% saving in non-leakage consumption per customer 75% reduction in customer leakage – but savings only last 2 years.	Costs to utility: Setup - $5,000 plus 20 cents for each person in the supply area. Annual administration/enforcement - $1,000 plus 5 cents for each person in the supply area. $300 cost to each customer for implementation of audit recommendations.
Evaporative Cooling Unit and Cooling Tower audit This measure allows for water audits for evaporative cooling units and cooling towers for both residential and non-residential customers.	4% of customers participating in any one year.	20% reduction in cooling uses. Measure life of 5 years.	Costs to utility: Setup - $5,000 plus 20 cents for each person in the supply area. Annual administration/enforcement - $1,000 plus 5 cents for each person in the supply area. Cost to each customer for implementation of audit recommendations: $100 for residential $300 for non-residential.

Table 13 Demand Side Management Modelling Guidelines developed by NSW Office of Water regarding costs, savings and market penetration regarding options to reduce demand

D1.3: COST BENEFIT ANALYSIS

Table 14 below provides advice on the cost benefit of options for reducing demand and has been developed in consultation with YSC stakeholders giving consideration to:

- Best Practice Guidelines;
- The specifics of demand in Young Shire, for example the significant usage by a smaller number of commercial operators and
- Opportunities for collaboration through the Centroc Water Utilities Alliance.

This advice then informs the implementation schedule at Table 15.

The ranking of the QBL in Table 15 is as follows:

First priority actions with scores of 20:
- Education in Water Conservation
- Non-Residential Audit
- Council operational improvements including System Water Loss Management
- Residential washing machine rebate

Second priority actions with scores of between 15 and 20:
- Residential Retrofit
- BASIX
- Council rainwater tank promotion
- Permanent Low Level Water Conservation Measures (Outdoor)
- WELS

Thirds priority action with a score below 15:
- Audit of evaporative cooling

Option		Description	Implementation Assumptions	Social	Environmental	Economic	Governance
1	Residential Retrofit	Replacement of inefficient shower heads, taps and sinks with more flow-efficient fixtures. The program includes supporting customers in replacing fixtures and fittings.	Program delivered through the CWUA as part of a $5000 per annum campaign including bill inserts and an advertising campaign.	5 – Savings to community and increase in community capacity/resilience.	3 – some reduction in water and energy use. Showers – water efficient showers reduce water use by approximately 40% The use of flow regulated taps reduces water use by 10%	5 – Savings to YSC in energy bills. Reduction in need for future infrastructure augmentation. Costings for the program through the CWUA are reduced through regional procure.	5 – YSC works directly with its community and shows leadership.
2	WELS	Continuation of the Federal Government's Water Efficiency Labelling and Standards Scheme (WELS).	Program promoted through usual Council channels with review by CWUA for value add. Increase in the market share of front loading washing machines by 10%.	5 – Community understand and accept program.	3 – some reduction in water and energy use. 36% reduction in water use in front loading machines.	4 – Savings to community in energy and water bills.	3 – Linkage to existing Federal Program shows good governance.
3	Permanent Low Level Water Conservation Measures (Outdoor)	Enforcement of permanent restrictions on outdoor water use.	50% of customers comply with restrictions.	3 - Savings to community and increase in community capacity/resilience. May be issues in community acceptance and generation of community conflict and "water vigilantism."	5 - 5% reduction in outdoor water use for participating customers. Corollary reduction in energy use for pumping water. Increase in stormwater runoff.	4 - Savings to YSC in energy. Reduction in need for future infrastructure augmentation. Compliance with program will have costs. There may be some value in considering in considering compliance with the CWUA looking at this initiative in the context of other compliance based roles eg in waste water.	4 – may be issues in for YSC from a social perspective.
4	BASIX	Continuation of the State Government's BASIX program for new developments.	Baseline assumptions – number of households with water efficient fixtures are: Showers: 27% Taps: 25% Toilets: 60% Increases to 80% under BASIX regulations.	5 - Good community acceptance of the program.	5 - 40% reduction in shower usage 10% reduction in tap usage ~50% reduction in toilet usage Corollary energy savings and storm water runoff.	5 - Savings to YSC in energy. Reduction in need for future infrastructure augmentation	3 – Linkage to existing Federal Program shows good governance.

