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# Singleton Council

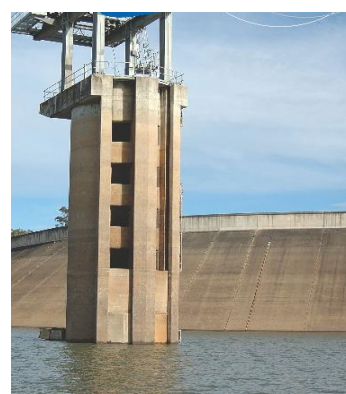
## Integrated Water Cycle Management Plan

### Evaluation Study

## APPENDICES

### - Technical & Supporting Information

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**June 2010**

DLM Environmental Consultants Pty Ltd  
*Strategies for a Water Efficient Future*

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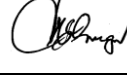
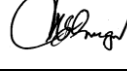
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## **Appendices**

**Appendix A: Urban Water Services in Singleton**

**Appendix B: Singleton System Boundaries**

**Appendix C: IWCM Related Targets, Obligations, Responsibilities & Requirements**

**Appendix D: Demand Management & Projections**

**Appendix E: Information & Data Assessment**

**Appendix F: IWCM & Other Issues**

**Appendix G: Project Reference Group – Minutes of Meeting**

**Appendix H: Glossary & Abbreviations**

# **APPENDIX A**

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## **URBAN WATER SERVICES IN SINGLETON**

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## **1A. GENERAL**

Singleton Shire covers an area of 4,893 square kilometres and services a shire wide population of 21,936 (2006 Census).

The Town of Singleton itself has a population of over 13,600, is located in the centre of the Hunter region of NSW, and is 200 kilometres to the North West of Sydney. Some small towns and villages within the Shire include Broke, Jerrys Plains, Bulga, Ravensworth, Mount Olive, Belford and Branxton.

The Shire is noted both for coal mining (18 mines produce approximately 70 million tonnes of coal per year), 2 large power stations and a growing wine and tourism industry.

### **Water Supply**

Council provides water supply services to a population of 17,919 (6,628 assessments; Source: 2008/09 Performance Report), with potable supplies to Singleton, Jerrys Plains, Broke, Mount Thorley and the Army Camp. Raw water is sourced from the Hunter River via Glennies Creek Dam.

The Singleton potable water supply system comprises:

- Obanvale WTP: (Direct Filtration): (Capacity: 30 ML/d)  
The Water Treatment Plant was built in 1993
- 8 Service Reservoirs: (Capacity: 25 ML)
- 6 Pump Stations: (Capacity: 28.9 ML/d)
- 97.3 Kms of transfer and trunk supply mains
- 162.2 Kms of trunk reticulation mains.

### **Sewerage**

Council provides sewerage services to a population of 15,009 (5,559 assessments; Source: 2008/09 Performance Report).

Council operates one sewage treatment plant, with the following characteristics:

- ✧ Intermittent Extended Aeration Activated Sludge Plant
- ✧ Built in 1998
- ✧ Capacity: 20,000 EP
- ✧ Discharge (under EPA Licence No. 3088) to Doughboy Hollow, adjacent to the Hunter River.



The overall sewerage system also comprises:

- 14 Pumping Stations (Capacity: 9.1 ML/d)
- 19 kms of Rising Mains
- 116 kms of Gravity Trunk Mains and Reticulation.

[Schematic Drawings of the Singleton Water Supply and Sewerage Systems are included as Appendices in Volume 2: Attachment B: System Boundaries].

## 2A. CATCHMENT PERSPECTIVE

### a. Location

Singleton LGA is located in the Hunter – Central Rivers Catchment.

The predominant industry in Singleton Shire is coal mining, but tourism, wine production, manufacturing and support industries are also significant employers.

The Hunter Central Rivers catchment covers an area of 22,000 km<sup>2</sup>, and has a population of more than 350,000.

The locations of the principal towns in the Singleton LGA as well as Lake St. Clair (Glennies Creek dam) are shown in Figure A1 below. A satellite image of the area is presented in Figure A2. This image highlights the Hunter River, the location of the Water Treatment Plant and the Sewage Treatment Works.



Figure A1: Principal Towns in Singleton LGA

(Source: NSW LGA)



Figure A2: Satellite Image of Singleton  
(Source: Google Earth)

## b. Climate

Key climate characteristics for Singleton are summarised in Table A1: below:

**Table A1: Climate by Month**

Month	Mean Daily Maximum Temp. (°C)	Decile 9 Max. Temp. (°C)	Mean Daily Minimum Temp. (°C)	Mean Monthly Rainfall (mm)	Lowest Recorded Rainfall (mm)	Daily Evaporation (mm)
January	31.7	37.9	17.1	76.9	0 (1903)	220
February	30.9	36.6	17.1	72.5	0 (1940)	168
March	28.9	33.7	15.0	59.1	0 (1909)	155
April	25.3	29.8	10.9	44.1	0 (1980)	120
May	21.3	25.0	7.5	40.4	0 (1957)	90
June	18.0	21.0	5.3	47.6	2.3 (1953)	60
July	17.4	20.2	3.8	43.3	0.3 (1972)	71
August	19.4	23.3	4.4	36.4	0 (1982)	81
September	22.9	27.9	7.0	41.7	0 (1980)	111
October	26.3	31.7	10.3	51.9	1.4 (1988)	164
November	29.2	35.3	13.2	59.8	1.0 (1915)	195
December	31.3	36.7	15.7	67.7	0 (1884)	205
<b>Annual</b>	<b>25.2</b>	<b>-</b>	<b>10.6</b>	<b>641.4</b>	<b>234.2 (1950)</b>	<b>1640</b>

(Source: Bureau of Meteorology –Jerrys Plains & Cessnock Weather Stations)

Rainfall is relatively low; at an annual average of 641 mm. The wettest months are January and February, although rainfall is reasonably consistent from October to March. The lowest rainfall month is August. Average annual evaporation exceeds annual rainfall by almost 1000 mm annually. The data presented is long term (1884 to 2009).

It should also be noted that:

- The lowest annual rainfall of 234.2 mm (1950) is only 36.5% of the long term (125 years) annual average of 641.4 mm.
- There are 8 months where, historically, no rain has been recorded.
- Average annual evaporation exceeds rainfall by nearly 1,000 mm per year.

Climate data for the 12 months from January 2009 to December 2009 is presented for comparison in the Table below.

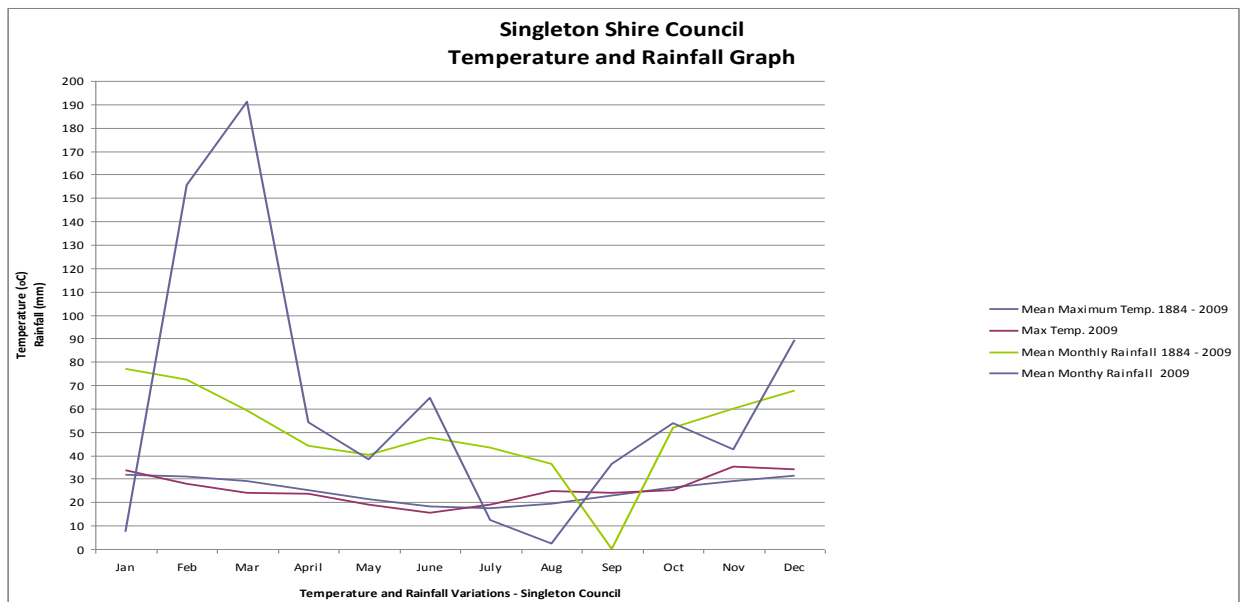
It is interesting to note that 2009 was cooler than the long term averages (6.7% lower mean maximum temperatures), but much warmer overnight – 16.4% higher mean daily minimum temperatures than the long term mean.

Rainfall was also significantly higher (16.5%) than the long term mean.



**Table A2: Recent Climate Data (2009)****RECENT DATA (2009)**

Month	Mean Daily Maximum Temp. (°C)	Mean Daily Minimum Temp. (°C)	Mean Monthly Rainfall (mm)
January	33.7	17.9	7.4
February	27.7	17.0	155.6
March	24.0	16.1	191.1
April	23.7	11.4	54.1
May	19.0	9.2	38.3
June	15.5	6.5	64.7
July	19.0	4.5	12.3
August	24.9	7.4	2.3
September	24.0	12.0	36.3
October	25.0	13.5	53.8
November	35.3	15.5	42.4
December	34.0	17.0	89.2
<b>Annual</b>	<b>23.5</b>	<b>12.3</b>	<b>747.5</b>
<b>Variation to Long Term Average.</b>	<b>-6.7%</b>	<b>+16.4%</b>	<b>+16.5%</b>



*Figure A3: Monthly Temperature and Rainfall Variations (showing changes to long-term averages from 1995)*

### c. Population Growth & Development

The total population of the Shire, as reported by the 2006 Census, was 21,936, an increase of 7.6% (1551 people) since the 2001 Census (Refer Table A3 below).

The Town of Singleton itself had a population of 13,664, compared with 12,530 in 2001 – a growth of 9.1% (or 1.75% pa on average). This population growth is well above the national growth rate of 1.3% pa over the last 10 years. Growth in dwellings has grown more rapidly than population growth. Between 2001 and 2006, an additional 507 dwellings were constructed in Singleton. This represents a growth rate of 2% pa.

**Potential issue:** From the point of view of a water utility, this implies an increasing customer base (number of assessments) and, potentially increasing water consumption and wastewater generation.

**Table A3: Singleton Population**

Location:	Population 2001 Census:	Population 2006 Census
Singleton LGA	20,385	21,936
Singleton Town	12,530	13,664

Source: ABS 2009.

The estimated population in the Shire in 2008 was 23,458 (Source: ABS)

Typically, the ABS projections are for a growth rate of 0.9% pa. The Hunter Valley Research Foundation has, however, predicted a “medium” growth rate of 1.19% pa.

In discussions with Council (Brian Carter, pers.comm); growth rates of 0.8% for population and 1.0% pa for dwellings have been adopted for the 2010 Developer Servicing Plans. Population projections, then, are based on Council's projections and are presented in Table A4 below.

**Table A4: Population Projections for Singleton**

Location	2006 Census	2008 Estimate	2010	2015	2020	2025	2030	2035	2040
Singleton LGA	21,936	23,458	23,835	24,804	25,812	26,861	27,953	29,089	30,270
Singleton Town	13,664	14,160	14,387	14,736	15,334	15,958	16,606	17,281	17,984

#### d. Topography

Singleton is located within the Hunter – Central Rivers Catchment (Refer Figure A4 below). The topography is generally described as undulating to hilly cleared lands graduating to flatter areas, with some areas of remnant vegetation. The most significant topographical feature is the Hunter River.

Singleton is largely characterised as rich alluvial floodplains.



Figure A4: Hunter – Central Rivers Catchment

## **e. Geology, Soils & Physical Characteristics**

### **Geology**

The Hunter Region is a transitional area between the Early Permian and middle Triassic rocks of the Sydney Basin (in the south), and the Palaeozoic rocks of the New England Fold Belt (to the north). These two major geological areas are separated by a fault line, the Hunter-Mooki Thrust Fault.

The Permian-age rocks, located in the central and south-eastern areas of the Region, are part of the Sydney Basin. They form the main part of the Hunter Valley and feature numerous coal seams of varying thicknesses and depths. These Permian rocks were formed in shallow marine and estuarine environments and therefore contain salt. This salt content has a direct influence on the level of salinity of many streams found on the central valley floor.

The Hunter River begins in the Barrington Tops, which are the second highest point in NSW after the Snowy Mountains. Downstream of the Rouchel Brook confluence, where the river heads inland towards Muswellbrook and Denman, the land begins to flatten out. The geology in this part of the catchment is characterised by softer rocks of conglomerate, shale, sandstone and coal from the Permian period (245-286 million years old). Soils in this area are softer, have a higher salt content and are highly erodible. Just south of Denman is where the Goulburn River joins the Hunter, connecting it to the western part of the Hunter catchment. This area is characterised by hard thick layers of sandstone, dissected by valleys of sandy soils, which past events have shown, are very easily eroded. When the Goulburn River and the Wollombi Brook, which also joins the Hunter from the western part of the catchment, have flooded in the past, large deposits of sand have been found on the banks of the Hunter River at Singleton, Maitland and other areas south of the confluence. As the river travels down to the lower Hunter Valley floodplains to Singleton and Maitland, the soils are finer-grained silts that have accumulated over millennia from sediment sources further up the valley, that have been trapped by vegetation along the floodplain.

### **Soils**

Soil types are very dependant on the parent rock and the locations in the landscape. Floodplain soils (which are predominant in Singleton Shire) include alluvials, podzolics and some “cracking” clays.

Given that the geology of the area derives from marine and estuarine environments, the soils generally contain salt.

Soil management issues in Singleton Shire, therefore, include management of land salinity, erosion, and sulphate soils and soil structure decline.

### **Potential Issues:**

**Within the urban area of Singleton itself, issues include:**

- ⌘ **urban salinity;**
- ⌘ **groundwater recharge and / or pollution;**
- ⌘ **gully and stream erosion.**



**f. Water Storage – Glennies Creek Dam**

Glennies Creek sub-catchment is located in the centre of the Hunter Catchment.

Glennies Creek Dam is located about 25 kilometres to the north of Singleton, 39 kilometres upstream of the junction of Glennies Creek with the Hunter River. The body of water behind the dam is Lake St Clair.

Relevant storage details are:

- Catchment area: 233 km<sup>2</sup>
- Surface area: 1,540 ha
- FSL: 186 m above sea level
- FSL Capacity: 283,000 ML

The Dam was constructed in 1983 and operates in conjunction with **Glenbawn Dam**. Together, the two dams supply nearly 250,000 ML of water per year for:

- ✧ town supplies (**Singleton**, Aberdeen and Scone);
- ✧ stock and domestic;
- ✧ industry (particularly coal mining);
- ✧ agriculture and horticulture (sheep and cattle);
- ✧ pastures and vineyards;
- ✧ recreation and tourism.

There are 1,405 licences within the Glennies Creek Dam and Glenbawn Dam system with 247,350 ML combined entitlement.

- |                                       |            |
|---------------------------------------|------------|
| ▪ High security/industry entitlements | 21,700 ML  |
| ▪ General security entitlements       | 128,500 ML |
| ▪ Stock and domestic requirements     | 1,850 ML   |
| ▪ Town water supplies                 | 10,800 ML  |
| ▪ Major Utility Power Generation      | 36,000 ML  |
| ▪ Supplementary water entitlements    | 48,500 ML  |

Water users hold access licenses which determine their share component. Share components specify how much of the valley's resource is available for each licence holder to use.

Storage in the Dam has recovered from the low of 48% in January 2008 to a current (25 January 2010) capacity of 72%. Refer Graph in Figure A5 below.

It should be noted that Town entitlements amount to **only 2.8%** of the total entitlements from Glennies Creek Dam.

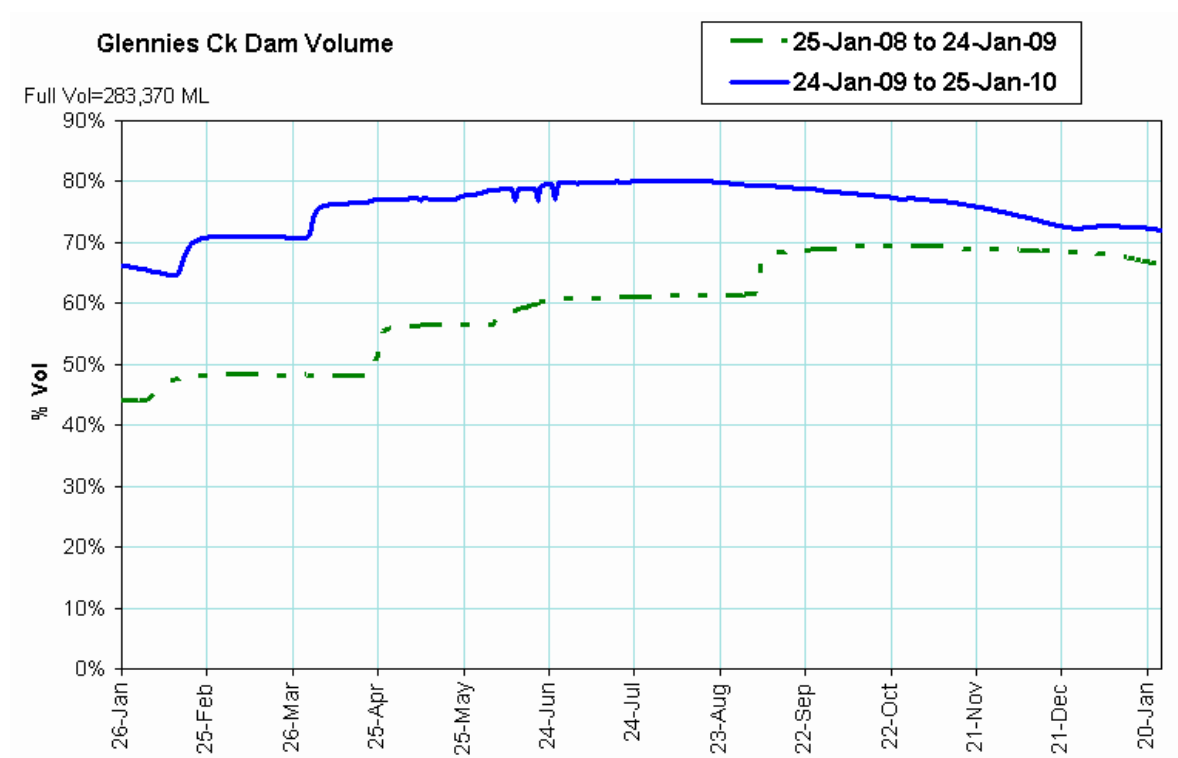


Figure A5: Glennies Creek Dam Volume

### Areas of Significance and Conservation Value

There are nearly 1,400,000 hectares of National Parks (920,000 hectares), State Conservation Areas (184,000 hectares), Nature Reserves (290,000 hectares) and Island Nature Reserves (1,038 hectares), which are wholly or partially located in the Hunter Region.

These are listed in Table A5 below.

**Table A5: National Parks, State Conservation Areas, Nature Reserves and Island Nature Reserves.**

(Source: DECCW)

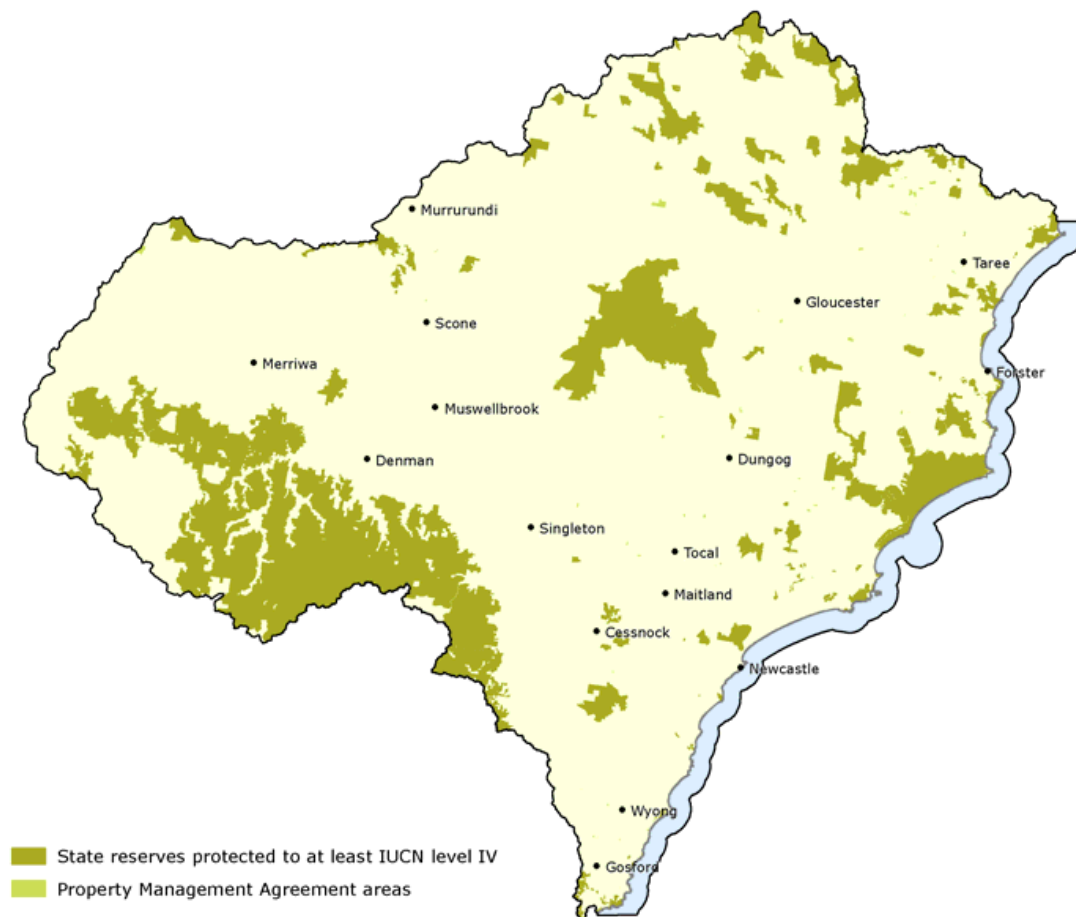
National Parks		State Conservation Areas		Nature Reserves	
Name	Area (ha)	Name	Area (ha)	Name	Area (ha)
Barrington Tops	74,568	Glenrock	516	Wallabadah	1,132
Myall Lakes	47,540	Lake Macquarie	667	Seal Rocks	0.3
Wollemi	493,594	Barrington Tops	8,446	Wingen Maid	1,077
Woko	8,730	Karuah	74	Seaham Swamp	11
Goulburn River	71,658	Medowie	2,850	Burning Mountain	15
Tomaree	2,357	Polblue	7,810	Cedar Brush	190

National Parks		Nature Reserves		Island Nature Reserves	
Name	Area (ha)	Name	Area (ha)	Name	Area (ha)
Yengo	163,385	Moffats Swamp	151	John Gould Island	26
Booti Booti	1,567	Coolongolook	198	Boondelbah Island	9
Ben Halls Gap	3,018	Awabakal	228	Moon Island	1
Coolah Tops	13,767	Camels Hump	545	Little Broughton Island	36
Mount Royal	6,920	Kooragang	2,926	Pulbah Island	69
Towarri	6,074	Camerons Gorge	1,318	Storm Petrel	8
Barakee	4,981	Tingira Heights	18	Bandicoot Island	30
Ghin-Doo-Ee	4,819	Hexham Swamp	900	Regatta Island	102
Wallingat	6,557	Karuah	823	Mills Island	61
Watagans	7,751	Back River	735	Snapper Island	13
Werakata	3,337	Bretti	2,902	Wallis Island	473
Belford	294	Killarney	435	Yahoo Island	46
Wallaroh	178	Monkerai	865	Corrie Island	164
Blue Gum Hills		Running Creek	910		
Regional Park	129				
		The Glen	2,750		
		Tomalla	605		
		Wallaroh	2,780		
		Darawank	575		
		Katambuhl	694		
		Mernot	320		
		Tilligerry	508		
		Worimi	1,077		
		Monkeycot	1,612		
		Pambalong	35		
		Black Bulga	1,554		
		Copeland Tops	1,692		

Of significance to Singleton Shire is that the southern section of the LGA extends into the extensive national parks of Yengo and Wollemi (where a remnant group of the very rare Wollemi Pine was discovered).

Nature Reserves in the catchment are shown in Figure A6.

Figure A6: Nature Reserves



## Wetlands

Nationally important wetlands in the Hunter Region are listed in Table A6 below.

Wetland	Area (ha)	Wetland type(s)
Myall Lakes	31,777	<ul style="list-style-type: none"> <li>▪ A2 - Sub tidal aquatic beds</li> <li>▪ A4 - Rocky marine shores</li> <li>▪ A5 - Sand, shingle or pebble beaches</li> <li>▪ A6 - Estuarine water, permanent waters of estuaries and estuarine systems of deltas</li> <li>▪ A7 – Intertidal mud, sand or salt flats</li> <li>▪ A8 – Intertidal marshes</li> <li>▪ A9 – Intertidal forested wetlands</li> <li>▪ A10 – Brackish to saline lagoons and marshes with one or more relatively narrow connections to the sea</li> <li>▪ A11 – Freshwater lagoons and marshes in the coastal zone</li> <li>▪ A12 – Non-tidal freshwater forested wetlands</li> </ul>
Port Stephens Estuary	30,253	<ul style="list-style-type: none"> <li>▪ A2 – Subtidal aquatic beds</li> <li>▪ A6 – Estuarine water</li> <li>▪ A7 – Intertidal mud, sand or salt flats</li> <li>▪ A8 – Intertidal marshes</li> <li>▪ A9 – Intertidal forested wetlands</li> </ul>
Wallis Lakes and adjacent estuarine islands	8,556	<ul style="list-style-type: none"> <li>▪ A2 – Subtidal aquatic beds</li> <li>▪ A6 – Estuarine water</li> <li>▪ A7 – Intertidal mud, sand or salt flats</li> <li>▪ A8 – Intertidal marshes</li> <li>▪ A9 – Intertidal forested wetlands</li> </ul>
Kooragang Nature Reserve	2,926	<ul style="list-style-type: none"> <li>▪ A4 – Rocky marine shores</li> <li>▪ A5 – Sand, shingle or pebble beaches</li> <li>▪ A6 – Estuarine water</li> <li>▪ A7 – Intertidal mud, sand or salt flats</li> <li>▪ A8 – Intertidal marshes</li> <li>▪ A9 - Intertidal forested wetlands</li> <li>▪ A11 – Freshwater lagoons and marshes in the coastal zone</li> </ul>
Salt Ash Air Weapons Range	2,790	<ul style="list-style-type: none"> <li>▪ A6 – Estuarine water</li> <li>▪ A8 – Intertidal marshes</li> <li>▪ A9 – Intertidal forested wetlands</li> <li>▪ B4 – Riverine floodplains</li> <li>▪ B9 – Permanent freshwater ponds (&lt;8 ha), marshes and swamps on inorganic soils</li> <li>▪ B10 – Seasonal/intermittent freshwater ponds and marshes on inorganic soils</li> <li>▪ B13 – Shrub swamps</li> <li>▪ B14 – Freshwater swamp forest</li> </ul>
Barrington Tops Swamps	1,500	<ul style="list-style-type: none"> <li>▪ B15 – Peat lands; forest, shrub or open bogs</li> </ul>
Shortland Wetlands Centre		<ul style="list-style-type: none"> <li>▪ A11 – Freshwater lagoons and marshes in the coastal zone</li> <li>▪ A12 – Non-tidal freshwater forested wetlands</li> </ul>

**Table A6: Nationally Significant Wetlands - Hunter Region**

(Source: A Directory of Important Wetlands in Australia, 2001)

There are no known wetlands of significance in the Singleton LGA. Refer Figure A7 below.

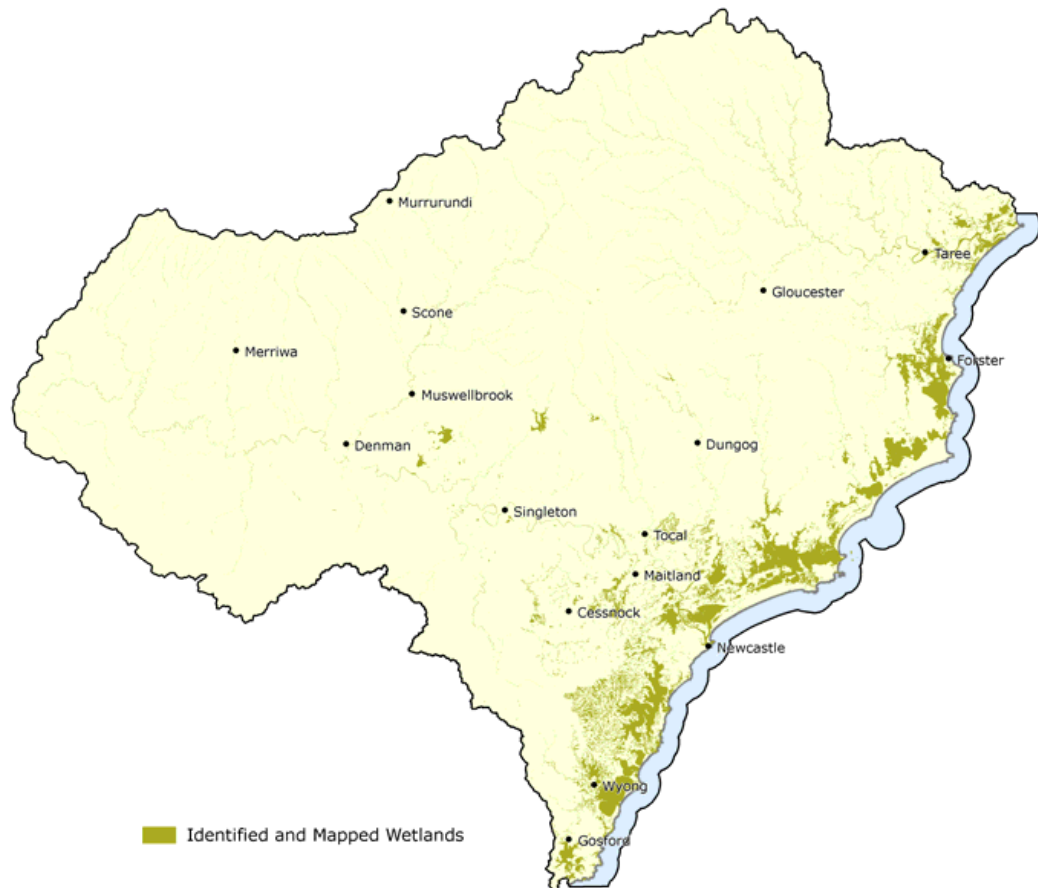


Figure A7: Identified Wetlands

### **Aboriginal Heritage**

The Hunter Catchment is located within or partly within four (4) Regional Aboriginal Land Council areas; primarily Northern and Sydney/Newcastle as well as Central Coast and Wiradjuri. There are seven (7) Local Aboriginal land Councils represented within or partly within the region; Awabakal (Newcastle), Karuah (Karuah), Mindaribba (East Maitland), Walhallow (Quirindi), Wanaruah (Muswellbrook), Worimi (Tanilba Bay) and Windradyne (Bathurst). There are no “Declared Aboriginal Places” in Singleton Shire. (Source: DECCW; AHIMS database).

The DECCW database does not represent the totality of sites across the State.

There are undoubtedly, “intangible” sites and places of high sensitivity and significance to Aboriginal communities which may not be recorded on the database

Within Singleton Shire, the following initiatives are in place:

- ⌘ development of a “Working in Partnership Program”, by the establishment of an Upper Hunter Valley Regional Partnership Committee;
- ⌘ creation of the Aboriginal Development Consultative Community in 2006. This is a partnership between the Upper Hunter Valley Aboriginal Community and Coal & Allied;
- ⌘ completion of an oral history in 2007.

#### g. Vegetation

There are five (5) general native vegetation formations in the Hunter Region:

- **Closed Forest or Rainforest** – The main types of rainforest within the Hunter Region are sub-tropical (in deep valleys, south to easterly aspect, lower altitude, richer soils), warm temperate (higher altitude, less favourable areas), cool temperate (higher altitudes, characterised by the presence of *Nothofagus Moorei* – Antarctic Beech), and dry (sheltered situations in adverse sites such as rocky outcrops or areas with low rainfall).
- **Tall Open Forest** – Occurring in higher rainfall areas on good soils, along the coast, on the lowlands of the valley, and in some of the lower mountain areas.
- **Open Forests and Woodlands** – Occurring throughout the Region and including various Eucalypt types with varying understories of shrubs, grasses and ferns.
- **Heathland** – Occurring near the coast on exposed coastal sands, dune systems, headlands, and on inland areas that are exposed, seasonally wet and poorly drained, or on skeletal soils.
- **Sedgeland and Wetlands** – Including riverine, estuarine and coastal habitats, such as swamps and water-logged areas in the lower reaches of the Hunter River and creeks draining into Lake Macquarie, Port Stephens and Myall Lakes. Grasslands occur throughout the Region.

There are approximately 3,497 vascular plant species in the Hunter, Central and Lower North Coast region of NSW. (Source: DEC Atlas Data).

Within the Singleton Shire, there are 8 vegetation species listed as vulnerable or threatened.

Common Name & Type	Scientific Name	Level of Threat
Narrow Leaf Bottlebrush (Shrub)	<i>Callistemon linearifolius</i>	Vulnerable
White flowered wax plant (Climber)	<i>Cynanchum elegans</i>	<b>Endangered</b>
Darwinia peduncularis (Shrub)	<i>Darwinia peduncularis</i>	Vulnerable
Darwinia peduncularis - (Tree)	<i>Eucalyptus fracta</i>	Vulnerable
Slaty Red Gum (Tree)	<i>Eucalyptus glaucina</i>	Vulnerable
Olearia cordata (Shrub)	<i>Olearia cordata</i>	Vulnerable
Hairy Geebung (Shrub)	<i>Persoonia hirsute</i>	<b>Endangered</b>
Illawarra Greenhood (Orchid)	<i>Pterostylis gibbosa</i>	<b>Endangered</b>

The historical and existing extents of vegetation in the Hunter Catchment are shown in Figures A8 and A9 below.

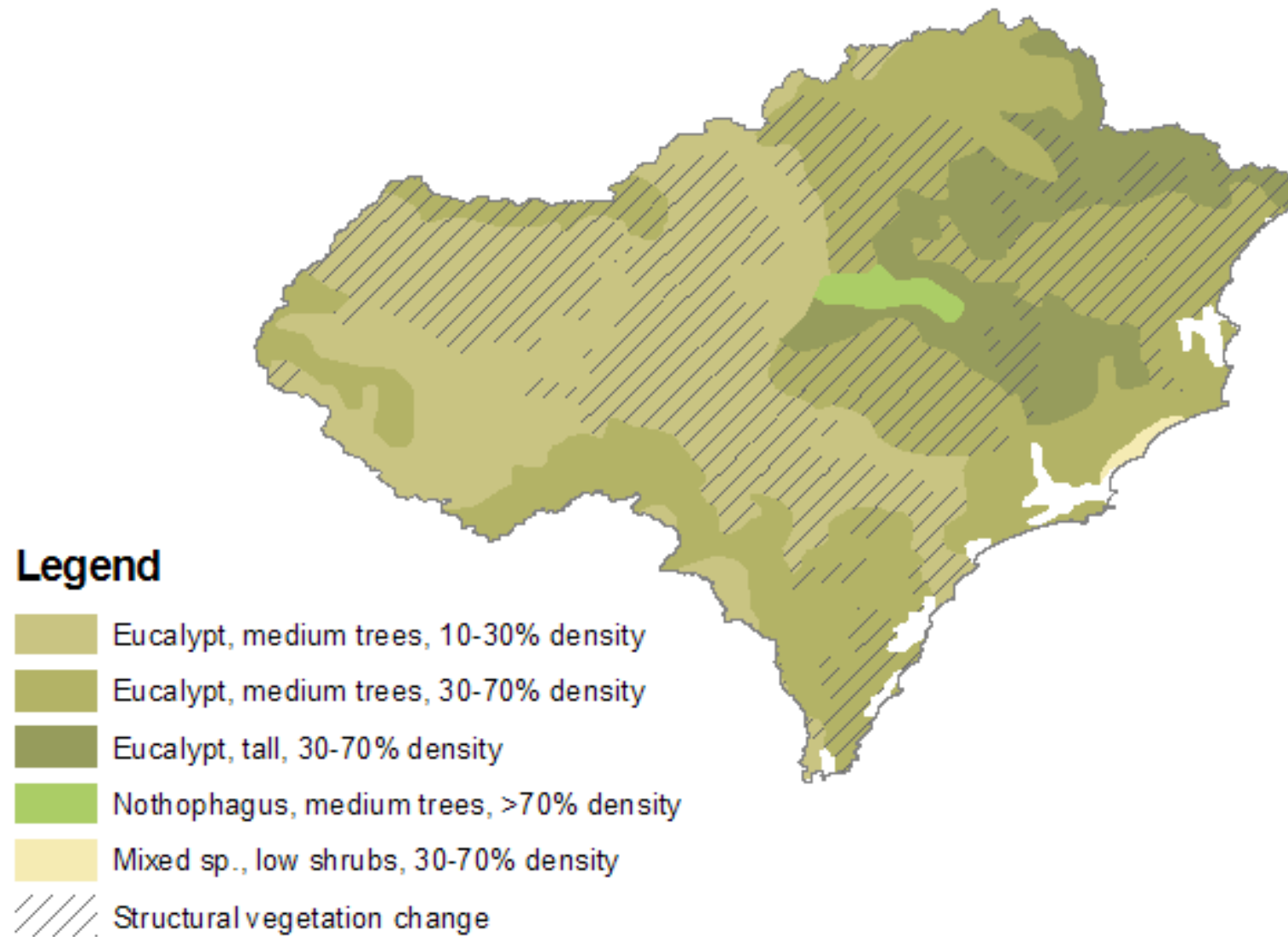


Figure A8: Historical Vegetation in the Hunter Catchment

(Source: Hunter Central Rivers CMA)



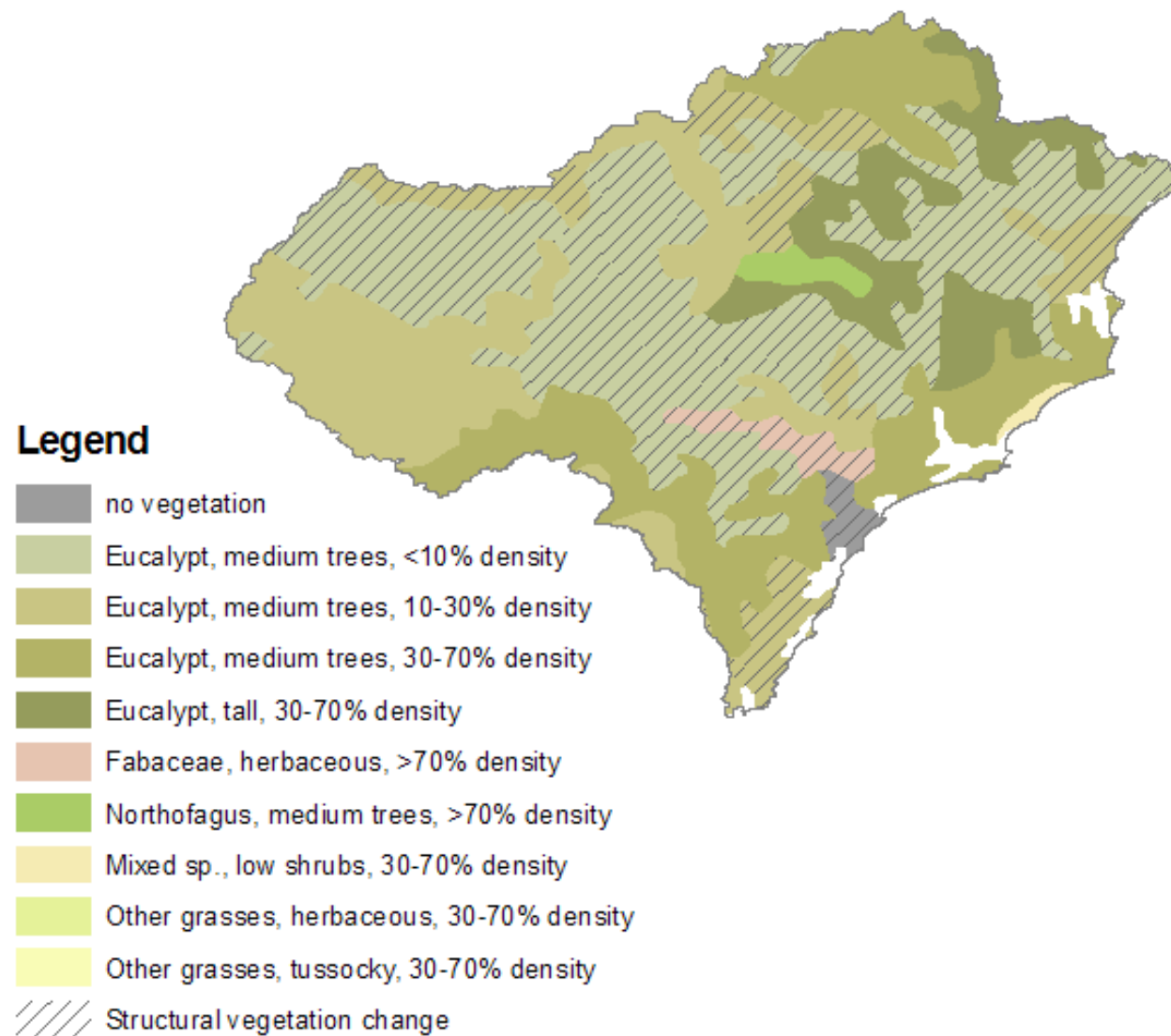


Figure A9: Existing Extents of Vegetation in the Hunter Catchment

(Source: Hunter Central Rivers CMA)

## **h. Land Use**

The Hunter Valley is an area of economic importance to New South Wales, particularly with respect to coal mining, power generation and agriculture.

Nearly 100 million tonnes of coal is exported every year. (Source: Hunter Valley Research Foundation).

The principal land uses in Singleton Shire include;

- ✧ coal mining;
- ✧ power generation;
- ✧ agriculture (particularly vineyards);
- ✧ manufacturing;
- ✧ support industries and commercial enterprises.

The following are the six (6) general types of landuse in the Singleton LGA:

- ✧ residential
- ✧ commercial
- ✧ industrial
- ✧ open space
- ✧ rural/non-urban
- ✧ special use.

Land uses in the Hunter region are shown in Figure A9.

### **Potential Issue:**

From a water supply perspective, the high consumption of water by mining is a potential issue for the resource within the catchment and, potentially for Council, in terms of possible increases in demand.

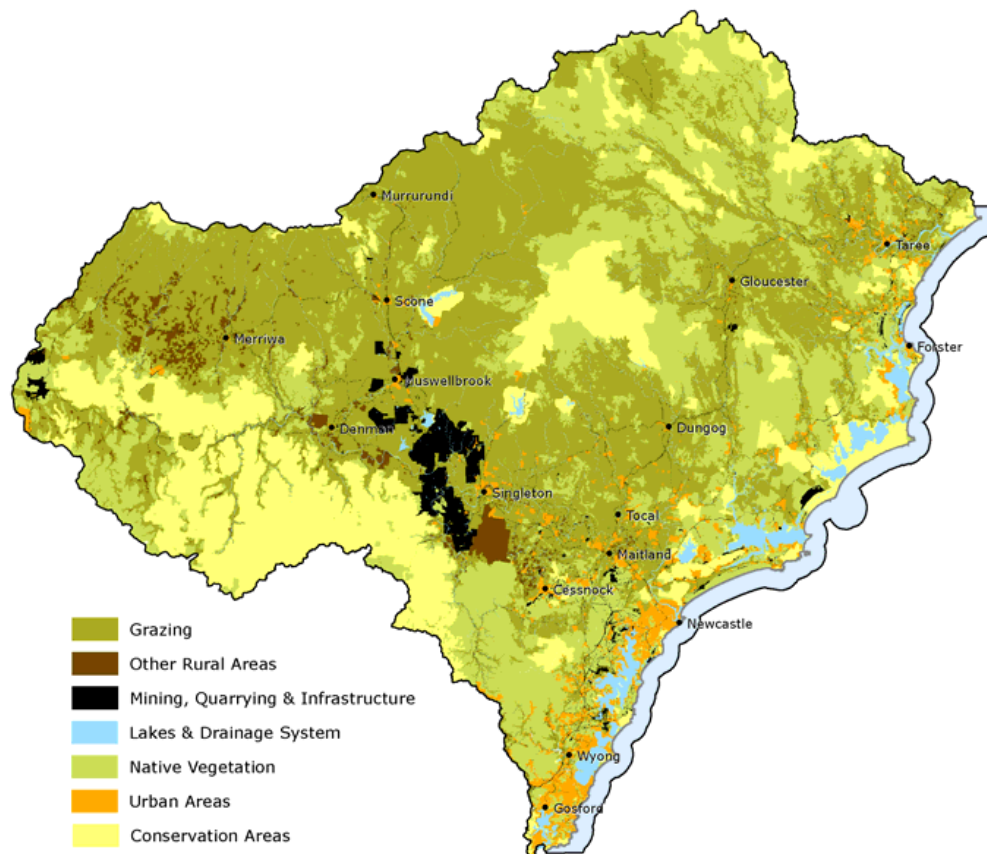


Figure A9: Land Uses in the Hunter Region

#### i. Flooding & Stormwater Management

Singleton was subjected to a major flooding event in 1955, which brought on the subsequent construction of the Town levee in 1963.

The 1955 Flood was adopted by Council as the flood standard for building and development controls.

In 1988, Council undertook a review of flood studies and reports for the Singleton area and prepared a Development Control Plan (DCP).

The DCP recommended the preparation of a Floodplain Management Plan.