			Relapse rate driven by return to baseline market for fixtures and appliances. 100% of new dwellings install rainwater tanks.				
5	Education in Water Conservation	Continuation or expansion of water conservation education programs aimed at improving efficiency in water use.	50% of customers recognise and response to programs where the target users are residential. Campaign through Save Water and the CWUA with review for value add.	5 – Savings to community in water and energy bills. increase in community capacity/resilience.	5 -2% reduction in residential use for water with corollary energy consumption reduction.	5 – Savings to YSC in energy bills. Reduction in need for future infrastructure augmentation. Costings for the program through the CWUA are reduced through regional procure.	5 – YSC works directly with its community and shows leadership.
6	Non-Residential Audit	Audit of water use in non-residential properties with a focus on the commercial sector. The purpose of the audit is to identify leaks and potential areas for improvement in water efficiency.	High water using customers participate in program – typically use 4 times the amount of water of the average customer. 25% of commercial users (approx. 15) participate in audit.	5 – Savings to community in water and energy bills. increase in community capacity/resilience.	5 -20% reduction in water use for participating customers. Corollary energy consumption reduction.	5 – Savings to YSC in energy bills. Reduction in need for future infrastructure augmentation. Costings for the program through the CWUA are reduced through regional procure.	5 – YSC works directly with its community and shows leadership.
7	Council operational improvements including System Water Loss Management	Includes: leak detection and repair pressure monitoring Council buildings retrofit review of Council policy and operations to reduce water use	Where possible this work is undertaken with support through the CWUA eg. Regional procure of leak detection and repair program and regional approach to policy review.	5 – Keeping rates to a minimum through reduced water losses. Community value of program high.	5 – While losses are currently estimated at 5.7% - further work in both understanding losses and improving performance will improve this already good outcome. Corollary energy consumption reduction and storm water outcomes.	5 – Savings to YSC in energy bills. Reduction in need for future infrastructure augmentation. Costings for the program through the CWUA are reduced through regional procure.	5 – YSC leads by example.
8	25:75 Fixed to Variable Charge Ratio	YSC is implementing Best Practice pricing. 2011/2012 pricing was 34:66	Ongoing work to ensure the water business viability with the current pricing structures, especially as water consumption is reduced as a result of other demand management measures.	Being implemented.	Being implemented.	Being implemented.	Being implemented.
9	Residential	YSC promotes scheme	Increase in the market share of top	5 – Savings to	5 -2% reduction in residential	5 – Savings to YSC in	5 – YSC works directly

	washing machine ,rebate	as part of its community education program and other existing communication mechanisms.	loading washing machines by 10%.	community in water and energy bills. increase in community capacity/resilience.	use. Corollary energy consumption reduction.	energy bills. Reduction in need for future infrastructure augmentation. Costings for the program through the CWUA are reduced through regional procure.	with its community and shows leadership.
10	Council rainwater tank promotion	YSC promotes the value of rainwater tanks	Increase of installation of rainwater tanks by 2% per annum.	5 – Savings to community and increase in community capacity/resilience.	3 – some reduction in water and energy use depending on the uptake of rainwater tank installation.	5 – Savings to YSC in energy bills. Reduction in need for future infrastructure augmentation.	5 – YSC works directly with its community and shows leadership.
11	Audit of evaporative cooling	YSC gives consideration to being part of a regional audit of evaporative air conditioners.	There would need to be a perception regionally that this is worthwhile as YSC provide advice it is not a significant issue for their lga.	2 – Not an issue for the lga.	2 - negligible	2 - negligible	2 - negligible

Table 14 Cost Benefit Analysis

D2: SCHEDULE FOR IMPLEMENTATION

Based on the cost benefit analysis and the QBL ranking undertaken above, the following schedule for implementation is recommended.