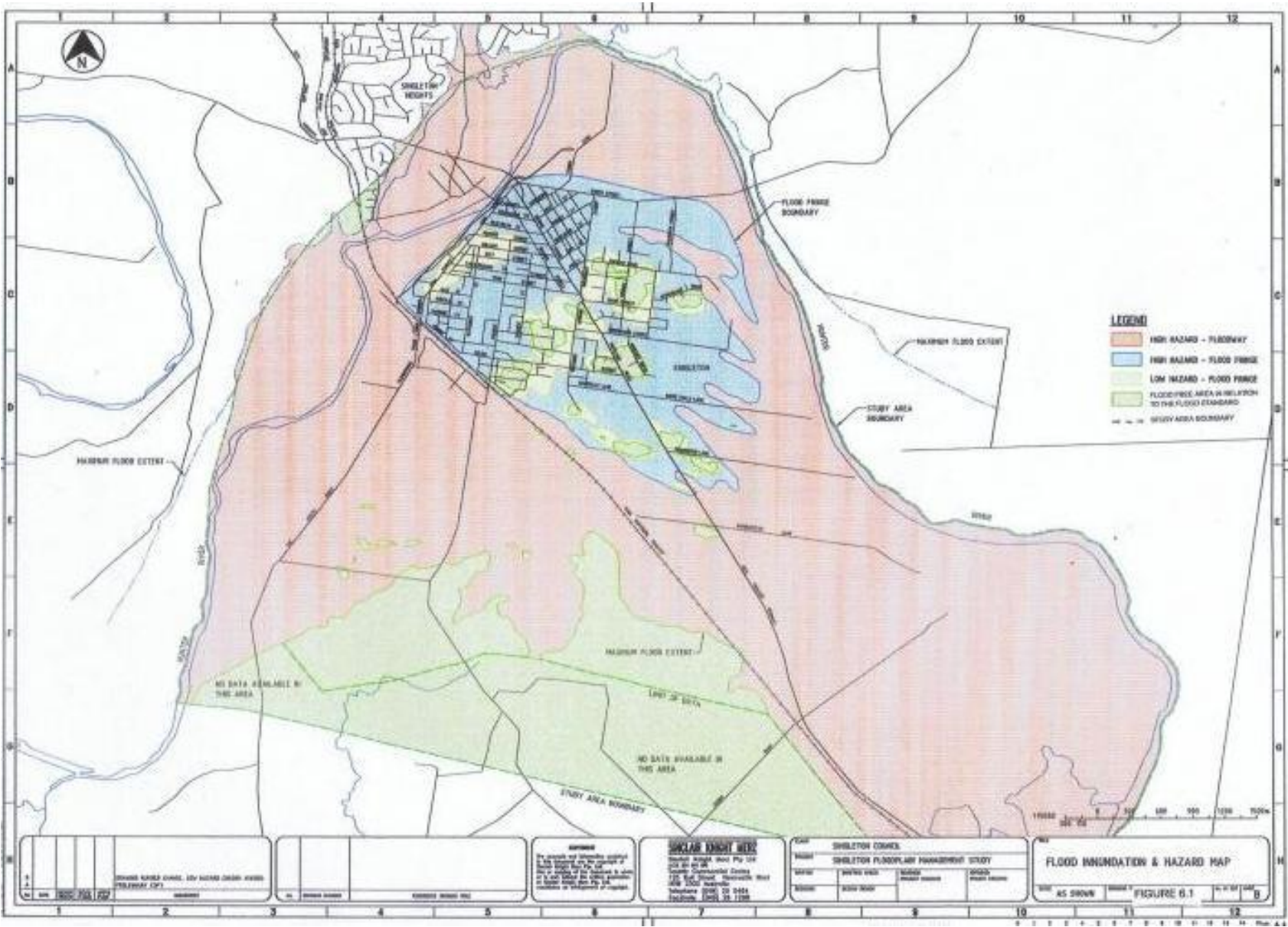
**Data Gap & Potential Issue (for Council): Completion of Floodplain Management Plan**

Council completed its Urban Stormwater Management Plan in 2003.

This document should be reviewed and updated.

The Flood Inundation Plan for Singleton is included as Figure A10.

**Data Gap & Potential Issue (for Council): Review Stormwater Management Plan**



## j. Hunter-Central Rivers Action Plan

The area and location of the Hunter-Central Rivers CMA are shown in Figure A11 below.

The Catchment Management Authority published its “Action Plan” in 2006, addressing a range of Catchment and Management Targets, including:

**Table A7: Hunter-Central Rivers Catchment Targets**

Management Targets to be Achieved by 2015	
Asset	Target
<b>Biodiversity and Native Vegetation</b>	<ul style="list-style-type: none"> <li>• Protect an additional 31,000 ha of native vegetation</li> <li>• Regenerate 25,500 ha of native vegetation</li> <li>• Treat 2,400 ha of weed affected lands</li> <li>• Implement priority recovery actions on 800 ha</li> <li>• Manage an additional 52,000 ha of landscapes having physical, cultural or spiritual significance to aboriginal people</li> <li>• Protect an additional 1,100 km of native riparian vegetation</li> <li>• Regenerate 550 km of degraded native riparian vegetation</li> </ul>
<b>Water and Aquatic Ecosystems</b>	<ul style="list-style-type: none"> <li>• Protect an additional 4,600 ha of wetlands</li> <li>• Enhance 2,600 ha of wetlands</li> <li>• Restore native fish passage to 60 instream barriers</li> <li>• Stabilise 125 km of unstable or degraded stream channels and estuarine shorelines</li> <li>• Improve habitat to 200 km of stream channels</li> <li>• Manage 75 estuarine floodgates to increase tidal movement</li> <li>• Protect an additional 21,000 ha of priority marine habitat</li> <li>• Enhance 130 km of vegetation along coastal lake shorelines</li> <li>• Enhance 250 km of marine shorelines</li> </ul>
<b>Land Management</b>	<ul style="list-style-type: none"> <li>• Treat animal pests over 31,000 ha</li> <li>• Manage 200 km of roads that affect sensitive areas using current best practice erosion and sediment control</li> <li>• Revegetate 8,400 ha of highly erodible soils</li> <li>• Stabilise 800 ha of actively eroding soils</li> <li>• Revegetate 1,200 ha of salinity recharge areas with deep-rooted vegetation</li> <li>• Improve nutrient management on 500 ha of land</li> <li>• Stabilise 150 ha of salt affected areas</li> <li>• Implement sustainable grazing management practices on an additional 19,000 ha of grazing land</li> <li>• Develop and implement property plans for an additional 25,000 ha</li> </ul>



## Management Targets to be Achieved by 2015

Asset	Target
Land Management (cont'd)	<ul style="list-style-type: none"> <li>• Maintain 420 Lower Hunter Valley Flood Mitigation Scheme structures</li> <li>• Retrofit 620 ha of existing developed areas with current best practice urban stormwater management</li> <li>• Improve the management of 120 sewage management systems</li> <li>• Treat an additional 5,000 ha of acid sulphate soils</li> <li>• Revegetate 240 ha of degraded dune systems</li> <li>• 60 industry groups develop, adopt and audit an Environmental Management System.</li> </ul>

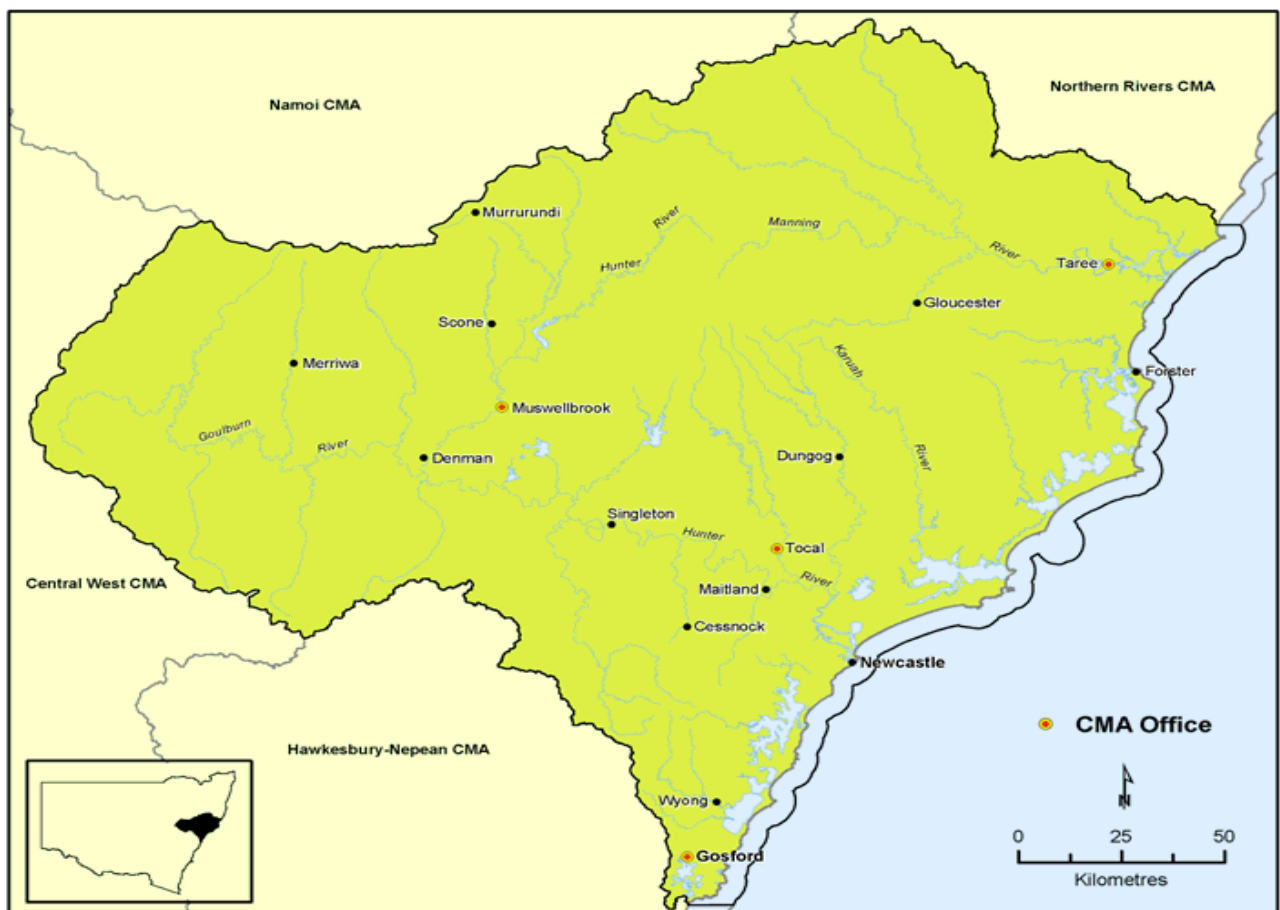


Figure A11: Hunter-Central Rivers CMA area

**k. Environmentally Sensitive Areas**

The Department of Environment, Climate Change and Water has determined “Environmentally Sensitive Zones” across NSW.

These environmentally sensitive zones (ESZs) are defined as:

- Regions immediately surrounding sensitive receptors (eg. Rivers, drinking water bores)
- Regions on or near vulnerable groundwater
- Regions of recognised environmental significance

The map of ESZs for Singleton is shown below. **Most of the Singleton urban area is impacted by ESZs.**

**Summary of Potential Issues**

Potential issues identified under this catchment perspective review are:

- Increasing customer base resulting in increases in water consumption & wastewater generation over the next 30 years.
- Potential for urban salinity with potential impacts on water & sewerage infrastructure
- Potential for groundwater recharge and/or pollution from septic tank systems and leaking wastewater lagoons
- Potential gully erosion & stream erosion
- Eight (8) vegetative species listed as vulnerable or endangered
- High current & future water consumption by the mining industry, with potential demand impacts on the water resource
- Lack of a Floodplain Management Plan (not an Urban IWCM Issue)
- Need to review and update the Stormwater Management Plan (not an Urban IWCM Issue)

A map of the ecological and environmental assets in Singleton Shire is attached as Figure A12.  
(Source: NSW NPWS)

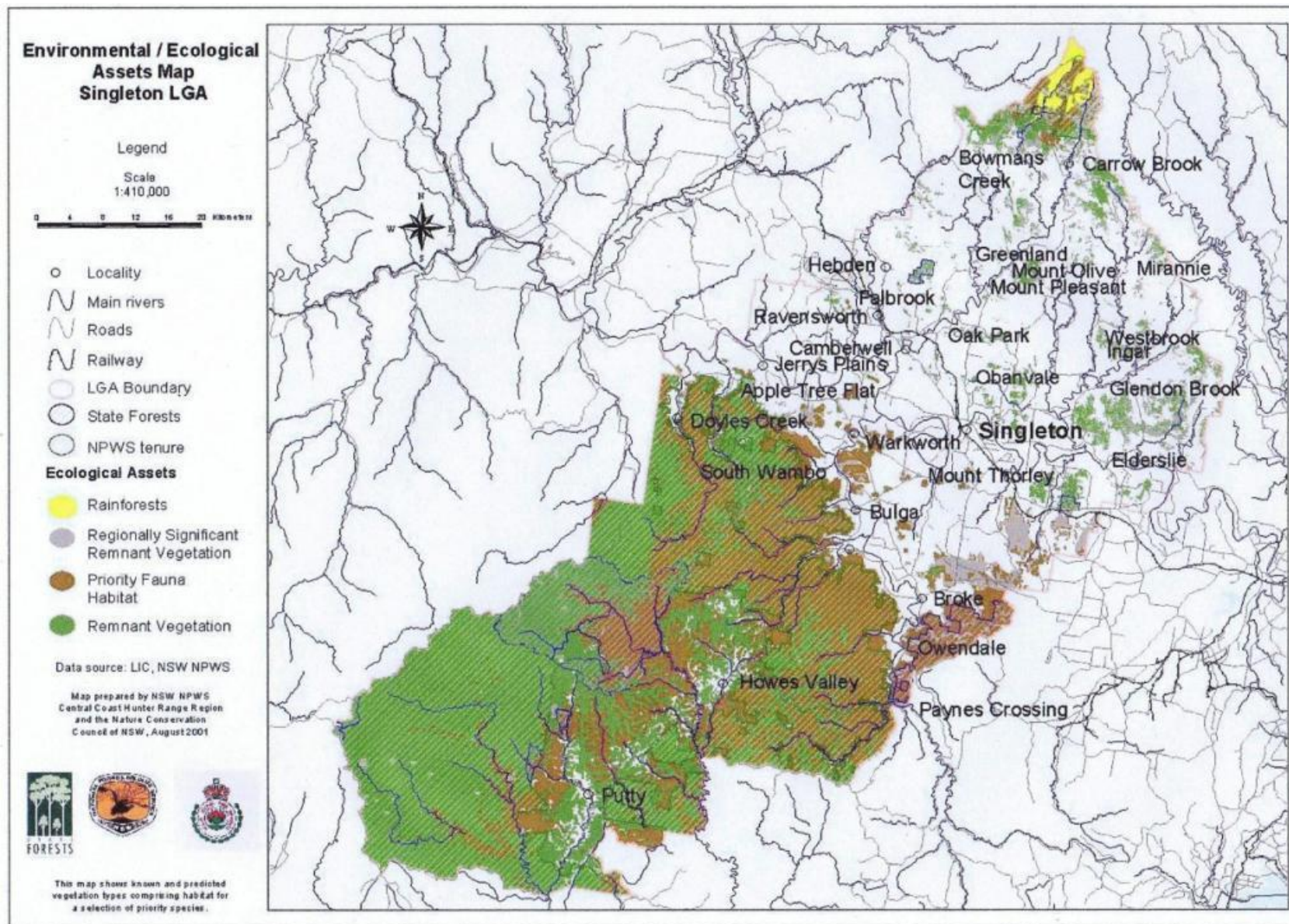


Figure A11: Environmental/Ecological Areas - Singleton LGA  
(Source: NPWS)



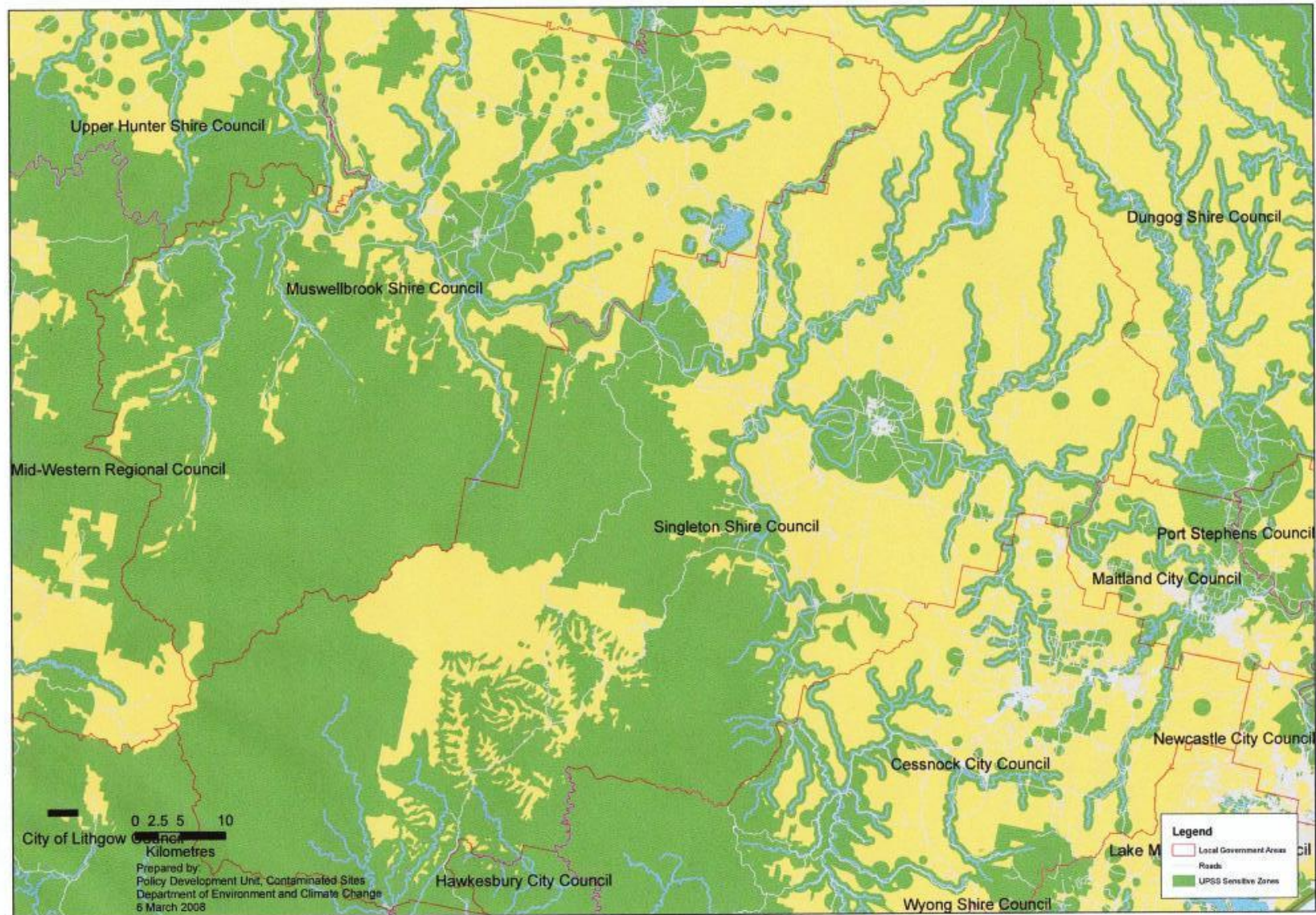


Figure A12: Environmentally Sensitive Areas - Singleton  
(Source: DECCW)

### 3A. WATER RESOURCES CONTEXT

#### a. Hunter Regulated River Context – Water Sharing Plan

##### General

The Hunter Regulated River water Source comprises:

- a) the bed and banks of all rivers, from the upstream limit of Glenbawn Dam water storage downstream to the estuary of the Hunter River, and from the upstream limit of Glennies Creek Dam water storage downstream to the junction with the Hunter River, and
- b) the unconsolidated alluvial sediments underlying the waterfront of all rivers which have been declared by the Minister to be regulated rivers, except those unconsolidated alluvial sediments within one metre of works taking water pursuant to licenses issued under Part V of the *Water Act 1912* of their equivalent aquifer access licenses issued under the *Water Management Act 2000*.

The Hunter Regulated River Water Source is also divided into three (3) management zones (Zone 1, Zone 2, Zone 3). The zones are defined from a single common point, which is the junction of Glennies Creek with the Hunter River. This is the cadastral junction of the Parishes of Vane (County of Durham), Auckland (County of Durham) and Lemington (County of Hunter). Specifically, the common boundary point for the management zones is:

The regulated rivers included in the Water Sharing Plan include (inter alia):

- Glennies Creek from the upper limit of the Glennies Creek Dam water storage, including all tributaries to the storage (named and unnamed) up to high water mark of the storage, downstream to the confluence of Glennies Creek with the Hunter River;
- Hunter River from the upper limit of Glenbawn Dam water storage, including all tributaries to the storage (named and unnamed) up to high water mark of the storage, downstream to a point adjacent to the eastern boundary of Lot 2, DP 1012258. Parish of Maitland, County of Northumberland on the southern bank of the River and adjacent to a point 150 m downstream of the western boundary of Lot 1, DP 856702, Parish of Middelhope, County of Durham on the northern bank of the River, 1400 metres upstream of Oakhampton rail bridge.

Glennies Creek Dam is the source of Singleton's water supply. The categories and share components of access licenses under this Water Sharing Plan are shown in Table A8.

**Table A8: Water Access Licence Categories & Locations**

Access Licence Category	Total Share Component
Major utility	36,000 megalitres per year
Local water utility	10,832 megalitres per year
Domestic and stock	1,738 megalitres per year
High security	22,159 unit shares
General security	128,163 unit shares
Supplementary water	49,000 unit shares

At the commencement of the Plan, in July 2004, domestic and stock water extractions under basic landholder rights were estimated to be 5,515 ML/year. There are currently no extractions for native title rights from the water source. However, both forms of extraction may increase during the term of the Plan.

The water supply system is managed to ensure sufficient water is set aside to supply basic landholder rights.

**Singleton Shire Council has a Town entitlement of 5,000 ML in the Local Water Utilities category, which represents 2.0 % of total allocations.**

**[Council also holds Groundwater entitlements of 4,050 ML (which have not been accessed to date)]**

The Plan was suspended in December 2006, since the extremely dry conditions were threatening the security of water supplies to Macquarie Generation.

Overall the Plan establishes a long term average annual extraction limit estimated as 217, 000 ML per year (out of an annual natural average flow estimated at 1,042,000 ML) and identifies water above this limit (approximately 80 % of flows) as planned environmental water.

Historically, water use in the Hunter Regulated River system has been substantially lower than the limit set by the Plan; as not all of the entitlement available under existing licenses is fully used. Since the Plan was implemented in 2004, the maximum regulated system water use has been 157,000 ML in 2005-2006.

A plan of the Hunter Regulated River Water Source is presented in Figure A13 below.

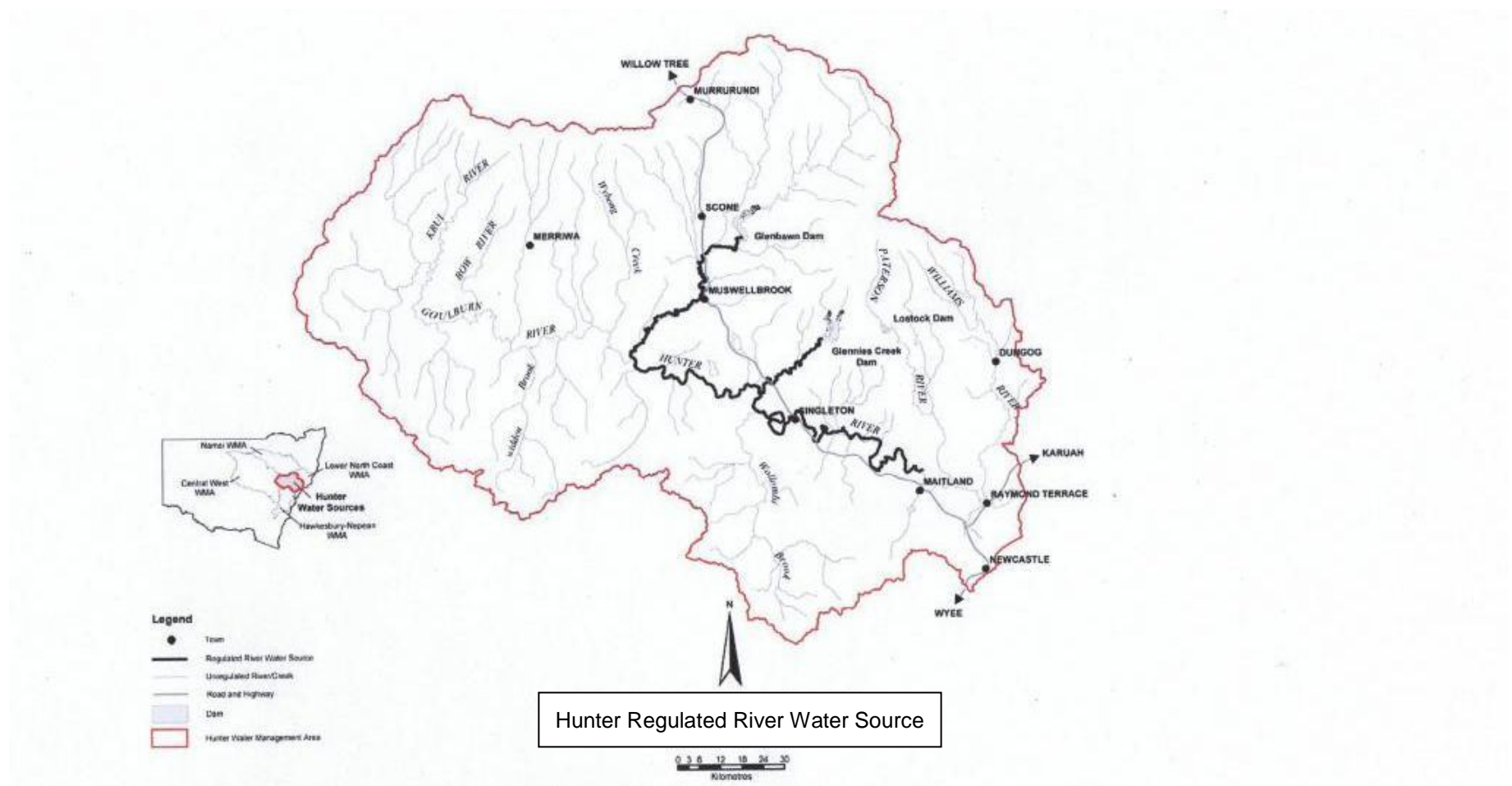











Figure A13: Hunter Regulated River Water Source  
(Source: CMA)

## b. Water Quality Objectives

Catchment water quality and river flow objectives were established by the Environment Protection Authority (EPA), now within the Department of Environment, Climate Change and Water (DEECW).

Key indicators and numerical criteria for the Water Quality Objectives listed are shown in Table A9.

**Table A9: Water Quality Objectives (Major Regulated Rivers)**

Criteria	Objective
 <b>Protection of Aquatic Ecosystems</b>	Maintaining or improving the ecological condition of water bodies and riparian zones over the long term
 <b>Secondary Contact Recreation</b>	Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed
 <b>Primary Contact Recreation</b>	Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed
 <b>Livestock Water Supply</b>	Protecting water quality to maximise the production of healthy livestock
 <b>Irrigation Water Supplies</b>	Protecting the quality of waters applied to crops and pasture
 <b>Drinking Water</b>	Refers to the quality of drinking water drawn from the raw water source before any treatment
 <b>Homestead Water</b>	Protecting water quality for domestic use in homesteads including drinking, cooking and bathing
 <b>Aquatic foods (cooked)</b>	Protecting water quality so that it is suitable for the production of aquatic foods for human consumption
 <b>Visual amenity</b>	Aesthetic qualities of water

Key indicators and numerical criteria for the principal Water Quality Objectives listed are shown in Table A10.



**Table A10: Water Quality Objectives: Indicators & Criteria**

INDICATOR	NUMERICAL CRITERIA (Trigger Values)
<b><u>Aquatic Ecosystems</u></b>	
Total Phosphorus	0.05 mg/L
Total Nitrogen	0.5 mg/L
Chlorophyll-a	0.005 mg/L
Turbidity	6 – 50 NTU
Salinity (EC)	125 – 2200 $\mu$ S/cm
Dissolved Oxygen	85 – 100%
pH	6.5 – 8.5
<b><u>Secondary Contact Recreation</u></b>	
Faecal Coliforms	1000 cfu/100 mL
Enterococci	230 per 100 mL
Algae & BGA	15,000 cells/mL
<b><u>Primary Contact Recreation</u></b>	
Turbidity	Approx. 6 NTU
Faecal coliforms	150 cfu/100 mL
Enterococci	35 per 100 mL
Protozoa	Absent
Algae & Blue Green Algae	15,000 cells/mL
Chemical Contaminants	None
<b><u>Livestock</u></b>	
Faecal Coliforms	100 cfu/100 mL
Algae & BGA	11,500 cells/mL
Salinity	3000 – 10,000 $\mu$ S/cm
<b><u>Irrigation Water Supplies</u></b>	
Algae & Blue Green Algae	Not visible
Salinity	280 $\mu$ S/cm
Thermotolerant Coliform	Varies – depending on whether food or non-food crops (Refer ANZECC Guidelines)

<b><u>Drinking Water</u></b>	All drinking water to comply with Australian Drinking Water Guidelines
Faecal coliforms	0
Salinity	800 - < 1500 $\mu$ S/cm
pH	6.5 – 8.5
Dissolved Oxygen	6.5 mg/L

<b><u>Homestead Supplies</u></b> (Domestic & Stock)	
Faecal coliforms	0
Total Dissolved Solids	500 – 1000 mg/L
Turbidity	5 NTU
pH	6.5 – 8.5

Water quality data for the Hunter River at Singleton is presented in Table A11 below.

**Table A11: Water Quality Data**

Parameter	Units	Sample Period	Hunter River										
			At Glenbawn			At Aberdeen				At Edinglassie			
			Ave	Max	Min	Sample Period	Ave	Max	Min	Sample Period	Ave	Max	Min
Bluegreen algae	Cells/mL	1999-'02	1126	3986	0	'99-'03	631	5336	0	-	-	-	-
Total Alkalinity	mg/L	1999	92	223	0	'99	193	235	159	-	-	-	-
Ammonia N	mg/L	'99-'01	0.14	10.0	0.01	'99-'03	0.01	0.06	0.01	-	-	-	-
Chlorophyll a	µg/L	'99-'02	3.4	7.0	1.0	'99	2.67	8.0	1.0	-	-	-	-
EC	µS/cm	1999	300	361	226	'00-'03	285	371	110	'02-'06	387	566	260
NO <sub>x</sub>	mg/L	'99-'02	0.31	0.46	0.012	'99-'03	0.09	0.46	0.01	'04-'06	1.69	11.75	0.08
Nitrate N	mg/L	1999	0.014	0.016	0.012	'99-'02	-	-	-	2002	0.23	0.30	0.20
Total N	mg/L	'99-'02	0.33	1.10	0.19	'99-'02	0.31	0.85	0.13	-	-	-	-
Ortho P	mg/L	'99-'02	0.02	0.32	0.01	'99-'02	0.02	0.18	0.01	-	-	-	-
Total P	mg/L	'99-'02	0.04	2.10	0.02	'99-'02	0.03	0.06	0.02	'04-'06	0.43	2.40	0.01
Turbidity	NTU	1999	23.7	25.0	4.4	'01-'03	6.7	39.0	0.9	'04-'06	22.4	159.0	5.7
pH	units	1999	8.5	8.8	8.3	'01-'03	8.3	9.2	7.5	'02-'06	8.3	9.1	7.8
Total coliforms	CFU/mL	-	-	-	-	-	-	-	-	'02-'06	2007	2419	22
Faecal coliforms	CFU/mL	-	-	-	-	-	-	-	-	'02-'06	236	2419	10
Hardness as CaCO <sub>3</sub>	mg/L	-	-	-	-	-	-	-	-	'02-'06	166.3	223.0	128.0
TDS	mg/L	-	-	-	-	-	-	-	-	'04-'06	179.2	250.0	124.0



## 4A. CURRENT URBAN WATER SYSTEMS

### a. Overview

Singleton Shire Council, as the Local Water Utility, provides water supply and sewerage services for a population of nearly 18,000 people (Performance Report, 2008/09), including water supplies to the coal mining industry, the army base and an abattoir.

Council also provides water supply services to a number of Villages, namely:

- Broke Village
- Jerrys Plains Village
- Bulga Village
- Camberwell Village

**Potential Issue: These Villages are not currently sewered.**

### b. Business Objectives & Levels of Service

Council is currently measuring its performance against Objectives and Levels of Service established as part of the 1998/99 business planning process. Strategic Business Plans are meant to be revisited and updated every 5 years.

The current relevance of the Objectives and Levels of Service are, therefore, questioned.

[Council is currently proceeding with the development of a new, 2010 Strategic Business Plan for Water Supply and Sewerage Services and has engaged consultants to assist with this process. A workshop involving Council and senior staff was conducted in April 2009 to commence the process].

The existing Objectives are presented here for information only and are discussed in more detail in **Appendix C: IWCM Related Targets, Obligations, Responsibilities and Requirements.**

**Table A12: Water Supply: Business Objectives**

<b>Focus Areas</b>	<b>Objective</b>
Customer Service	1. Meet Levels of Service to which customers have agreed and can afford 2. Establish affordable service areas and solutions 3. Increase public awareness of water wastage 4. Establish 10 year pricing policy 5. Keep the community informed and be responsive to its needs 6. Community consulted and considered on all major expenditure decisions
Environment	7. Manage the system to prevent adverse environmental impacts 8. Promote and assist establishment of industry and developers in Singleton Shire
Asset Management	9. Ensure reliable, secure and cost effective service using latest technology 10. Ensure the system provides levels of service agreed 11. Provide a Capital Works Program which supplies system needs
Human Resources	12. Maintain a capable, motivated and skilled workforce
Business	13. Evaluate options to achieve capital and maintenance programs with affordable rates and relatively low levels of reserves 14. Set up the water fund as an independent business.

**Table A13: Water Supply: Levels of Service**

Description	Unit	1998/99 Target Levels of Service	Comments/Achievement
<b>Availability of Supply</b>			
<b>Normal Quantity Available</b>			
Domestic Peak day	Litres/tenement/day	4,000	Yes – currently 1900L/tenement/day
Domestic Annual	Kilolitres/tenement/year	250-350 (60%) 500 (Average)	Yes – domestic annual usage: 290 kL/tenement /year
Peak to Average consumption ratio	-	3.9	
<b>Fire Fighting</b>			
Compliance with Building Code of Australia and NSW Fire Brigade requirements	% area served	95% Target: Increased standard in CBD ie. 2x22L/s	98% achieved
<b>Pressure</b>			
Minimum pressure when conveying 0.15 L/s/tenement	Metres head	15	100%
Maximum static pressure	Metres head	120	100%
<b>Consumption Restrictions in Droughts</b>			
In accordance with Council's Drought Management Plan	% normal use	In accordance with targets set in Drought Management Plan	1 occurrence in last 12 years
Average duration restrictions	months per 10 year period	n/a	
Average frequency of restrictions	Number of times/10 year period	n/a	
<b>Supply Interruptions to Consumers</b>			
<b>Temporary Supplies during planned interruptions</b>		to all essential services and commercial areas	
Planned:			
- Notice given to domestic customers	days	>1	95%
- Notice given to commercial customers	days	>1	95%
-Notice given to industrial customers	days	>1	95%
-Maximum duration of interruption	hours	<6	100%
-Number of interruptions	number per customer per year	<1 (excl. system break downs or system	Estimated at 90% achievement (due to

		development (eg connecting new subdivisions etc)	subdivisional activity)
<b>Description</b>	<b>Unit</b>	<b>1998/99 Target Levels of Service</b>	<b>Comments/Achievement</b>
<b>Unplanned:</b>			
Target is for less than 30 houses to be affected per failure.			NA
- Maximum duration	hours	4	NA
- Maximum number per two years	times	4	NA
Total number of interruptions	number per year per 1000 connections	10	NA
<b>Response Times</b>			
(Defined as maximum time to have staff onsite or to investigate problem or answer inquiry)			
<b>Supply Failure</b>			
During working hours	minutes	30	100%
Out of working hours	minutes	30	100%
<b>Minor Problems and general inquiries</b>			
Oral inquiry		30 minutes to 1 day	90% (estimate)
Written inquiry		10 days	95% (estimate)
Note: Times apply for 95% of occasions			
<b>Service Provided</b>			
Time to provide an individual connection to water supply serviced area (90% of times)	working days	5	85%
<b>Water Quality</b>			
<b>Microbiological Quality</b>			
Coliforms	number per 100 ML	0	96% (2005 – 2009)
Faecal Coliforms	number per 100 ML	0	100%
Current long term microbiological compliance (thermo tolerant coliforms)	% complying	100	98%
Note: In accordance with the 1996 NHMRC guidelines (Now 2004 Guidelines)			
<b>Physical Results</b>			
pH	-	6.5-8.5	Yes
Colour	True Colour Units	<5	Yes
Turbidity	Nephelometric	<0.2	95%

	Turbidity Units		
Taste and Odour	Complaints per 1000 customers per year	5	NA
Dirty Water	Complaints per 1000 customers per year	5	NA
Aesthetics, Disinfection			
<b>Chemical – Inorganic Results</b>			
Iron	mg/L	<0.03	100%
Manganese	mg/L	<0.01	75%

**It should be noted that these Levels of service are targets that Singleton Shire Council set out to achieve.**

**They were never intended to form a formal customer contract**

**Table A14: Sewerage: Business Objectives**

<b>Focus Areas</b>	<b>Objective</b>
Customer Service	<ol style="list-style-type: none"> <li>1. Meet Levels of Service to which customers have agreed and can afford</li> <li>2. Establish affordable service areas and solutions</li> <li>3. Establish 10 year pricing policy</li> <li>4. Reduce illegal connections in 'old' part of town</li> <li>5. Promote and enforce good operational procedures for trade waste dischargers</li> <li>6. Keep the community informed and be responsive to its needs</li> <li>7. Community consulted and considered on all major expenditure decisions</li> </ol>
Environment	<ol style="list-style-type: none"> <li>8. Manage the system to prevent adverse environmental impacts and use waste for beneficial purposes</li> <li>9. Promote and assist establishment of industry and developers in Singleton Shire</li> </ol>
Asset Management	<ol style="list-style-type: none"> <li>10. Ensure reliable, secure and cost effective service using latest technology</li> <li>11. Ensure the system provides levels of service agreed</li> <li>12. Provide a Capital Works Program which supplies system needs</li> </ol>
Human Resources	<ol style="list-style-type: none"> <li>13. Maintain a capable, motivated and skilled workforce</li> </ol>
Business	<ol style="list-style-type: none"> <li>14. Evaluate options to achieve capital and maintenance programs with affordable rates and relatively low levels of reserves</li> <li>15. Set up the sewer fund as an independent business.</li> </ol>

**Table A15: Sewerage: Levels of Service**

Description	Unit	1998/99 Target Levels of Service	Comments/Achievement
<b>Availability of Service</b>			
extent of area serviced	serviced area	Target is to provide appropriate sewer services to the maximum extent possible	Extensions to services being allowed for in new SBP
<b>Frequency of System Failures (1)</b>			
<b>Category One</b>			
Failure due to rainfall and deficient capacity	number/year	Currently: Sewers overflow in Dunnolly PS catchment (0-2 times per year), but there are no failures	100% compliance
<b>Category Two</b>			
Failures due to pump or other breakdown include power failure	number/year	Zero (there are currently two per year in the small temporary SPS in Huntview, which is to be replaced)	100% compliance
<b>Category Three</b>			
Failures due to blockages	number/year	Currently: 100 (improved from 200) Target: 50	90% compliance (estimate)
<b>Response Times to System Failure</b>			
(Defined as the maximum time to have staff onsite to commence rectification after notification)			
<b>Priority One</b>			
(Major spill, significant environmental or health impact, or affecting large number of consumers i.e. a major main)			
- Response time during working hours:	minutes	30	100% compliance
- Response time after hours:	minutes	30	100% compliance
<b>Priority Two</b>			
(Moderate spill, some environmental or health impact, or affecting small number of consumers i.e. other mains)			

Description	Unit	1998/99 Target Levels of Service				Comments/Achievement
- Response time during working hours:	minutes	30				100% compliance
- Response time after hours:	minutes	60				100% compliance
<b>Priority Three:</b>						
(Minor spill, little environmental health impact, or affecting a couple of consumers)						
-Response time during working hours:	minutes	30				60% compliance
- Response time after hours:	minutes	60+				60% compliance
<b>Response Times to General or Minor Customer Complaints and Inquiries (1)</b>						
- Written complaints	day	10				95% (estimate)
- Oral complaints	day	30 minutes to 1 day (depending on nature)				90% (estimate)
Note: Times for 95% of complaints						
<b>Odour Complaints</b>						
- Treatment Works	number/year	Zero				100% compliance
- Pumping Stations	number/year	8 (Bourke St SPS)				100% compliance
<b>Discharge Licence Conditions</b>	(Percentiles)	50%	80%	90%	100%	
-Quantity	kL/day				6,000	100% compliance
- Biochemical Oxygen Demand	mg/L	20	-	30	35	98% (2004 – 2008)
- Non Filterable Residue	mg/L	20	-	30	35	94% (2004 – 2008)
- Oil and Grease	mg/L				10	94% (2004 – 2008)
- pH					6-9	100% (2004 – 2008)
- Phosphorus	mg/L				10	-
- Total Nitrogen	mg/L	-	15	-	-	98% (2004 – 2008)
- Faecal Coliforms (geometric mean)	no/100 ML				No limit	

**Note:** (1) Failure is defined as a sewer overflow from the collection system or treatment works.

These Levels of Service are targets that Singleton Shire Council aims to achieve. They are not intended to form a formal customer contract.

**Potential Issue:** Confirm revised Levels of Service relevant to the current management & operation of the Water Supply & Sewerage Businesses.

**c. Land Uses in Singleton & Associated Licensed Activities**

The principal sources of economic growth and development in the Singleton LGA include:

- ✧ Coal Mining;
- ✧ Power Generation;
- ✧ Abattoir;
- ✧ Agricultural production;
- ✧ Agricultural produce processing;
- ✧ Manufacturing;
- ✧ Light engineering;
- ✧ Small business enterprises;
- ✧ Support industries and commercial enterprises.

A total of 35 Licenses have been issued by DECCW, under the Protection of the Environment Operations Act, 1997 (POEO) in the Singleton Local Government Area. Of these, only four (4) are located in the Town of Singleton.

The four (4) Licenses issued in Singleton Town are presented in Table A16.

**Table A16: Licences Issued by POEO in Singleton**

<b>Licence Number</b>	<b>Name</b>	<b>Address</b>	<b>Status</b>	<b>Non-compliances</b>
11279	Shellden Pty Ltd (Abattoir)	Old Northern Road, Cnr New England & Golden Highways WHITTINGHAM 2330	Issued	Yes, 2002 (Failure to monitor)
12728	Singleton Council (Animal accom.)	Gresford Road SINGLETON 2330	Issued	No
3088	Singleton Council (STP)	Army Camp Road SINGLETON 2330	Issued	Yes, 1999, 2000, 01, 02, 03, 04, 06 & 07
5927	Singleton Council (Waste Disposal)	Dyrring Road SINGLETON 2330	Issues	Yes, 2000, 02,03, 05, 06, 07 & 08



**Table A17: Licences Issued within the Shire, but outside the Town**

Licence Number	Name	Address	Status	Non-Compliances
7056	Applied Soil Technology Pty Ltd	Elderslie Road MITCHELLS FLAT 2330	Issued	Yes, 2002, 03, 05
11879	Ashton Coal Operations Pty Ltd	Glennies Creek Road & New England Highway CAMBERWELL 2330	Issued	Yes, 2003, 04, 05, 06, 07 & 08
7654	Bio-Recycle Australia Proprietary Ltd	New England Highway MUSWELLBROOK 2333	Issued	No
563	Bulga Coal Management Pty Ltd	Broke Road SINGLETON 2330	Issued	Yes, 1999, 2000, 01, 02, 03, 04, 05, 06, 07 & 08
3390	Camberwell Coal Pty Ltd	Bridgman Road SINGLETON 2330	Issued	Yes, 1999, 2000, 01, 02, 03, 04, 05, 06 & 07
640	Coal & Allied Operations Pty Ltd	Lemington Road SINGLETON 2330	Issues	Yes, 2001, 02, 03, 04, 05, 06, 07 & 08
37	Cumnock No.1 Colliery Pty Ltd	Off Old New England Highway RAVENSWORTH 2330	Issued	Yes, 2003, 04, 05
12325	Downer EDI Mining Blasting Services Pty Ltd	8 Melva Place SINGLETON 2330	Issued	No
12158	Dyno Nobel Asia Pacific Pty Ltd	186 Long Point Road WARKWORTH 2330	Issued	Yes, 2007
12159	Dyno Nobel Asia Pacific Pty Ltd	5 Woodlands Road MOUNT THORLEY 2330	Issued	No
12614	Envirogen (Oak) Pty Ltd	Cnr Nobles Land & Middle Falbrook Road SINGLETON 2330	Issues	Yes, 2008 & 09
Licence	Name	Address	Status	Non-

<b>Number</b>					<b>Compliances</b>
7622	Glennies Creek Coal Management Pty Ltd	640 Middle Falbrook Road SINGLETON 2330	Issued		Yes, 2002
7390	Hebden Quarries Pty Ltd	Lot 5 Hebden Road HEBDEN 2330	Issued		Yes, 2003 & 05
2122	Macquarie Generation	New England Highway LIDDELL 2333	Issued		Yes, 1999, 2000, 01, 02, 03, 04, 05, 06 & 07
11658	Maticon Pty Ltd	18 Enterprise Crescent SINGLETON 2330	Issued		No
24	Mount Thorley Coal Loading Ltd	Mount Thorley Road, MOUNT THORLEY, VIA SINGLETON 2330	Issued		Yes, 2002 & 04
10620	Mushroom Composters Pty Ltd	Broke Road SINGLETON 2330	Issued		No
11220	Orica Australia Pty Ltd	Pikes Gully Road RAVENSWORTH 2330	Issued		No
5585	Ravensthorn Coal Terminal Pty Ltd	Liddell Station Road RAVENSWORTH 2330	Issued		Yes, 2000, 03, 04, 07 & 08
2652	Ravensthorn Operations Pty Ltd	Off Lemington Road RAVENSWORTH 2330	Issued		Yes, 2001, 02, 03, 04, 05, 06, 07 & 08
11262	Redbank Project Pty Ltd	112 Longpoint Road WARKWORTH 2330	Issued		Yes, 2002, 03, 04, 05, 06, 07 & 08
10337	Resource Pacific Pty Ltd	Mining Leases CML 1348 & CML 1349 & Part of CML 378 SINGLETON 2330	Issued		Yes, 2001, 07 & 09
3391	Rix's Creek Pty Ltd	Rix's Creek Lane SINGLETON 2330	Issued		Yes, 2001, 02, 03, 04, 05, 06, 07 & 08

<b>Licence Number</b>	<b>Name</b>	<b>Address</b>	<b>Status</b>	<b>Non-Compliances</b>
3141	United Collieries Pty Ltd	134 Jerrys Plains Road WARKWORTH 2330	Issued	Yes, 2004, 05, 06, 07, 08 & 09
529	Wambo Coal Pty Ltd	Jerrys Plains Road WARKWORTH 2330	Issued	Yes, 1999, 2000, 01, 02, 03, 04, 05, 06, 07 & 08
1376	Warkworth Mining Ltd	Putty Road MOUNT THORLEY 2330	Issued	Yes, 2001, 02, 03, 04, 05, 06 & 08
10860	Xstrata MT Owen Pty Ltd	Hebden Road RAVENSWORTH 2330	Issued	Yes, 2001, 02, 03, 04, 05, 06, 07, 08 & 09
12840	Xstrata MT Owen Pty Ltd	Hebden Road RAVENSWORTH 2330	Issued	Yes, 2009
4460	Thiess Pty Ltd	Hebden Road RAVENSWORTH 2330	Issued	Yes, 2001, 02, 03, 04, 05, 06, 07 08 & 09

The non-compliances relevant to this IWCM Evaluation Study relate to the Sewage Treatment Works and these are outlined and discussed more fully in Appendix C: IWCM Related Obligations, Responsibilities and Requirements.

DECCW advises that there are currently no contaminated sites listed for Singleton.