Schedule of recommended action for implementation of the demand management plan		
Existing programming extension		
Action	Steps	Timing
Permanent Low Level Targets for Water Conservation	• Develop targets and promote – consider regional support through the Centroc Water Utilities Alliance (CWUA). • Include in this program advice on water saving targets linked to demand forecasting.	Ongoing
WELS and Basix	Promote - consider regional support through the CWUA.	Ongoing
Community education with Savewater Alliance	Engage in CWUA Savewater programming and give consideration to specific value adding activities in Young.	Ongoing
Council policy review	Recommend to the CWUA a review of policy, procedure and staff training for Council activities with a focus on • Parks, and gardens management; • Verge and round-abouts management; • Management of breaks and repairs and • Water use and retro-fitting for Council facilities.	Ongoing with annual review
Continue and expand the YSC water supply system's current Non Revenue Water (NRW) and leakage volumes	• Undertake a hydrological assessment including pressure testing; • Review/determine the YSC water supply system's current NRW and leakage volumes; • Review consumption records to ensure all metered records are included; • Review customers to ensure all billed unmetered volumes are excluded from the NRW volume (e.g. retirement villas); • Estimate the volume of unmetered consumption; • Estimate the annual leakage volumes by reviewing the annual water balances and • Undertake simple system monitoring e.g. night time flows, to confirm the current level of leakage.	2012 – 2013 2013-2014
New programming		
Action	Steps	Timing
Develop and implement a Council owned infrastructure retrofit program	• Identify priority programming and • Develop a program of implementation referring to the CWUA where possible.	2012 – 2013 2013-Ongoing
Scope the need for water conservation work to be targeted at users of evaporative water air conditioners	• Request a scoping study be undertaken by the Centroc Water Utilities Alliance identifying the usage of evaporative water air conditioners in the region.	2012-2013
Assuring compliance with the NOW best practice guidelines		
Action	Steps	Timing
Ensure data integrity including for population in the township of Young bulk water meter data	• Undertake data collection for the population serves by the reticulated supply and • Ensure metering of bulk water terminal supply.	2012-2013

Ensure all new free standing and multi-unit residential developments (both strata and non-strata) approved after 1 July 2004 are separately metered	• Complete the metering backlog for all new free standing and multi-unit residential • developments (both strata and non-strata); • Separately meter the remaining free standing residential premises and • Complete metering of the remaining free • standing residential premises.	2012-2013
Update customer classifications in accordance with the 8 categories defined in the latest NSW Water Supply and Sewerage Performance Monitoring Report and ensure matching pricing policy.	• Add new customer categories to billing database and review all customers to ensure they have been classified with the correct category; • Report consumption by the 8 customer categories and • Ensure all classifications are considered in pricing policy.	2012-2013
Monitoring and Review		
Action	Steps	Timing
Monitor and review Demand Management Plan effectiveness.	• Implement recommendations associated with monitoring in this Demand Management Plan; • Continue ongoing monitoring of demands and demand management measure activities and • Review the DMP in two years to update demand analysis and forecasts for new information and to ensure that YSC has an appropriate balance between demand and supply-side investment.	Ongoing with review due 2014

Table 15 Recommended implementation schedule

E: REFERENCES

Australian Bureau of Statistics, Water Account, Australia (various years)

Australian Bureau of Statistics, Water Account, Australia 2000 -01, Catalogue 4610.0

Australian Bureau of Statistics, Household Water Use & Effects of the Drought, July 2005

Australian Government, Water for the Future, Urban Water Use, 2003

Birrell, Rapson and Smith for the Water Services Association of Australia, Impact of Demographic Change and Urban Consolidation on Domestic Water Use, 2005

Bureau of Meteorology, Climate Statistics for Forbes (www.bom.gov.au/climate/averages)

Coombes P.J., M. Thyer, A. Frost, G. Kuczera and I. Grimster (2003). Development of stochastic multisite rainfall and urban water demand for the Central Coast Region of New South Wales. 28th Hydrology and Water Resources Symposium. Engineers Australia. Wollongong. NSW.

Coombes P.J., 2004. Development of Synthetic Pluviograph Rainfall Using a Non-parametric Nearest Neighbourhood Scheme. WSUD2004 conference. Adelaide.