All the above licensed activities for the **Town of Singleton** are subject to a Trade Waste Agreement with Singleton Shire Council.

#### **d. Current Water Supply Services**

The Water Supply, Treatment and Distribution systems for Singleton are discussed in detail in **Appendix B: System Boundaries**.

A summary of the water supply services provided by Council is presented below.

### Water Supply Service Summary

Key aspects of the water supply service to the town of Singleton are summarised in Table A18 below:-

**Table A18: Summary of Water Supply Services**

<b>Water Sources:</b>	<ul style="list-style-type: none"><li>• Glennies Creek Dam</li><li>• (Hunter River Regulated source)</li></ul>	
<b>Entitlements:</b>	<ul style="list-style-type: none"><li>• Town Entitlement</li><li>• High Security (Mine allocation plus Mt. Thorley &amp; Jerrys Plains)</li><li>• High Security</li><li>• General Security (Parks, Mt. Thorley)</li><li>• Groundwater entitlement</li></ul>	<ul style="list-style-type: none"><li>5,000 ML/yr</li><li>1939 ML/yr</li><li>81 ML/yr</li><li>24 ML/yr</li><li>4,050 ML/yr</li></ul>
	<b>Total</b>	<b>11,094 ML</b>
<b>Rainwater Tanks</b>		600 No.
<b>Populations:</b>	LGA (2006) Census	21,936
	Singleton	13,664
	Population supplied with water supply services (2008/09 Performance Return)	17,919
	Population supplied with sewerage services (2008/09 Performance Return)	15,009
<b>Metered Customers:</b>		
<b>(2008/09)</b>	Residential	5,839
	Non-Residential	<u>789</u>
	<b>Total</b>	<b>6,628</b>
<b>Total Water Extracted:</b>		2,476 ML
<b>(2008/09)</b>		
<b>Authorised Annual Consumption:</b>		2,414 ML (all potable supply)
<b>(2008/09)</b>	(Refer Table A18 below for total water usage)	
<b>Unaccounted for Water:</b>		62 ML (2.6%)
<b>(2008/09)</b>		
<b>Treated (Potable) Water:</b>	Total System : Compliance E.coli	100%
<b>Quality Compliance</b>		
(Performance Report 2008/09)		

Water Consumption

Details of water consumption in Singleton are summarised in Table A19 below:-

**Table A19: Water Consumption Profile****Annual Consumption****Potable Supply**

Peak Annual Demand Recorded		3,554 ML (1998)
Peak Month Demands	2009	367 ML (January)
	2008	214 ML (January & December)
	2007	289 ML (January)
	2006	344 ML (January)
	2005	335 ML (December)
	2004	296 ML (January)
	2003	346 ML (January)
	2002	390 ML (January)
	2001	346 ML (January)
	2000	341 ML (February)
	<b>1999</b>	<b>422 ML (January)</b>
	1988	421 ML (March)

**Consumptions by User Category (2008/09)** [based on water extracted from all sources]

Residential	1,490 ML	(61.7%)
Commercial	428 ML	(17.7%)
Industrial	286 ML	(11.8%)
Rural	41 ML	(1.7%)
Institutional	169 ML	(7.0%)
Public Parks & Open Space	- ML	(0%)
Bulk Sales	- ML	(0%)
Unbilled authorised	- ML	(0%)

**Total   2,414 ML**

Peak day demands by User Category are not known.

**This is a Data Gap**

**The Demand management modelling carried out as part of this study (Refer Appendix D) indicates that at current rates of consumption, the Water Treatment Plant has surplus capacity beyond the 30 planning horizon of this Evaluation Study.**

#### Water Treatment:-

Singleton operates 1 Water Treatment Plant, namely:-

- Direct Filtration Plant
- Total Capacity: 30 ML/d
- Peak Day Demand: 26.4 ML/d (April 1998)  
**(Since 1998)**
- Peak Day Demand: 25.2 ML/d (December 2001)  
**(Last 10 years)**
- Peak Day Demand: 19.6 ML/d (January 2005)  
**(Last 5 years)**

The peak day demand has been steadily declining since 1998, which will significantly extend the life of the Water Treatment Plant.

The current 2008/09 Peak Day Demand for Singleton Water Treatment Plant (17.2 ML/d) is approximately 51% of the total plant capacity.

Currently, commercial/industrial use accounts for only 29.5% of total consumption.

#### Water Quality

Water quality produced by Singleton's Water Treatment Plant is typically of high quality. In the period, 2006/07 to 2008/09, the Treatment Plants met all Australian Drinking Water Quality Guidelines for physical, chemical and microbiological criteria (as per TBL Annual Performance Reports) as shown in Table A20 below.

**Table A20: Water Quality Compliance Results**

Criteria	2006/07	2007/08	2008/09
Physical	100%	100%	100%
Chemical	100%	100%	100%
Microbiological			
• E.coli	100%	100%	100%
• Total coliforms	100%	100%	100%

(Source: DWE Performance Reports; 2006/07; 2007/08 & 2008/09)

### Water Use Profile

Singleton Council does not have any information on residential household and external use profiles. External use can be deduced from the daily water consumption figures (ie. summer use – winter use). This equates to 60% residential use for external purposes (gardens, lawns and swimming pools) in peak consumption months (with no restrictions applying) and 20% of total consumption over a full year.

The twenty (20) top water users in Singleton in 2008/09 (with comparative consumptions in 2007/08) were

Top 20 water consumers				
No.	Property Description	Category	Consumption (kL/a) (2008/09)	Consumption (kL/a) (2007/08)
28647	Motel	Commercial	10655	7975
18705	Motel	Commercial	10155	-
113563	Farm/Business	Rural	9701	9361
50823	Van Park	Commercial	9686	4177
70987	School	Public/Institutional	9498	3231
92692	Oval	Parks/Open Space	7941	8469
88120	Mine	Industry	7681	-
5231	Residential Units	Residential	6394	6740
28423	Takeaway	Commercial	6062	3640
95265	Motel	Commercial	5779	5097
147978	Pool	Parks/Open Space	5535	4676
104141	Light Industrial Business	Industrial	5478	-
110510	Park	Parks/Open Space	5291	6042
129391	Mall	Commercial (?)	4907	17006
28688	School	Public/Institutional	4169	-
120826	School	Public/Institutional	4092	3278
41087	Light Industrial Business	Industrial	3942	-
28522	Motel	Commercial	3675	-
24349	Mall	Commercial (?)	3382	-
128855	Cement works	Industrial	3365	5732

The biggest water users in 2008/09 were two motels (10.7 & 10.2 ML/year respectively), whereas in 2007/08 the biggest user was the Mall (17.0 ML/year). The Mall's usage in 2008/09 was reduced significantly to 8.6 ML/year.

There are no major industrial users (the mine used 7.7 ML/year in 2008/09 and wasn't in the top 20 users in 2007/08).

Areas where Council could have some beneficial influence in reducing water consumption are:

- Water audits for motels and the caravan park
- Audits and actions to reduce usage at Council facilities (like the ovals & swimming pool)
- Education/awareness campaigns at all schools



### Assets & Asset Management

Singleton has a comprehensive Asset Management Plan, including a Water Supply Asset Register, which lists the following information:-

- WTP's and Pump Stations
- Reservoirs
- Filtered Water Mains
- Filtered Water Fittings
- Raw Water Mains
- Raw Water Fittings.

Council has also recently completed a *100 Year Asset Renewal Plan for Water Supply and Sewerage Services, February 2009*.

Details of Council's Water Supply Assets are shown in Table A21 below:

**Table A21: Details of Water & Sewerage Assets**

Business	Assets	Dep'n. Expense	Fair Valuation	Accumulated Depreciation & Impairment	Carrying Amount (WDV)	Asset Condition (1)	Estimated cost to bring up to a satisfactory condition \$'000	Required Annual Maintenance \$'000	Current Annual Maintenance \$'000
		(\$)	\$'000	\$'000	\$'000				
<b>Water Supply</b>	Treatment Plants	441	18,016	9,671	8,345	2	-	593	811
	Reticulation Mains	622	38,101	15,271	22,830	3	-	168	226
	Trunk Mains	267	15,213	6,114	9,099	3	-	19	5
	Reservoirs	67	6,153	2,400	3,753	3	65	48	30
	Pump Stations	16	572	312	260	2	-	202	353
	<b>Sub total</b>	<b>1,413</b>	<b>78,055</b>	<b>33,768</b>	<b>44,287</b>		<b>65</b>	<b>1,030</b>	<b>1,425</b>
<b>Sewerage</b>	Pump Stations	176	5,709	3,561	2,148	3	520	118	69
	Reticulation Mains	456	33,162	16,093	17,069	4	1,500	256	564
	Manholes	60	5,283	2,588	2,695	4	150	42	-
	Treatment Works	196	7,882	4,196	3,686	3	-	204	260
	<b>Sub total</b>	<b>888</b>	<b>52,036</b>	<b>26,438</b>	<b>25,598</b>		<b>2,170</b>	<b>620</b>	<b>893</b>

Table A20 indicates that Water Supply Assets are in fair to good condition, but are aging and that a program of asset replacement / renewal is necessary (which Council has in place under its 30 Year Forward Capital Works Program).

Councils Asset Register indicates that a high percentage of distribution and reticulation pipework is at or older than 30 years.

Council also recognises that it has a high percentage of AC pipes which will need to be replaced over the next 30 years. .

**Note: (1) Condition 2 = Superficial Deterioration** (Ranges from Good to Fair)

**Condition 3 = Deterioration Evident** (Ranges from Fair to Marginal)

**Condition 4 = Requires Major Reconstruction** (Ranges from Poor to Critical)

**e. Current Sewerage Services**Sewerage Services Summary

Key aspects of the sewerage services in Singleton LGA are summarised in Table A22 below:-

**Table A22: Summary of Sewerage Services**

		<b>2007/08</b>	<b>2008/09</b>
Population Served:	Permanent	14,926	15,009
(TBL performance Reports)			
Connected Properties:	Residential	5,077	5,115
	Non- Residential	451	444
Unsewered Urban Premises (No.)		200	316
Unsewered Urban Premises (%)		4%	6.2%
No. of on-site systems (within LGA)		4,357	4,951 (Mostly in the Villages)
Volume of Sewage treated (ML/d)		1,278	1,353
Volume of Sewage treated (kL/property)		643	636
Volume Recycled		33.3% (426 ML)	33.3% (451 ML)
Biosolids Re-used (On site uses)		0%	0%
Infiltration (assessed)	Not measured		
EPA Licences:	Licence No. 3088 Licence to discharge to Doughboy Hollow		
		0	0
Public Health Incidents			
Environmental Incidents (Cat. 1)		0	0
(Cat. 2/3)		0	0
Odour Complaints		2	1
Service Complaints		13	20

Source: DWE Performance Reports 2007/08; 2008/09

### Sewerage Systems

Principal aspects of Council's sewerage infrastructure include:-

- Treatment Works: Intermittent Extended Aeration Activated Sludge Plant (20,000 EP Capacity)
- Pumping Stations: 14 No.
- Pumping Capacity: 9.1 ML/d
- Length of Mains: Gravity Reticulation: 117 kms  
Pumping (Rising)Mains: 19 kms
- Total Length of Mains 136 kms

### Sewage Treatment:-

The Singleton Sewage Treatment Plant, which discharges into the Hunter River via Doughboy Hollow (the licensed discharge point), is licensed by DECCW (EPA) under Licence No 3088. The Licensed discharge point is at the outlet pit, downstream of the maturation pond.

Flow data at the Treatment Plant is summarised in Table A23 below:

***Table A23: Annual Flows at Sewage Treatment Plant***

<b>Capacity</b>	20,000 EP
<b>Flow Categorisation</b>	
-Annual Residential Inflow	1,353 ML/yr
-Annual Non-Residential Inflow	Not separately measured or recorded
<b>Total</b>	<b>1,353 ML</b>
-Trade Waste	Not recorded
-Infiltration	0
Average Dry Weather Flow	46.7 L/s
Peak Dry Weather Flow:	91.7 L/s
Peak Wet Weather Flow	12.0 ML/d

Effluent Quality:

Effluent analysis results (mean values) for the Singleton Plant are shown in Table A24 below.

**Table A24: Analysis Results for Singleton (2008 EPA Licence Periods)**

Parameter	Singleton STP		
	90%ile limit	100%ile limit	% Compliant
pH (units)	-	6.5-8.5	-
BOD (mg/L)	10	15	<b>100</b>
TSS (mg/L)	15	20	<b>100</b>
Ammonia (mg/L)	2	5	<b>100</b>
Total N (mg/L)	10	15	<b>100</b>
Faecal coliforms (per 100 ml)	200	600	<b>100</b>
Oil & Grease (mg/L)	10	15	<b>100</b>
Total P (mg/L)	0.3	0.5	<b>100</b>

These are very good treatment results.

There are however, a number of “non-compliances” listed on the DECCW website ([www.environment.nsw.gov.au/prpoeoapp/LicenceDetails.aspx](http://www.environment.nsw.gov.au/prpoeoapp/LicenceDetails.aspx)) for 2000, 2001, 2002, 2003, 2004, 2005, 2007 & 2008 and these are discussed more fully in **Appendix C: IWCM Related Targets, Obligations, Responsibilities and Requirements.**

Trade Waste Management

Council updated its Trade Waste Policy in 2005.

<b>Potential Issue:</b> With changes to the Trade Waste Guidelines published by the NSW Office of Water in 2009, this Policy is now out of date and will need to be updated.
--

Council also has in place a Community Service Obligation Policy with respect to Liquid Trade Waste Services.

#### Assets and Asset Management

Council maintains an excellent Asset Management Plan, including an up-to-date Asset Register, which lists the following information:-

- Sewer Pump Stations
- Sewer Rising Mains
- Gravity Sewers
- Sewer Manholes.

The assets are listed with the Water Assets in Table A20 above.

Table A20 indicates that the Sewerage Assets are in **fairly poor condition**, are aging, but sufficient annual expenditure appears to be directed to renewals and maintenance.

Council's 100 Year Asset Renewal Plan details the works required to bring the sewerage asset base up to good condition.

#### **Potential Issue: Sewerage infrastructure condition assessment**

#### **f. Current Stormwater Services**

Singleton has a fully functional stormwater drainage system. Stormwater discharge is typically to the Hunter River.

#### Stormwater Management

Consultants, Sinclair Knight Merz (SKM), were commissioned in 1998 to carry out a review of existing flood studies and to prepare a Development Control Plan (DCP). A pivotal recommendation of SKM's report was that a Flood Plain Management Plan be prepared. **This has not been completed.**

Council does have a Stormwater Management Plan (2003) which deals primarily with stormwater quality management and environmental aspects.

A "Flood Safe" brochure is also posted on Council's website which advises residents about flooding incidents, the risks involved and some measures which can be implemented to minimise risk. This information brochure is sponsored by the Singleton SES.

#### Stormwater Levels of Service

Council does not have Levels of Service in place for stormwater services.

Stormwater quality data is also not available because there is no monitoring program in place.



## **5A. CLIMATE CHANGE ASPECTS**

A 2008 Report on NSW climate change impacts, *Future Climate and Runoff Projections (to 2030) for New South Wales and 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
- 9 out of 15 of the global climate models (GCM's) show a decrease in the mean annual rainfall
- Winter rainfalls are likely to be lower across the entire State
- There is less likelihood of reductions in future summer rainfalls (only 5 out of 15 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
- Averaged across all regions, the median estimate is a 5% decrease in mean annual rainfall.

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.

**Impacts on the Water Utility** may include:

- Changes to water access licence conditions
- Greater uncertainty about yield from the existing raw water sources (potentially decreased water availability with increasing water demand)
- 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
- Greater interest and/or need to use low carbon dioxide (green) energy

**Impacts on Customers may include:**

- Increased total and/or seasonal water usage
- Increased grey water use
- Increased use of evaporative coolers

- Movement of people and industries away from areas of water shortage

### **Impacts Specific to Singleton**

The Tom Farrell Institute for the Environment has undertaken climate change modelling specific to the Hunter, Lower North Coast and Central Coast regions (utilising the CSIRO GCM predictions for NSW). (Source: *Hunter & Central Coast Regional Environmental Management Strategy*).

For Singleton the projections indicate:

- ✧ very little change in rainfall patterns, except for a statistically significant increase in autumn rainfall;
- ✧ an increase in extreme heat days;
- ✧ general increases in mean daily temperatures, with autumn and winter increases the most significant;
- ✧ a significant increase in the average minimum temperature of approximately 4.2°C in the western zone (including Singleton Shire) for the period 2020-2080;
- ✧ minimal changes in average summer maximum temperatures.

Table A25 shows the CSIRO's modelled predictions for the Hunter-Central Rivers catchment. Graphs of the relevant projections are also attached as Figures A13 and A14.

Singleton Council will need to consider these possible predictions in planning the future needs for both water supply and sewerage.

It is understood that Council will be required to assess the "secure yield" of its water source (Glennies Creek Dam) in the next year or two (pers.comm: Brian Carter).

<b><u>Potential Issue:</u> Determination of secure yield of Singleton's water source being Glennies Creek Dam</b>
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**Table A25: Current and Projected Climate Change in the Hunter-Central Rivers Catchment**

	<u>Present (1990) <sup>(1)</sup></u>	<u>Projected Change</u>	
		2030	2070
Temperature			
Average	Paterson: 17-32 °C <sup>(2)</sup> Scone: 17-29 °C <sup>(2)</sup> Williamtown: 18-29 °C <sup>(2)</sup>	+ 0.2 +1.6 °C	+0.7-+4.8 °C
No. Days below 0 °C	Scone: 5	Scone: 1-4	Scone: 0-2
No. Days above 35°C	Scone: 17	Scone: 19-32	Scone: 24-78
No. Days above 40°C	Scone: 1	Scone: 1-4	Scone: 2-23
Rainfall			
Annual Average	Paterson: 928 mm Scone: 647 mm Williamtown: 1,120 mm	-7-+7%	-20-+20%
Extreme Rainfall <sup>(3)</sup>		-10-+12%	-7-+10%
Evaporation		+1-+13%	+2-+40%
No. Droughts per decade <sup>(4)</sup>	3	1-5	1-9
Extreme Winds		-5-+8%	-16-+24%
No. Fire Days <sup>(5)</sup>	Williamtown: 16	Williamtown: 17-19	Williamtown: 18-24

1 Present day conditions for temperature and rainfall represent long-term averages from the Bureau of Meteorology. For extreme temperatures, the present average is based on 1964-2003. For fire danger, the present average is based on 1974.

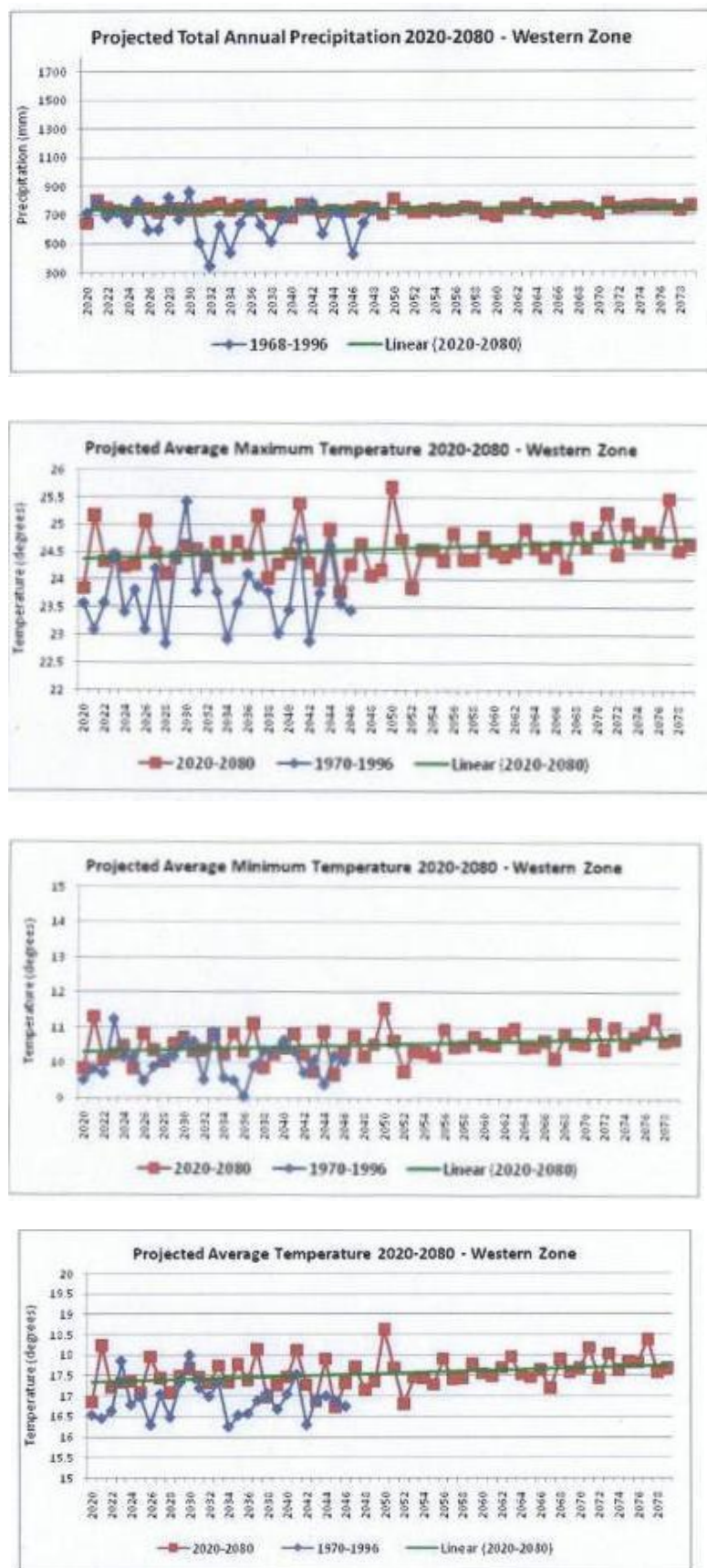
2 Range represents average July and January maximum temperature.

3 Defined as 1 in 40 year 1-day rainfall total. Values represent the range in seasonal projections from a limited set of climate models.

4 The values for drought represent average monthly drought frequencies, based upon the Bureau of Meteorology's criteria for serious rainfall deficiency (see also Burke et al., 2006)

5 Number of days annually with a "very high" or "extreme" fire danger index. Changes are for 2020 and 2050, respectively.

(Source: CSIRO – Climate Change in the Hunter-Central Rivers Catchment)



**Figure A15: Projected Rainfall & Temperature Impacts of Climate Change – Singleton Shire**  
(Source: Hunter & Central Coast Regional Environmental Management Strategy)

## 6A. SUMMARY

This Attachment has documented the Urban Water Services provided by Singleton Shire Council in terms of:

- the Catchment Context
- the Water Resources Context
- the Urban Water Systems Context, and
- the potential Climate Change Impacts.

The Data Gaps and Potential Issues identified in this investigation include:

### a. Data Gaps

- Floodplain Management Plan
- Outdated Strategic Business Plans (1998)
- Water usage on public parks & open space areas
- Top individual water consumers
- Peak demands by user category
- Quantified water losses
- Assessment of sewerage system infiltration
- Trade waste discharges to the sewerage system and, in particular, to the Sewage Treatment Plant
- Update of the 2005 Trade Waste Policy in accordance with the revised Guidelines issued by the NSW Office of Water (2009)
- Update of the 2003 Stormwater Management Plan
- No Council endorsed Levels of Service for stormwater

### b. Potential Issues

Item	Reference	Issue
1.	Section 2A – Catchment Perspective: Population Growth (Page A7)	Increasing customer base resulting in increases in water consumption & wastewater generation over the next 30 years.
2.	Section 2A – Catchment Perspective: Geology & Soils (Page A9)	Potential for urban salinity with potential impacts on water & sewerage infrastructure
3.	Section 2A – Catchment Perspective: Geology & Soils (Page A9)	Potential for groundwater recharge and/or pollution from septic tank systems and leaking wastewater lagoons
4.	Section 2A – Catchment Perspective: Geology & Soils (Page A9)	Potential gully erosion & stream erosion
5.	Section 2A – Catchment Perspective: Vegetation (Page	Eight (8) vegetative species listed as vulnerable or endangered

A16)				
6.	Section 2A – Catchment Perspective: Land Use (Page A19)	High current & future water consumption by the mining industry, with potential demand impacts on the water resource		
7.	Section 2A – Catchment Perspective: Stormwater (Page A20)	Review & update Stormwater Management Plan		
8.	Section 4A – Urban Water Systems: Sewerage to Villages (Page A33)	Four Villages (Broke, Jerrys Plains, Bulga & Camberwell are not sewered		
9.	Section 4A – Urban Water Systems: Levels of Service (Page A39)	Relevance of current Levels of Service (framed in 1998)		
10.	Section 4A – Urban Water Systems: Land Uses (Page A43)	Non-compliances with Licences issued by DECCW under the Protection of the Environment Act, 1997. [Refer Appendix C: IWCW Related Targets, Obligations, Responsibilities & Requirements]		
11.	Section 4A – Urban Water Systems: Effluent Quality (Page A51)	Non-compliances with DECCW (EPA) Licence. [Refer Attachment E]		
12.	Section 4A – Urban Water Systems: Trade Waste Policy (Page A51)	Current Trade Waste Policy not in accordance with revised (2009) Guidelines		
13.	Section 4A – Urban Water Systems: Effluent Quality (Page A52)	Non- compliances with EPA Licence conditions (refer Appendix C)		
14.	Section 4A – Urban Water Systems: Sewerage Asset Condition (Page A52)	Condition of sewerage infrastructure		
15.	Section 4A – Urban Water Systems: Stormwater Levels of Service (Page A53)	No Stormwater Levels of Service have been adopted by Council and no Floodplain Management Plan developed		
16.	Section 5A – Climate Change Aspects: (Page A55)	Council endorsed strategy for managing potential climate change impacts		
17.	Section 5A – Climate Change Aspects: (Page A55)	Assessment of “secure yield’ of existing water source (Glennies Creek dam)		

## **7A. REFERENCES**

Refer to Appendix E: Information & Data Assessment for a full listing of all references used in the IWCM Evaluation Study.



## **APPENDIX B**

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### **SINGLETON SYSTEM BOUNDARIES**

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## 1. WATER UTILITY BOUNDARIES

There are essentially three boundaries which apply to a Local Government Owned Water Utility (LWU), namely:

- Service Boundaries
- Administrative Boundaries and
- Physical Boundaries

### a. *Service Boundaries*

Singleton Shire Council, as the Local Water Utility (LWU), provides water supply, sewerage and stormwater to the following towns:-

Potable Water Supply:	<ul style="list-style-type: none"><li>• Singleton</li><li>• Mount Thorley Industrial Area (90 industrial customers. Interconnection pipeline with Singleton system feeding to a major reservoir in the industrial area)</li><li>• Army Camp – Abattoir</li><li>• (supplied by extended trunk main from Singleton to local balance tank)</li><li>• Broke Village (supply to 110 houses 9150 lots in the Village) via connection to the Singleton – Mount Thorley supply main)</li><li>• Jerrys Plains Village (supply to 90 houses (120 lots in Village), sourced from Naegan – Bayswater Power Station)</li></ul>
Sewerage:	<ul style="list-style-type: none"><li>• Singleton (5,115 connections)</li><li>• Maison Dieu (pressure sewer system – not all properties connected)</li></ul>
Stormwater:	<ul style="list-style-type: none"><li>• Singleton only</li><li>• Villages have standard, semi-rural, table drain systems</li></ul>

Maps and details of the water supply, sewerage and stormwater systems are appended in Attachment B1.

### **General Comments:**

- Council is considering the provision of potable water supplies to Bulga and Camberwell Villages. Concept designs and cost estimates are being reviewed and allowance has been made for these schemes in the revised Water Financial Model (2009).

The existing Council resolution is that these schemes not proceed without State Government subsidy.

- None of the Villages are sewered. Consultants have been engaged to prepare concept designs and cost estimates for provision of sewerage to all Villages.

Previously, Council has resolved not to proceed with the Villages' sewerage scheme without subsidy, due to the high costs involved



Figure B1: Shire of Singleton and Surrounding Villages

#### ***b. Administrative Boundaries***

Singleton Shire Council is responsible for the planning, operation and management of all water supply, sewerage and stormwater services within the Shire, subject to the regulatory functions of a number of NSW State Government Departments, namely:-

- \* NSW Office of Water,
- \* NSW Health,
- \* Department of Environment, Climate Change and Water (DECCW).

Other Agencies relevant to the operation and management of Singleton's water supply, sewerage and stormwater services include:-

- \* State Water, Newcastle; in relation to water allocations from the Hunter River.
- \* NSW Department of Primary Industries,
- \* NSW Department of Lands
- \* NSW Roads and Traffic Authority,

c. *Physical Boundaries*

Singleton is located in the Hunter Local Government region of New South Wales, is within the Hunter – Central Rivers catchment and is surrounded by Upper Hunter, Dungog, Maitland, Cessnock, Hawkesbury & Mid Western Regional Councils

Figure 2 below shows Singleton in relation to the surrounding Shires.

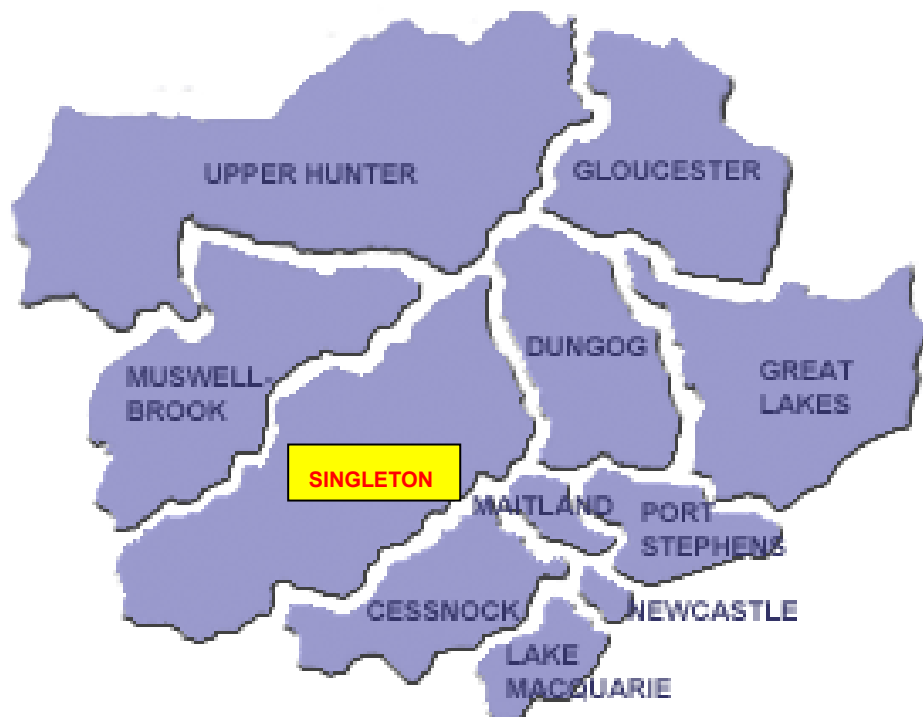


Figure B2: Hunter Local Government Boundaries

(Source: NSW Department of Local Government)

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**ATTACHMENT B1: SINGLETON SYSTEM BOUNDARIES - SCHEMATICS**

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**ATTACHMENT B - 1**  
**BULK WATER SUPPLY SCHEMATICS**

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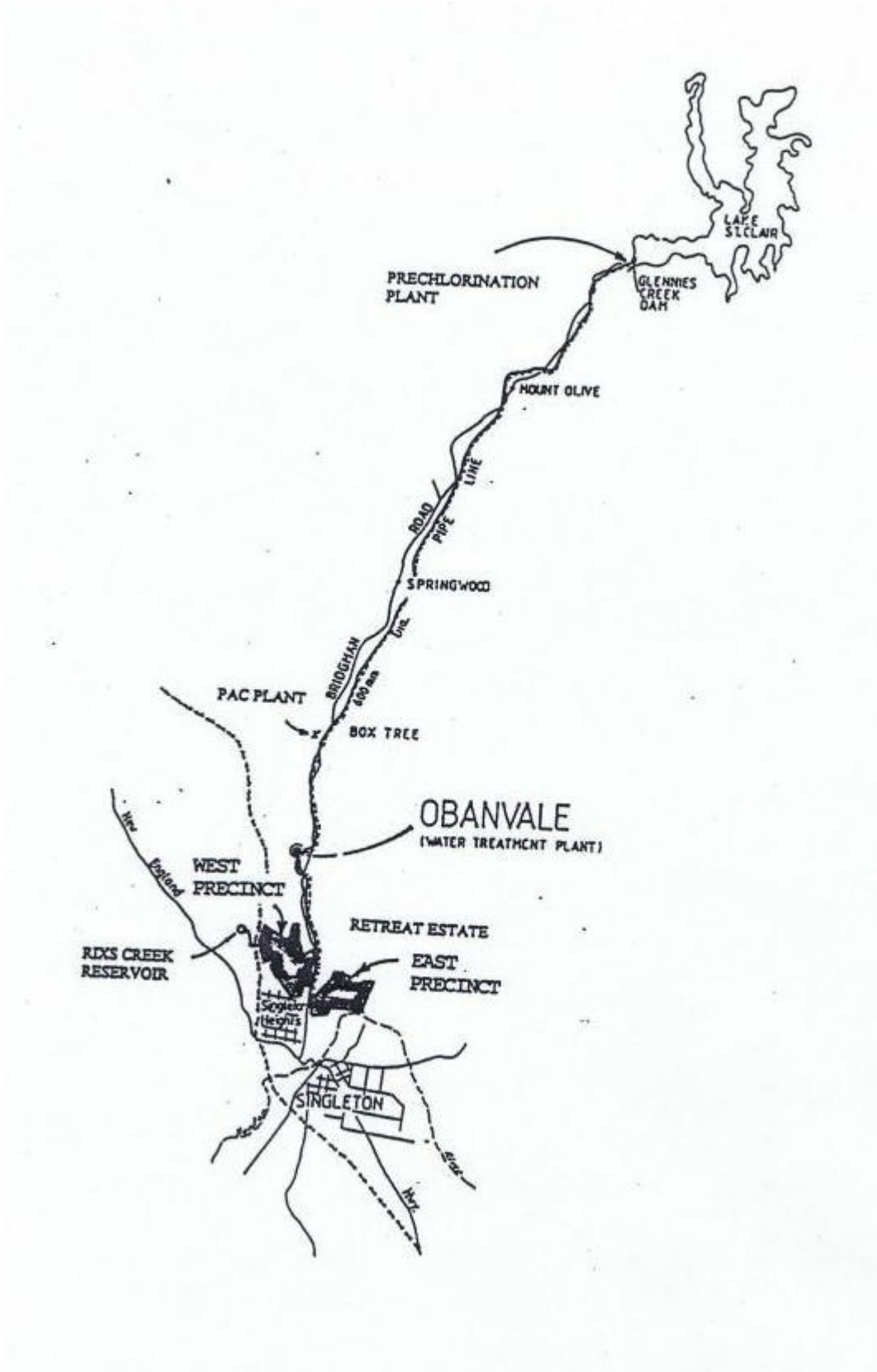