Coombes P.J., 2006. Integrated Water Cycle Modelling Using PURRS (Probabilistic Urban Rainwater and wastewater Reuse Simulator). Urban Water Cycle Solutions.

Coombes P.J., (2002). Rainwater tanks revisited – new opportunities for urban water cycle management. PhD thesis. University of Newcastle. Australia.

Coombes P. J., G. Kuczera and J.D. Kalma, 2000. A behavioural model for prediction of exhouse water demand, 3rd International Hydrology and Water Resource Symposium, 793-798, Perth, Australia.

Coombes P.J., and M.E. Barry, 2006. The effect of time steps and average assumptions on the continuous simulation of rainwater harvesting strategies. Water Science and Technology. IWA Publishing. London.

Coombes P.J., G. Kuczera, J. D. Kalma and J. R. Argue (2002). An evaluation of the benefits of source control measures at the regional scale. Urban Water. London.

CSIRO (2007) Climate change in the Lachlan and Central West Catchments.

Department of Energy, Utilities and Sustainability, Water Demand Tracking and Climate Correction, May 2002 (as revised in 2006)

Department of Water and Energy, TBL Performance Reports, Water Supply & Sewerage 2006/07and 2007/08

Department of Water and Energy, Demand Side Management Decision Support System (Simplified Version S1.1, July 2006)

Detection Services Pty. Ltd., Water Loss Audit & Leak Detection, Feb., 2009

Economics@ANZ, Australia's Water Supply, Consumption and Regulation – Water Use & Regulation 2007

Frost A.J., Mehrota R, Sharma A and Srikanthan R. (2006). Comparison of statistical downsizing techniques for multi-site daily rainfall conditioned on atmospheric variables for the Sydney Region. Proceedings of Water Down Under. Engineers Australia. pp. 471 – 482.

Institute for Sustainable Futures, University of Technology, Sydney, Guide to Demand Management, undated

IPART, Residential Water Use in Sydney, the Blue Mountains & Illawarra, Research Paper No. 26, Sydney, 2004

Kuczera G., and W.S. Ng (1994). Stochastic economic approach to headwork's augmentation timing. Research Report 72. Urban Water Research of Australia.

Loh, M & Coghlan, P; Domestic Water Use Study in Perth, Western Australia, 1998 – 2001, Water Corporation, Perth, 2003

MWH, Centroc Water Security Study (CWSS), (Report No. A1160801), October 2009.

MWH, Young Shire Council Draft Integrated Water Cycle Management Evaluation Study, (Report No. A1295700), April 2012

National Water Commission, Water Use in Australia 2008

Water Services Association of Australia, Water Wise Management: A Demand Management Manual, 1998

Young Shire Council, Management Plans 20010/11 & 2011/12

Young Shire Council, Water & Sewerage Budgets, 2011/12

Young Shire Council, Sewerage Treatment Plant Augmentation Report

Young Shire Council, Annual Report 2010/11

F: DEFINITIONS

(Source: Department of Water and Energy, Demand Side Management Decision Support System (Simplified Version S1.1, July 2006))

Benefit cost Ratio is the ratio of total benefits and costs arising from a demand management effort. Benefits include reductions in treatment and transfer costs and windfalls from the delay and downsizing of capital works projects (lower demands means smaller infrastructure). Costs include the cost of implementation incurred by the water utility for planning, administration and education campaigns and additional investment required by the utility and customers for water efficient fixtures and appliances, water loss management and recycled water and rainwater harvesting infrastructure.

End Use Model is the term that describes a model that looks to take account of the impact of different water conservation and source substitution on the volume of water used in different end uses and then aggregates these savings into an estimate of the total potential water to be saved.

End use refers to a specific use of water that can be identified within a specific customer category. Toilet use in residential accounts is one example of an end use, cooling system use in commercial would be another.

External Use refers to water used externally in irrigation and cooling towers.

Internal Use refers to water used internally in buildings and would also encompass any other water consumption that is not influenced by climate. This demand is assumed to remain unchanged by seasonal effects during the year.