Figure B-1: Schematic: Singleton Water Supply from Glennies Creek Dam



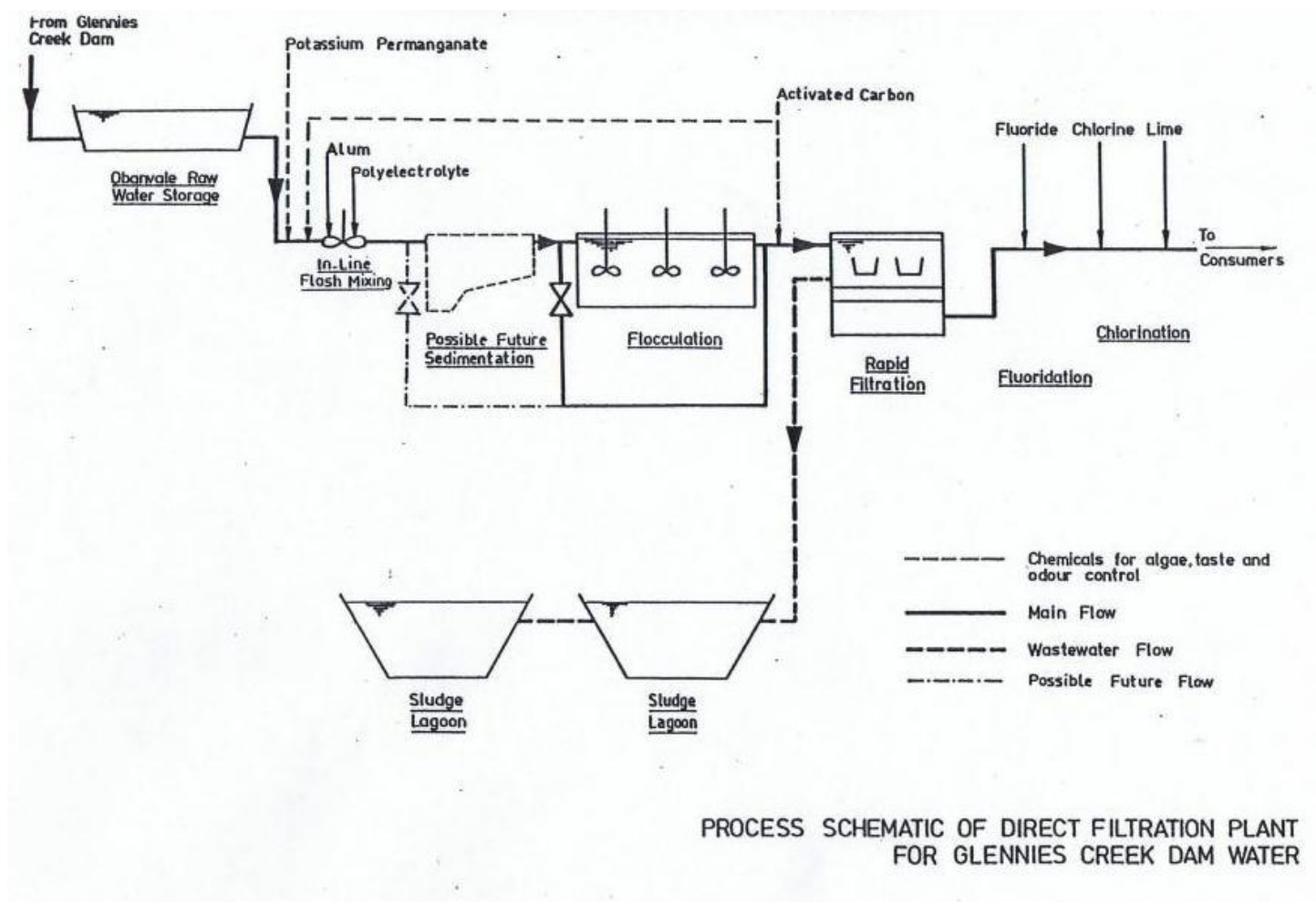


Figure B-2: Schematic: Singleton Water Treatment Plant







Figure B-4: Singleton & Surrounds Water Supply



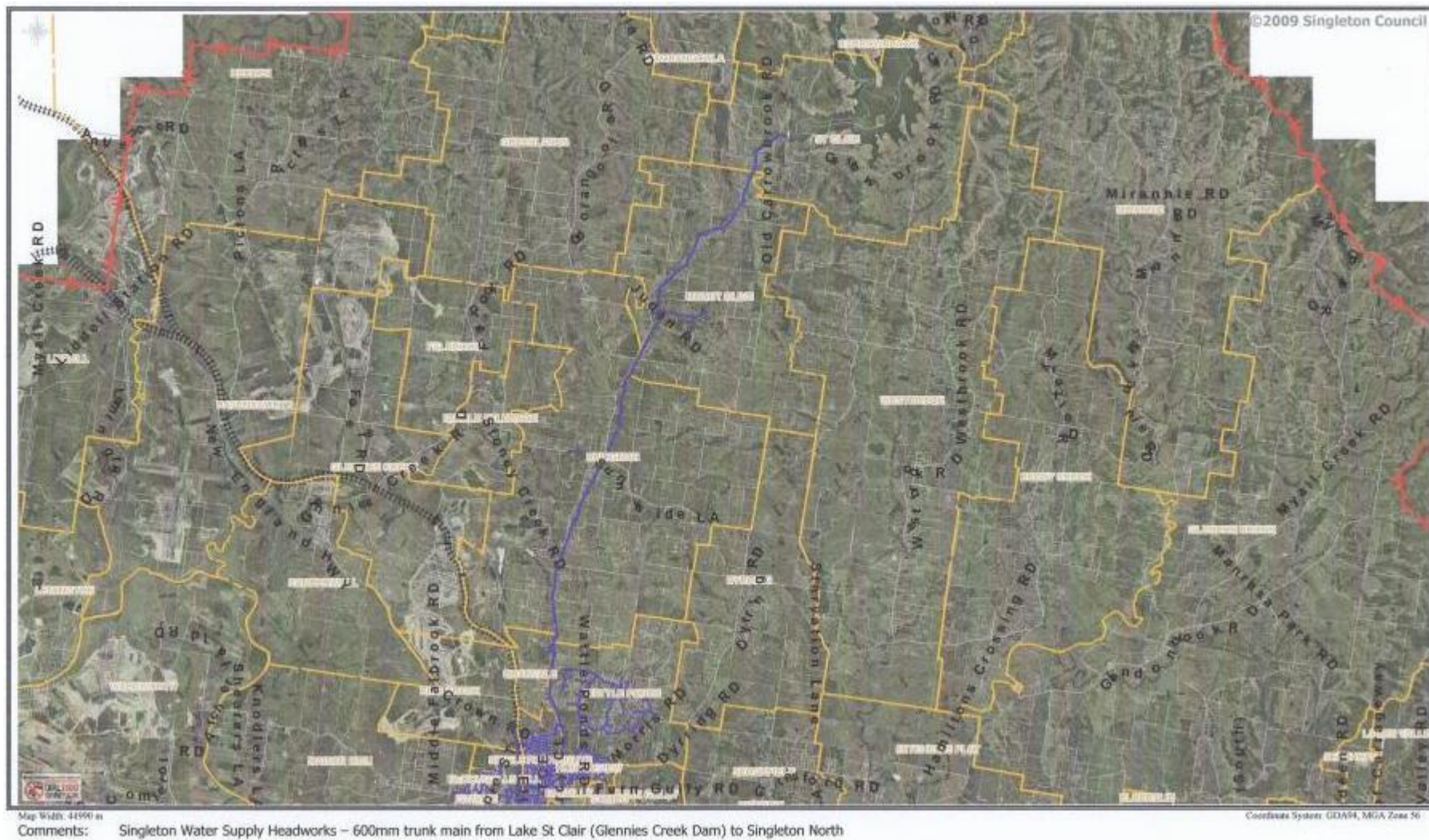


Figure B-5: Singleton Water Supply Headworks



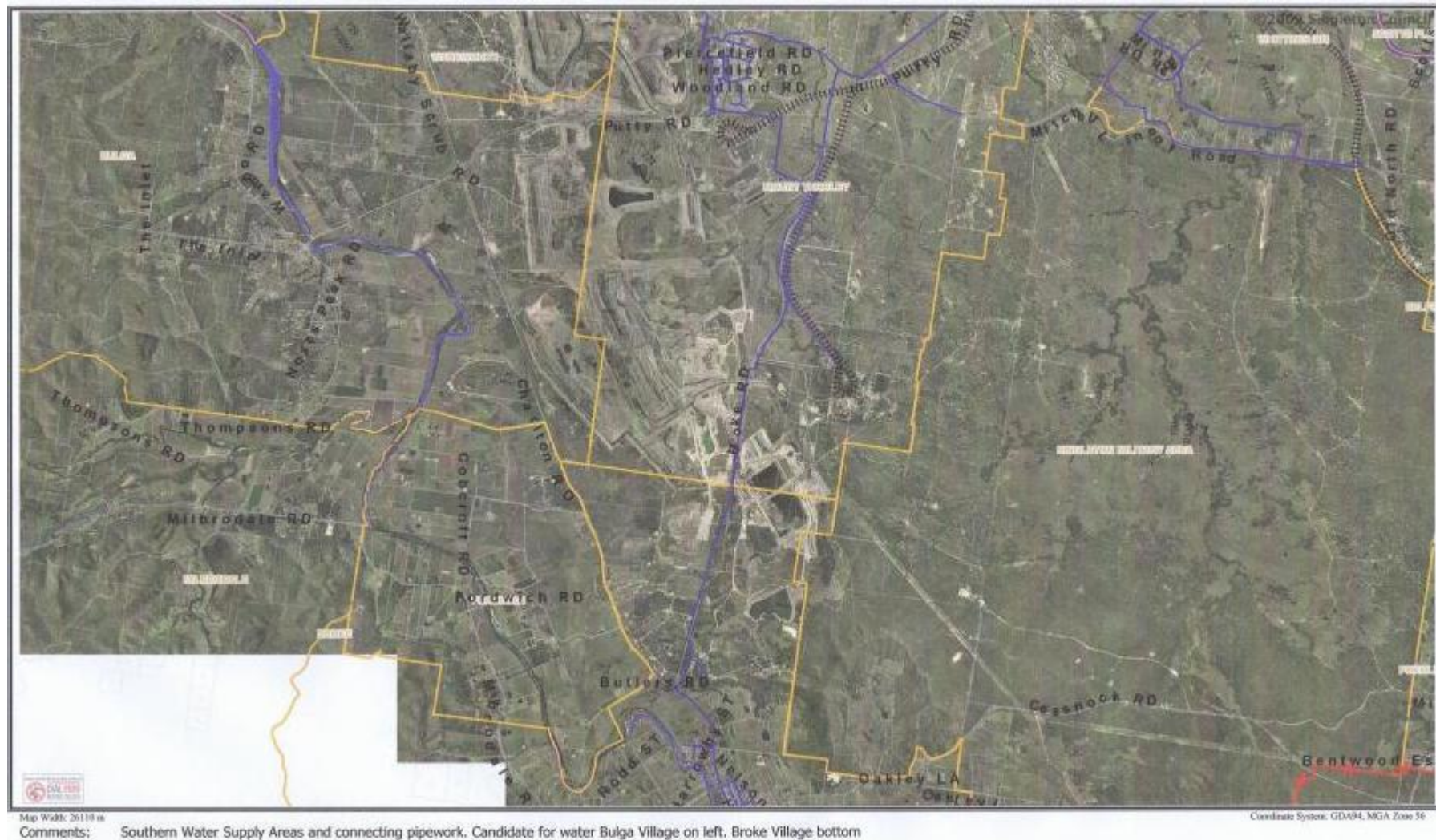


Figure B-6: Southern Water Supply Areas



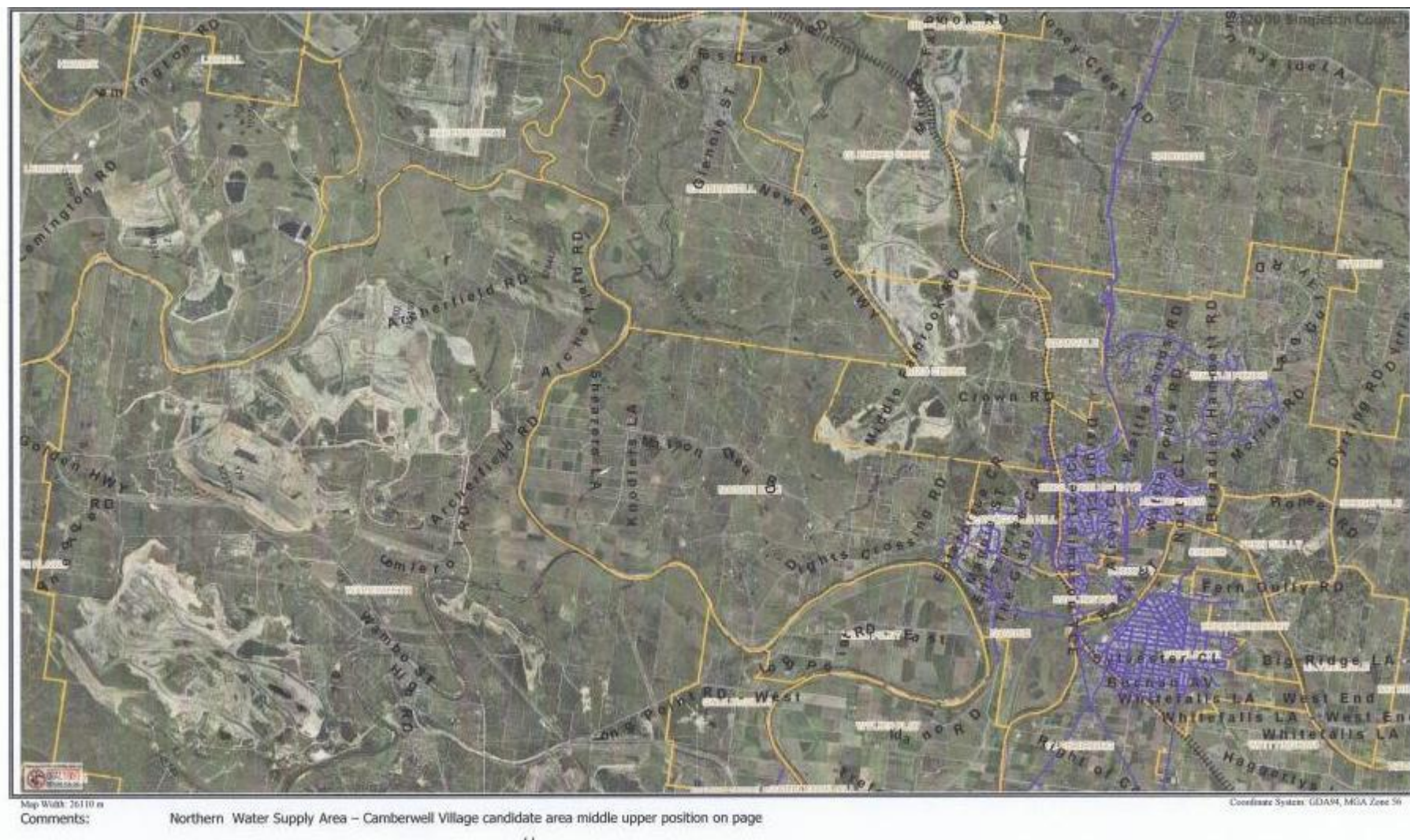


Figure B-7: Northern Water Supply Area





Figure B-8: Jerrys Plains water Supply Headworks



Figure B-9: Jerrys Plains Water Supply Area



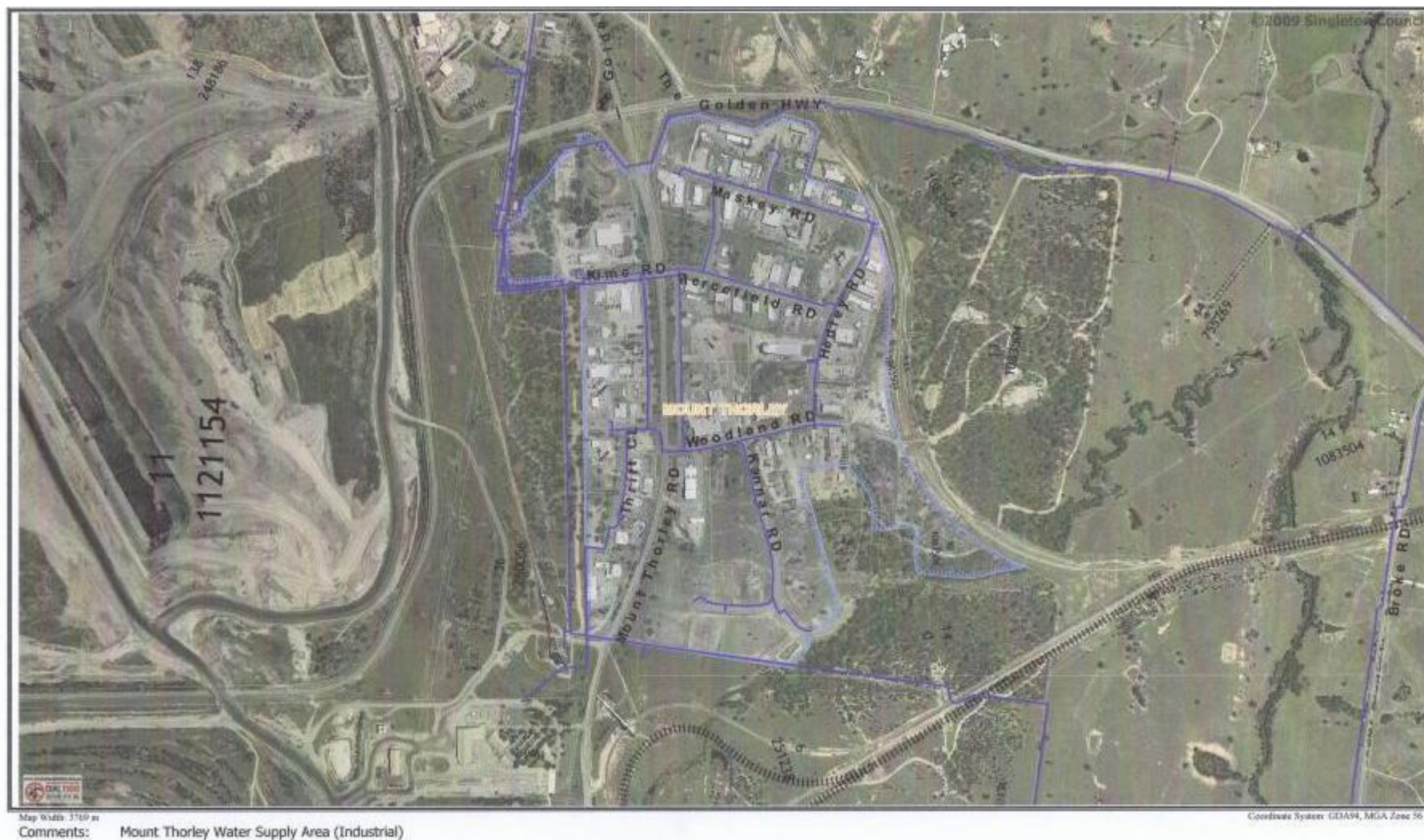


Figure B-10: Mount Thorley Water Supply Area



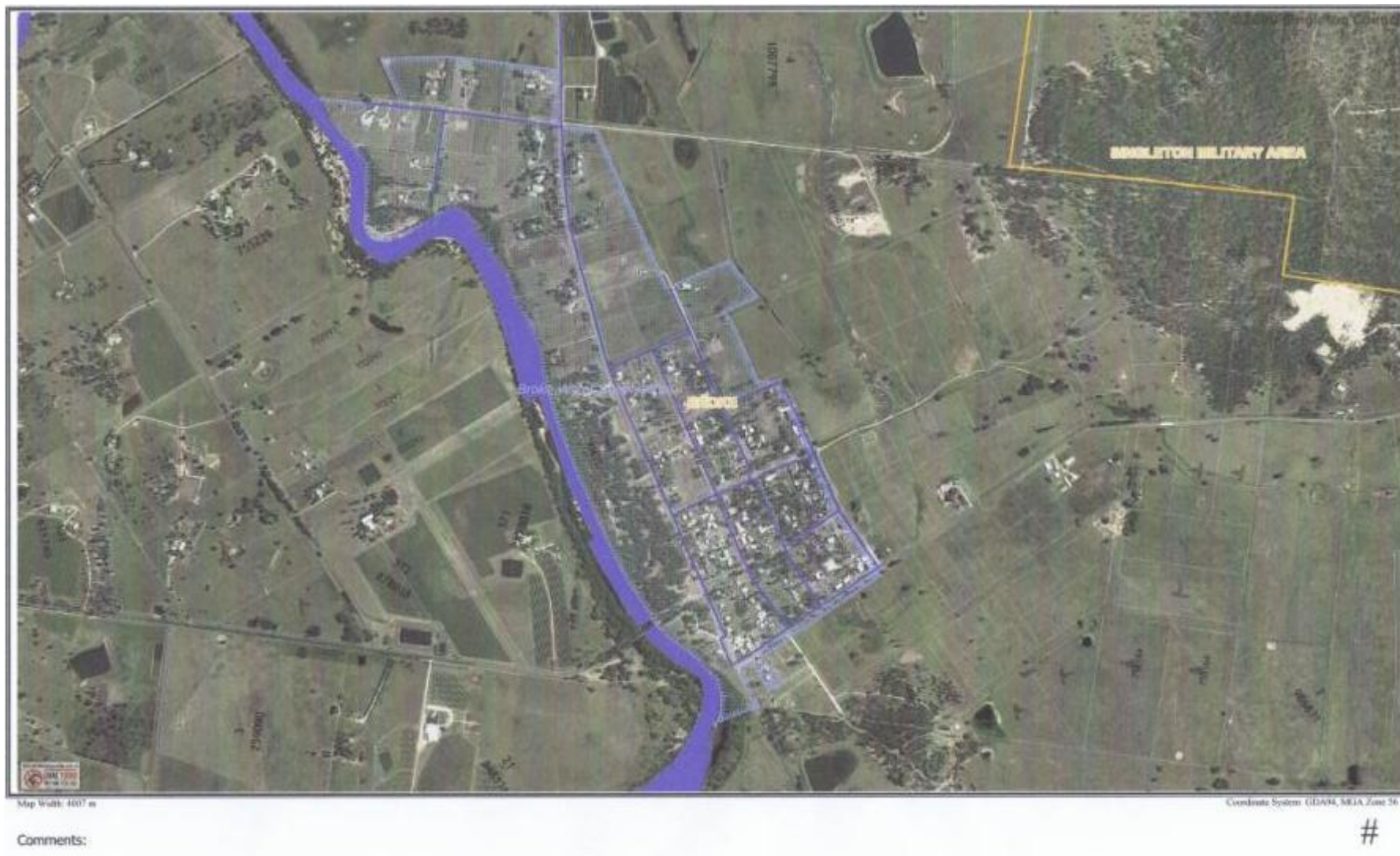


Figure B-11: Broke Water Supply Area

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**ATTACHMENT B - 2**  
**SEWERAGE SYSTEMS**

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Figure B-12: Singleton Sewerage Service Area

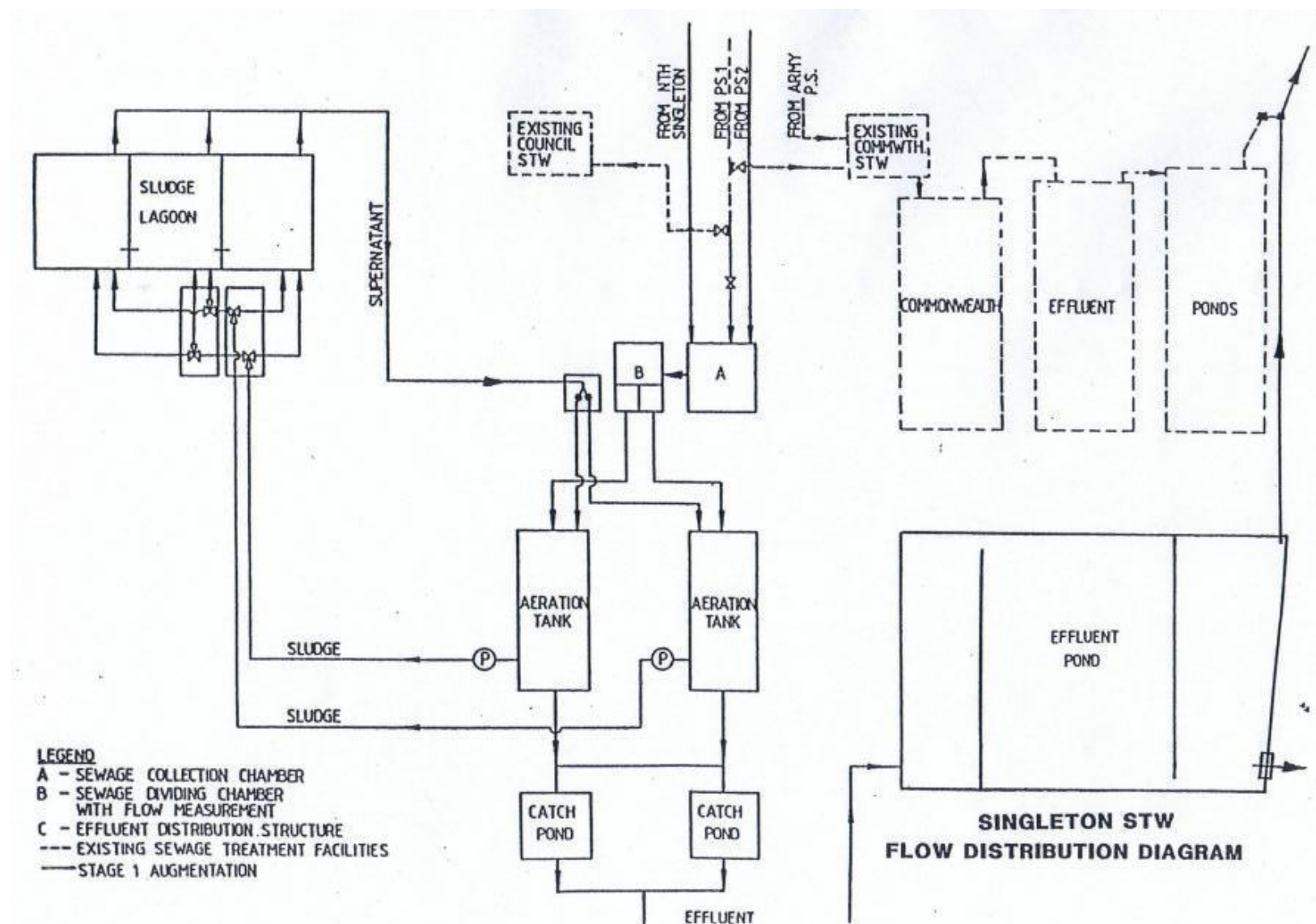


Figure B-13: Schematic: Singleton Sewage Treatment Plan

## **APPENDIX C**

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### **IWCM RELATED TARGETS, OBLIGATIONS, RESPONSIBILITIES & REQUIREMENTS**

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## Attachments

- 1: Singleton TBL Reports for 2007/08
- 2: Forward Capital Works Programs for Water Supply & Sewerage

## 1C. INTRODUCTION

There are a number of plans, strategies, initiatives and legislative documents and requirements which impose obligations, tasks and responsibilities on Local Water Utilities.

This Section summarises these externalities and the requirements and obligations they impose on the water businesses of Singleton Shire.

## 2C. AUSTRALIAN DRINKING WATER GUIDELINES

The Australian Drinking Water Guidelines (ADWG 2004) provide the generally accepted criteria for drinking water quality standards for LWUs.

Singleton Shire Council has adopted the ADWG for its water quality standards, to ensure that the water reaching all consumers is safe to drink.

NSW Health defines the requirements for monitoring frequencies and number of samples and Council's obligation is to comply with these requirements.

The analysis results for Singleton (575 samples) and Jerrys Plains (112 samples) for the period 1 July 2005 to 30 June 2009 are summarised in the Table below:

**Table C1: NSW Health Analysis Results**

Period	Parameter	Compliance (Meeting Guideline Values)	
		Singleton	Jerrys Plains
July 2005 – June 2009	Total Coliforms	96%	99%
	E. coli	100%	100%
	pH	100%	100%
	Turbidity	100%	100%
	TDS	100%	100%
	Chemical	100%	100%
	<u>Except</u>		
	Lead	-	75%
	Fluoride (daily)	86%	NA
	Fluoride (weekly)	91%	NA
	Fluoride (Field Result)	NA	NA

(Source: NSW Health Drinking Water Database)



In terms of overall performance over the four (4) years, the following are the non-compliances recorded:

<b>Singleton:</b>	Total Coliforms:	23 exceptions
	Fluoride daily:	142 exceptions
	Fluoride weekly:	39 exceptions
<b>Jerrys Plains:</b>	Total coliforms:	1 exception
	Lead:	2 exceptions

The non-compliances for Singleton related to minor problems with sampling techniques for fluoride, which have now been corrected.

**Issues: Jerrys Plains – non-compliance with Lead concentrations**

The Drinking Water Guidelines have recently been revised to now incorporate a risk based framework for the Management of Drinking Water Quality.

It is expected that this will become the standard for LWUs to implement in the future.

A key requirement of the Framework is the preparation of a Drinking Water Quality Management Plan. Singleton Shire is planning to develop a Management Plan in 2011.

**Potential Issue: Development of a Water Quality Management Plan in accordance with the Australian Drinking Water Guidelines**

### 3C. WATER ENTITLEMENTS

Water entitlements for Singleton are detailed below:

<b>Licence</b>	<b>Location</b>	<b>High Security ML/year</b>	<b>General Security ML/year</b>
HU/20AL 200015	Glennies Creek – Town	5000	
HU/20AL200018	Jerrys Plains (supplied through MacGen)	32	
HU/20AL201448	Mt Thorley from Parks		24
HU/20AL201240	Mt Thorley from Windt	5	
HU/20AL201239	Mt Thorley Mine Allocation %	1907	
	Bulga 867		
	Mt Thorley 867		
	Warkworth 145		
	Council 33 to Mush Comp		

	Mushroom Comp Licence	51	
HU/20AL201247	Mt Thorley from Parks	25	
	Groundwater Entitlements (currently not accessed)	4,050	
	<b>Totals</b>	<b>11,070</b>	<b>24</b>

**Table C2: Water Entitlements**

The Town Entitlements total 5,000 ML/year (5,000 ML/yr for Singleton)

Mt Thorley water has been built-up over the years from a number of sources - 24 ML of General Security was transferred from existing town Parks usage along with 25 ML of High Security Water.

5 ML of High Security Domestic and Stock was purchased when the industrial land was bought in 1980.

The 1907 ML High Security allocation is an aggregation of the Mt Thorley Water Supply Joint Venture partnership allocations, including Council, but the MT industrial area reticulation is now supplied from town and not from the Joint Venture. This is the principal licence Council uses.

Potable water consumption in Singleton (under the Town water entitlement) has averaged 2,705 ML/year over the past five (5) years and 2,842 ML/year over the past ten (10) years. Potable consumption in 2008 was 2,349 ML/year.

There has been a general reduction in water consumption over the last ten (10) years, despite population growth in excess of 1.3% pa over the same period.

Council is currently using less than half its annual entitlement.

In summary, Council holds entitlements of 5,032 ML/a as Town Supply Entitlements, 1, 988 ML/a of High Security Entitlements and 24 ML/a of General Security Entitlements.

There are currently no reduced (drought induced) allocations of the Town supply entitlements.

#### **4C. LICENCES**

- **Sewage Treatment Plant Licence**

The **Singleton Sewage Treatment Plant** (located at Army Camp Road, Singleton) is required to operate in accordance with DECCW (EPA) Licence No. 3088.

The Licence Discharge Point is at the outlet pit downstream of the Maturation Pond, discharging to Doughboy Hollow.

The current licence discharge limits are shown below:

**Table C3: Discharge Volumes**

<b>Unit of measure</b>	<b>Volume Limit</b>
Kilolitres per day	33,600

**Table C4: Concentration Limits**

<b>Pollutant</b>	<b>Units of Measure</b>	<b>50 percentile concentration limit</b>	<b>80 percentile concentration limit</b>	<b>90 percentile concentration limit</b>	<b>100 percentile concentration limit</b>
Total suspended solids	milligrams per litre	20	-	30	35
Biochemical oxygen demand	milligrams per litre	20	-	30	35
Oil & Grease	milligrams per litre	-	10	-	15
Nitrogen (total)	milligrams per litre	-	15	-	25
Phosphorus (total)	milligrams per litre	-	10	-	15

**Table C5: Load Limits**

<b>Assessable Pollutant</b>	<b>Load Limit (kg)</b>
BOD (Enclosed Waters)	18,288
Nitrogen (total) (Enclosed Waters)	24,384
Oil & Grease (Enclosed Waters)	12,192
Phosphorus (total) (Enclosed Waters)	12,192
Total suspended solids (Enclosed Waters)	24,384

**Table C6: Monitoring Requirements**

<b>Pollutant</b>	<b>Units of Measure</b>	<b>Frequency</b>	<b>Sampling Method</b>
Biochemical oxygen demand	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
Nitrogen (total)	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
Oil and Grease	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
Phosphorus (total)	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
Total suspended solids	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample
Flow	Kilolitres	Continuous	Electronic sensor & continuous logger

Council is also required to submit annual returns, notify of any harm to the environment as a result of the sewerage system operation, provide written reports as requested by DECCW submit annual performance reports and manage biosolids (storage, treatment, transportation and disposal) in accordance with DECCW's Biosolids Guidelines.

There has been a number of non-compliances recorded by DECCW against the Singleton STP over the last five (5) years and these are detailed below:

**Table C7: STP Non-compliances**

Year	Non-compliant	Details	Comments
2008	BOD: Load limit TSS: 50%ile limit BOD:50%ile, 90%ile(?), 100%ile limits Oil and Grease: 80%ile & 100%ile limits Total N; 80%ile and 100% limits	Exceeded limit: once Exceeded limit: twice Exceeded limit: once  Exceeded limit: once Exceeded limit: once	Due to algae in Maturation Lagoon Not unusual for STP's, where sampling is grab sample once per month Not unusual for STP's, where sampling is grab sample once per month Not unusual for STP's, where sampling is grab sample once per month
2007	Total P: Load limit Total P: 80%ile limit	Exceeded limit: once Exceeded limit: five times	There are no facilities (ie. No chemical dosing)
	TSS: 100%ile limit	Exceeded limit: once	
2005	Oil and Grease: 100%ile limit Total P: 80%ile limit  Sample Collection	Exceeded limit: once  Exceeded limit: three times  Exceeded 4 week frequency for samples: once	Council's existing STP does not have P removal capability. This will be addressed with the new Plant which is being designed for P removal.
2004	Oil and Grease: 100%ile limit PRP:	Exceeded limit: once  Requirements not completed by due date	The PRP no longer applies. Necessary works implemented

**The record of non-compliance indicates a requirement for Council to improve the management of the STP, particularly in relation to BOD, TSS & Oil and Grease compliance.  
Council is currently (2010) finalising Tenders for the augmentation of the Sewage Treatment Plant (Therefore, this is not an IWCM Issue.)**

## **5C. CONTRACT OBLIGATIONS**

The Contract obligations Council have are:

- Water supply to Jerrys Plains Village is sourced separately from the Macgen – Bayswater Power Station. Council's obligation is to manage the supply to Jerrys Plains, including water quality monitoring as required by NSW Health.
- Singleton Army Camp: Bulk water supply and sewage treatment (Pay for Service Contract).
- Mount Thorley Joint Venture: Contract to manage a river water pumping scheme for three (3) open cut coal mines.
- Abattoir: Contract to supply water.

Council also takes the responsibility for quality compliance in relation to various mines via water carting contracts.

**All the above Contract Obligations are being met.**

**Given that Council is currently assessing Tenders for augmentation of the STP, the subsequent Contract will become a Contract Obligation in 2010 and beyond.**

## 6C. LEVELS OF SERVICE

The current Levels of Service (LOS) are somewhat dated, as they were developed as part of the 1998/99 Strategic Business Planning Process.