A Measure is a single water conservation or source substitution initiative. For example, a residential retrofit program would be considered a single measure as would a code requiring water efficient fixtures for all new development.

Per Capita Demand is the water demand per capita of the resident population served with water.

A Scenario is a group or bundle of individual conservation or source substitution measures.

System Loss or Leakage refers to water that escapes from the reticulation system.

Total Community Benefit Cost Ratio is the ratio of the combined benefits and costs of the utility and customers. This total community perspective provides an overall assessment of cost-effectiveness given that savings costs and savings accrued by the utility are ultimately passed onto consumers through rates and charges.

Unaccounted for Water refers to the difference between metered water consumption and production. Strictly speaking a system with no metering of consumption would have 100% unaccounted for water.

Utility Benefit Cost Ratio is the ratio of the benefits and costs from the perspective of the water utility. These benefits and costs do not include the costs to customers of additional investment in water efficient fixtures and appliances and source substitution, nor benefits arising to customers from hot water savings.

Water Consumption is assumed to refer to all water passing from reticulation mains into customer's service lines.

Water Supplied is assumed to refer to water passing through bulk meters and treatment facilities into the reticulation system.

G: YOUNG STATUS AGAINST NOW 2007 BEST PRACTICE MANAGEMENT CHECKLIST FOR DMP'S

Topic	Outcome Achieved	Status
Demand Monitoring	A. Bulk water production metered and recorded on a daily basis.	Recommend bulk water metering and terminal supply.
	B. All new free standing and multi-unit residential developments (both strata and non- strata) approved after 1 July 2004 must be separately metered.	Currently implemented will need backlog review..
	C. All free standing residential premises must be separately metered by 1 July 2007.	Currently implemented will need backlog review..
	D. LWUs should encourage separate metering of existing multi-unit residential developments where cost-effective.	Currently implemented will need backlog review..
	E. Customer water consumption billed at least three times a year (and preferably quarterly).	Bills are quarterly
	F. Customers classified in accordance with the categories defined in the latest NSW Water Supply and Sewerage Performance Monitoring Report (2009/10 categories: Residential, Commercial, Industrial, Rural, Institutional, Bulk sales, Public Parkes and Unbilled) and consumptions reported annually.	No, Young needs to amend their reporting categories
	G. If facing augmentation of the peak day capacity of your system, monitor and record service reservoir levels on a daily basis in high demand periods	N/A - Young is supplied bulk water by Goldenfields
Demand Forecasting	A. Historical records corrected for influence of climate.	Yes
	B. Data records screened for errors.	Yes
	C. Demand forecasts prepared for each customer category as well as for leakage and unaccounted for water (UFW).	Yes
Demand Management Planning	A. Examined a range of long-term demand Management measures including: • Retrofit programs • Rebates for water efficient programs • Rebates for rainwater tanks • Rebates for garden mulch • Effluent and stormwater re-use programs	Yes
	B. Completed benefit/cost analysis of demand management measures that includes benefits from reduced capital works and lower operating costs.	Yes
	C. Completed investment schedule/plan for implementing cost-effective demand management measures.	Schedule provided will require more work in costings. Much of this is being undertaken by the CWUA and comes at cheaper rates than those provided by the NOW DSS
Implementation	A. Subsidised and promoted at least two of the identified demand management initiatives referred to in Demand Management Planning A above	See schedule of implementation.
	B. Examine the implementation of permanent water saving measures to minimise wastage, in accordance with Item 91(iii) of	Yes – See advice in Demand

	the National Water Initiative.	Management Plan
	C. Implement a cost effective leakage reduction program to reduce system water losses.	Current UFW – mostly leakage at 5.7%. See advice on improving operations in implementation schedule.
	D. Ongoing customer education campaign focussing on the importance of conserving our valuable water resources.	Yes, Savewater Alliance.
	E. If average residential water use per property exceeds that for the median NSW utility (290 kL/a in 2002/02) by over 20%, the LWU must show progress towards achieving a reduction in average residential use by 1 July 2007.	UFW – mostly leakage at 5.7%
	F. Monitoring program for reviewing the effectiveness of the implemented demand management measure	See implementation schedule.