These LOS are being reviewed and updated by Council as part of a review of the dated Strategic Business Plans. It is anticipated that the revised SBPs will be available by mid 2010.

The existing LOS are reproduced below because they are the current service commitments by Council to its customers.

**Table C8: Water Supply: Levels of Service**

Description	Unit	1998/99 Target Levels of Service	Achievement/Comments
<b>Availability of Supply</b>			
<b>Normal Quantity Available</b>			
Domestic Peak day	Litres/tenement/day	4,000	Yes – currently 1900L/tenement/day
Domestic Annual	Kilolitres/tenement/year	250-350 (60%) 500 (Average)	Yes – domestic annual usage: 290 kL/tenement /year
Peak to Average consumption ratio	-	3.9	
<b>Fire Fighting</b>			
Compliance with Building Code of Australia and NSW Fire Brigade requirements	% area served	95% Target: Increased standard in CBD ie. 2x22L/s	98% achieved
<b>Pressure</b>			
Minimum pressure when conveying 0.15 L/s/tenement	Metres head	12m absolute 20m desirable	100%
Maximum static pressure	Metres head	120	100%
<b>Consumption Restrictions in Droughts</b>			
In accordance with Council's Drought Management Plan	% normal usage	In accordance with targets set in Drought Plan	1 occurrence in last 12 years

Description	Unit	1998/99 Target Levels of Service	Achievement/Comments
<b>Supply Interruptions to Consumers</b>			
Temporary supplies during planned interruptions			
Planned:			
- Notice given to domestic customers	days	>1	95%
- Notice given to commercial customers	days	>1	95%
Notice given to industrial customers	days	>1	95%
-Maximum duration of interruption	hours	<6	100%
-Number of interruptions	number per customer per year	<1 (excl. system break downs or system development (eg connecting new subdivisions etc)	Estimated at 90% achievement (due to subdivisional activity)
Unplanned:			
Target is for less than 30 houses to be affected per failure.			
- Maximum duration	hours	4	NA
- Maximum number per two years	times	4	NA
Total number of interruptions	number per year per 1000 connections	10	NA
<b>Response Times</b>			
(Defined as maximum time to have staff onsite or to investigate problem or answer inquiry)			
<b>Supply Failure</b>			
During working hours	minutes	30	100%
Out of working hours	minutes	30	100%
<b>Minor Problems and general Inquiries</b>			
Oral inquiry		30 minutes to 1 day	90% (estimate)
Written inquiry		10 days	95% (estimate)
Note: Times apply for 95% of occasions			
<b>Service Provided</b>			
Time to provide an individual connection to water supply serviced area (90% of times)	working days	5	85%

Description	Unit	1998/99 Target Levels of Service	Achievement/Comments
<b>Water Quality</b>			
<b>Microbiological Quality</b>			
Coliforms	number per 100 mL	0	96% (2005 – 2009)
Faecal Coliforms	number per 100 mL	0	100%
Current long term microbiological compliance (thermo tolerant coliforms)	% complying	100	98%
Note: In accordance with the 1996 NHMRC guidelines			
<b>Physical Results</b>			
pH	-	6.5-8.5	Yes
Colour	True Colour Units	<5	Yes
Turbidity	Nephelometric Turbidity Units	<0.2	95%
Taste and Odour	Complaints per 1000 customers per year	5	NA
Dirty Water	Complaints per 1000 customers per year	5	NA
Aesthetics, Disinfection			
<b>Chemical – Inorganic Results</b>			
Iron	mg/L	<0.03	100%
Manganese	mg/L	<0.01	75%



**Table C9: Sewerage: Levels of Service**

Description	Unit	1998/99 Target Levels of Service	Achievement/Comments
<b>Availability of Service</b>			
Extent of area serviced	served area	Target is to provide appropriate sewer services to the maximum extent possible	Extensions to services being allowed for in new SBP
<b>Frequency of System Failures</b>			
<b>Category One</b>			
Failure due to rainfall and deficient capacity	number/year	<2 per year	100% compliance
<b>Category Two</b>			
Failures due to pump or other breakdown include power failure	number/year	<2 per year	100% compliance
<b>Category Three</b>			
Failures due to blockages	number/year	150 per year	90% compliance (estimate)
<b>Response Times to System Failure</b>			
(Defined as the maximum time to have staff onsite to commence rectification after notification)			
<b>Priority One</b>			
(Major spill, significant environmental or health impact, or affecting large number of consumers i.e. a major main)			
- Response time during working hours:	minutes	30	100% compliance
- Response time after hours:	minutes	30	100% compliance

Description	Unit	1998/99 Target Levels of Service				Achievement/Comments
<b>Priority Two</b>						
(Moderate spill, some environmental or health impact, or affecting small number of consumers i.e. other mains)						
- Response time during working hours:	minutes	30				100% compliance
- Response time after hours:	minutes	30				100% compliance
<b>Priority Three:</b>						
(Minor spill, little environmental health impact, or affecting a couple of consumers)						
-Response time during working hours:	minutes	30				60% compliance
- Response time after hours:	minutes	60+ (depending on nature of problem)				60% compliance
<b>Response Times to General or Minor Customer Complaints and Inquiries (1)</b>						
- Written complaints	day	10				95% (estimate)
- Oral complaints	day	30 minutes to 1 day (depending on nature)				90% (estimate)
Note: Times for 95% of complaints						
<b>Odour Complaints</b>						
- Treatment Works	number/year	<4				100% compliance
- Pumping Stations	number/year	<12				100% compliance
<b>Discharge Licence Conditions</b>	(Percentiles)	50%	80%	90%	100%	
-Quantity	kL/day				6,000	100% compliance
- Biochemical Oxygen Demand	mg/L	20	-	30	35	98% (2004 – 2008)
- Non Filterable Residue	mg/L	20	-	30	35	94% (2004 – 2008)
- Oil and Grease	mg/L				10	94% (2004 – 2008)
- pH					6-9	100% (2004 – 2008)
- Phosphorus	mg/L				10	-
- Total Nitrogen	mg/L	-	15	-	-	98% (2004 – 2008)
- Faecal Coliforms (geometric mean)	No./100 ML				No limit	-

**Council is generally complying with these Levels of Service.**

**Potential Issue: The need to update the Levels of Service.**

**[Council is currently updating the Strategic Business Plans for Water Supply & Sewerage and, as part of that process, the Levels of Service will be reviewed in line with current management and operational objectives – and community expectations].**

Council does not have Levels of Service for Stormwater Services.

Council has in place:

- An Urban Stormwater Management Plan (2003);
- The *Singleton Floodplain Management Development Control Plan* (DCP) which incorporates a plan of areas affected by flooding and recommends that Council prepare an actual Floodplain Management Plan **(This has never been completed)**;
- A community education program on Stormwater Quality which in 2008/09 involved:
  - program at three local schools
  - stencilling of drains throughout Singleton with “ a drain is just for rain”;
  - distribution of educational posters, brochures and leaflets to the community;
  - exhibitions in shopping centres;
  - local media campaigns.

## 7C. PERFORMANCE REPORTING

Annual performance reporting to the Office of Water is a requirement of Best Practice service provision for LWUs in NSW.

Although strictly not an Obligation for Council, the resulting Triple Bottom Line (TBL) Report, issued to Council, provides benchmarking information to enable LWUs to review their overall performance.

The TBL Reports for Water Supply and Sewerage for 2007/08 are appended to this Attachment.

On a state wide and similar sized LWUs comparison, the following are areas where Council's performance ranked in the bottom 20%:

Item	LWU's with 3,001 to 10,000 Assessments	All LWUs
<u>Water Supply</u>		
▪ customer interruption frequency per 100 properties	✓	✓
▪ average annual water supplied (kL/property) – Coastal	✓	✓
▪ real losses (leakage) (L/ service connection /day)	✓	-
▪ residential revenue from usage charges (% of residential bills)	✓	-
<u>Sewerage</u>		
▪ average sewerage interruption (minutes)	✓	✓
▪ total days lost (%)	✓	✓
▪ volume of sewage collected per property (kL)	✓	✓
▪ sewer main cost per property (\$)	-	✓

Council may consider it appropriate to take the necessary action to improve its performance in relation to each of the above items.

**Potential Issues:** Items listed above; where Council's TBL reported performance was in the bottom 20% for Councils in the 3,001 to 10,000 population category.

The TBL Reports also note that Council is non-compliant with Best Practice requirements in the following areas:

### Water Supply

- Pricing – complying residential charges  
(This is the requirement that LWUs like Singleton are required to recover 75% + of revenue from usage charges)
- Sound water conservation  
(Council has committed to completion of a Water Conservation & Demand Management Strategy in 2010)
- Integrated Water Cycle Management Strategy  
(This is being addressed in this Document)

### Sewerage

- Integrated Water Cycle Management Strategy  
(This is being addressed in this Document)

## 8C. LEGISLATIVE REQUIREMENTS

As with all LWUs in NSW, Singleton is required to comply with a range of legislative obligations.

These are set out in Table C10 below.

**Table C10: Singleton Shire Council: Legislative Obligations**

Legislation	Council's Obligations & Requirements
Soil Conservation Act, 1938	This Act (inter alia) addresses soil erosion, preservation of watercourse environments and the protection of trees on protected land. Council is required to comply with the Act in relation to prevention of soil erosion and protection/preservation of watercourse environments, specifically Sections 19 (Proclaimed Works) and 22 (Preservation of Proclaimed Works)
Fluoridation of Public Water Supplies Act, 1957	This Act, together with the Fluoridation of Public Water Supplies Regulation (2002) and the Code of Practice for the Fluoridation of Public Water Supplies (2002) direct G in the approvals required and the responsibilities attached to the fluoridation of Council's water supplies. Fluoridation applies at the Singleton Water Treatment Plant (but not for Jerrys Plains) and, under the legislation, Council is responsible for: <ul style="list-style-type: none"> <li>• Daily and weekly tests at the treatment plant</li> <li>• A monthly test submitted to Health's Analytical Laboratory</li> <li>• Reporting to Health of dosing above 1.5 mg/L and any interruptions to dosing longer than 24 hours</li> </ul>
Environmental Planning and Assessment (EP&A) Act, 1979	Requires that all proposals, activities and functions which are investigated, designed, planned, constructed and operated by SC are to be assessed for their environmental impact. The Act provides the basis for the preparation of environmental planning instruments that may be directly or indirectly related to the water business
Occupational Health & Safety Act, 2000 (1)	Relevant & important to all SC's operations, including Water & Sewerage. Requirements include risk assessment, risk management and training of staff in safety matters. Council MUST provide a safe working environment and provide equipment & resources to ensure safety of its workers and the community and can be liable for any breaches of these requirements.
Public Health Act, 1991	Provides powers to NSW Health in relation to the supply of safe drinking water. Requirement for testing of drinking water and provision of results of testing. Powers to order rectification or closure of a water supply for non-compliance. Council is required to comply with the testing and reporting requirements of the Act and to take action to rectify any matters affecting or likely to affect the safety of the water supply to consumers.

**Potential Issue: Fluoridation of Jerry's Plains water supply**

<b>Legislation</b>	<b>Council's Obligations &amp; Requirements</b>
Protection of the Environment Operations Act, 1997	<p>Need to exercise due diligence to avoid environmental impact.</p> <p>Need to develop operations emergency management plans.</p> <p>Obligation to notify EPA of pollution "incidents"</p> <p>System licensing for sewerage systems; including Pollution Reduction Programs</p> <p>Treatment works operating licences must comply with the Act.</p>
Water Management Act, 2000	<p>Requirement to levy developer charges.</p> <p>Provides the framework for water sharing plans and environmental flows.</p> <p>Defines LWU access licences and bulk water supply regimes</p>
Catchment Management Authorities Act, 2003	<p>Hunter Central Rivers CMA is the statutory body created by this Act</p> <p>Provides the basis and authority for preparation of a Catchment Action Plan which sets direction for investment in natural resource management.</p>
Local Government Act, 1993 and Local Government (General) Regulation, 2005	<p>Need to comply with Accounting Standard AAS27 (including provisions regarding accounting for depreciation)</p> <p>Requirements to comply with DWE Best Practice Criteria. Statutory requirements in relation to pricing and charges (including Developer Charges).</p> <p>Also stipulates the need for Ministerial approval to undertake water supply or sewerage works (Section 60)</p> <p>Other requirements including State of Environment reporting, triple bottom line reporting, etc</p>

#### (1) Occupational Health & Safety

Council has in place a formally adopted Occupational Health & Safety strategy.

Council is also an active member of the Hunter Councils OH&S Group.

Council's 2009/10 Management Plan highlights the following in respect of OH&S:

##### Objectives

- To ensure employees have the necessary skills, training and motivation to successfully undertake their duties;
- To ensure compliance with all relevant OH&S obligations;
- To provide and maintain a safe and rewarding work environment for all members of the Singleton Council organisation
- and, under, Occupational Health & Safety Strategy:-
  - Review and develop Singleton Council's OH&S Management System to reflect best practice, promote continuous improvement and provide an infrastructure which addresses OH&S in a systematic way;
  - Develop and maintain a culture of accountability for ensuring health, safety and welfare;
  - Improve the capacity of Council program managers and employees to identify and manage hazards effectively.

There are also a number of Environmental Planning Instruments and requirements which impinge on the operations of Council and its related water and sewerage businesses. These are summarised in Table C11 below:

**Table C11: Relevant State Planning Instruments**

**State Planning Policies (SEPP's)**

Building Sustainability Index (BASIX), 2004

All new residential development, as well as alterations and additions are required to meet stipulated targets for water and energy efficiency. These targets became mandatory in 2005/06.

The Local Water Utility is required to include, in its planning role, any impacts of BASIX on future water needs

Housing for Seniors or People with a Disability, 2004

Implementation of this SEPP may impact on system demands in relation to water & sewerage services

Local Environmental Plans (LEP's)

Planning in NSW is carried out under the statutory control of the Environmental Planning and Assessment (EPA) Act, 1979. LEP's are the means used to prescribe land use policies and controls for Councils. Whilst LEP's focus on development control by land use zoning they may also deal with matters like the protection of heritage items, urban conservation,, environment protection, local works and area protection programs. Local councils are responsible for preparing LEP's DCP's alert developers to the level of detail required for certain types of applications and what standards are required for the design of certain developments. It ensures that standards related to water & sewerage infrastructure are suitable & relevant. The responsibility of the LWU is to ensure that Council places appropriate conditions on DCP's to protect the integrity and interest of the water businesses.

Development Control Plans (DCP's)

It would appear that Singleton Council is generally complying with all of the above legislative requirements. An extensive data search has failed to unearth any non-compliances.

## **9C. PERFORMANCE REPORTING AND BEST PRACTICE COMPLIANCE**

Singleton Shire Council has resolved to comply with the six (6) Best Practice Criteria, as defined by DWE, namely:

- Strategic Business Planning
- Pricing (including Developer Charges, Liquid Trade Waste Policy and Approvals)
- Water Conservation
- Drought Management
- Performance Reporting
- Integrated Water Cycle Management.

According to the NSW Office of Water, Council is currently compliant with most aspects of Best Practice, except:-

- ⋈ IWCM for both water supply and sewerage; (the IWCM will be completed in 2010)
- ⋈ Complying residential charges for water supply; (Council is working towards complying residential charges)
- ⋈ Compliance with sound water conservation principles.(Council will complete its Water Conservation & Demand Management Strategy in 2010)

## **10C. MANAGEMENT AND BUSINESS PLANS**

Singleton Shire Council's operations are directed by its Management Plan, which is prepared and adopted annually.

As previously noted, Strategic Business Plans for Water Supply and Sewerage were last prepared by Council in 1998/99 and are now being updated (completion by mid 2010).

The current 30 Year Capital Works Programs for Water Supply and Sewerage are attached to this Appendix C.

## **11C. OTHER COMPLIANCE ASPECTS**

Local water utilities are also required to comply with a range of other plans and strategies, as discussed below.

### **a. NSW Water Inquiry**

In August 2007, the Minister for Water Utilities announced an Inquiry into the institutional arrangements by which town water supply and sewerage services are provided in country NSW.

The Objectives of this Inquiry are to:

- i) identify the most effective institutional, regulatory and governance arrangements for the long term provision of water supply and sewerage services in the State; and
- ii) ensure that these arrangements are cost effective, financially viable, sustainable, optimise whole-of-community outcomes and achieve integrated water cycle management.



Essentially, the Government expects LWUs to:

- respond and plan in advance for the challenges facing the industry
- be financially self sufficient
- be able to comply with appropriate and stringent environmental and public health standards, and
- implement cost effective service standards.

Singleton Shire Council has made a submission to the Inquiry which essentially favours the status quo – that is, with Council continuing to provide and manage the water and sewerage services within the shire.

Council believes that it can continue to provide acceptable levels of service to its residential and non-residential customers at competitive pricing levels, while still meeting its required statutory and industry performance standards.

However, Council is actively pursuing an Alliance arrangement with its neighbouring Councils (namely, Muswellbrook & Upper Hunter), particularly in the areas of sharing resources and professional & technical expertise).

#### **b. Water Sharing Plans and Water Entitlements**

The water supply to Singleton is subject to the requirements of the Water Sharing Plan (WSP) for the Hunter Regulated River Water Source (July 2004).

#### **c. Water Quality and River Flow Objectives**

The NSW Water Quality Objectives are the agreed environmental values and long term goals for the State's surface waters. They set out:

- The community's values and uses for the State's rivers, creeks, estuaries and lakes (ie. Healthy aquatic life, water suitable for recreational activities like swimming and boating and drinking water)
- A range of water quality indicators to help assess whether the current condition of waterways supports those values and uses.

The Objectives are consistent with the agreed national framework for assessing water quality, as set out in the ANZECC 2000 Guidelines (ANZECC = Australian and New Zealand Environment and Conservation Council). These Guidelines provide an agreed framework to assess water quality in terms of whether the water is suitable for a range of environmental values (including human uses).

The Water Quality Objectives provide environmental values for NSW waters and the ANZECC guidelines provide the technical guidance to assess the water quality needed to protect those values.

The River Flow Objectives are the agreed high level goals for surface water flow management. They identify the key elements of the flow regime that protect river health and water quality for ecosystems and human uses.

The Objectives are set out in Appendix A; Section 3A, Page A30. Results of water quality monitoring are presented in Table A11, Page A33.

The Objectives are not being met.

#### **d. Water Recycling, Grey Water Reuse, Biosolids Management and Onsite Sewage Management**

There is a range of requirements and Guidelines for the management of water/effluent recycling, grey water use, on-site sewage management and biosolids management which apply to the operations of LWUs.

These are discussed below:

##### **Guidelines for Water Recycling**

- Managing Health and Environmental Risks (2006)
- Management of Private Recycling Schemes (2007)

The National Environment Protection and Heritage Council, the Natural Resource Ministerial Council and the Australian Health Ministers Conference released the *Australian Guidelines for Water Recycling – Managing Health and Environmental Risks* in November 2006. These Guidelines have been adopted by DWE for the assessment of Section 60 applications for approval to treat and supply recycled water under the *Local Government Act 1993* and Section 292 applications for approval to treat and discharge recycled water under the *Water Management Act 2000*.

The NSW Guidelines for Management of Private Recycled Water Schemes have adopted the principles outlined in the National Guidelines to the approval process for private recycled water schemes, requiring Section 68 Approval. This Guideline is intended to provide practical advice for obtaining approval to install and operate a private recycled water scheme within the NSW legislative framework.

Singleton does not recycle any reclaimed water, although approximately 33% of the water reclaimed from the Sewage Treatment Plant is reused by farmers around the Doughboy Hollow discharge point. The water is used to irrigate pasture.

**Potential issue: Development of a water recycling policy.**

##### **NSW Guidelines for Grey Water Reuse in Sewered, Single Household Residential Premises (2007)**

These Guidelines are to be applied in approving grey water treatment systems in accordance with section 68 of the *Local Government Act, 1993*. Councils must not approve the installation of a grey water treatment system unless the system has received accreditation from NSW Health.

Council encourages the use of grey water within Singleton and distributes relevant information to residents.

##### **Environmental Guidelines for the Use and Disposal of Biosolids Products (DECC 1977)**

These Guidelines apply to the management of biosolids and are incorporated in Council's EPA Licence. They:

- Outline the regulatory framework which applies
- specify objectives, design requirements and performance requirements and measurements
- specify the benchmarks to be used for measuring and monitoring performance
- outline the issues to be considered when planning composting and other organic processing facilities

- identify possible environmental management techniques
- list the items to be included in an environmental management plan and a water assessment plan for composting and other organics processing facilities.

Council does not have a Policy for reuse of biosolids and there is no reuse at present.

All sludge from the sewage treatment processes is stabilised in lagoons, dried and disposed to landfill.

A Report by Parsons Brinckerhoff Australia (2009) recommends upgrading of the sludge handling facilities to achieve EPA Grade B stabilisation requirements to enable land use of the biosolids

<b>Potential issue: Potential for reuse of biosolids</b>
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#### **On-site Sewage Management**

In 1998 the NSW Government introduced a package of local government regulatory reforms and guidelines to ensure more effective regulation and performance supervision by councils of small domestic sewage management facilities. These required councils, where on-site sewage management exists, to prepare and implement an "On-site Sewage Management Strategy".

Singleton's Strategy provides Council and the community with a means of assessing and regulating the installation and operation of all on-site sewage management systems within the Shire. The Strategy is primarily used to assess applications for on-site systems.

#### **e. NSW Groundwater Quality Protection Policy**

Singleton Shire Council does not currently draw on groundwater for water supply within the Shire, but may in the future. Council holds entitlements amounting to 4,050 ML/year of groundwater. There are also a number of private Groundwater Licences applying to agricultural enterprises.

Council does have a responsibility to ensure that its municipal operations have no impact on groundwater quality in its area.

The Groundwater Protection Policy which was prepared by the former Department of Land and Water Conservation has been adopted the NSW Office of Water.

The Policy objectives are to:

1. slow, halt or reverse any degradation in groundwater resources
2. direct potentially polluting activities to the most appropriate local geological setting so as to minimise the risk to groundwater
3. establish a methodology for reviewing new developments (industrial, mining, rural and urban) with respect to their potential impact on water resources
4. establish triggers for the use of more advanced groundwater protection tools, such as groundwater vulnerability maps or groundwater protection zones

and it is the intent of the Policy that these objectives will be achieved by applying the following management principles:

1. all groundwater systems managed such that their most sensitive identified beneficial use is maintained
2. town water supplies afforded special protection against contamination
3. groundwater pollution prevented so that future remediation not required
4. for new developments, the scale and scope of work required to demonstrate adequate groundwater protection is commensurate with the risk the development poses to the groundwater system

5. a groundwater pumper shall bear the responsibility for environmental damage or degradation caused by using groundwater that is incompatible with soil, vegetation or receiving waters
6. groundwater dependent ecosystems to be afforded protection
7. quality protection to be integrated with quantity protection
8. the cumulative impacts of developments on groundwater quality to be recognised by all those who manage, use or impact on the resource
9. where possible and practicable, environmentally degraded areas to be rehabilitated and their ecosystem support functions restored.

The Policy underpins the parent NSW State Groundwater Policy (1997) which was also prepared by the former Department of Land and Water Conservation.

**Potential issues: Urban salinity in Singleton.**

**f. Stormwater Management Policy**

The Strategic Framework for Managing Urban Stormwater which was published in 1996 by the EPA and implemented by the former Stormwater Trust, required Councils to produce Stormwater Management Plans.

Singleton Shire Council adopted its Stormwater Management Plan in 2003.

It would be appropriate for Council to review and update this Plan.

**g. Floodplain Development Manual**

The Floodplain Development Manual, published in 2005 by the former Department of Natural Resources, was prepared in accordance with the State Government's Flood Prone Land Policy. It guides Councils in the development and implementation of detailed local floodplain risk management plans and robust and effective floodplain risk management outcomes.

The process consists of the following steps:

- Flood Study: which defines the nature and extent of any flood problems
- Floodplain Risk Management Study; determines options in consideration of social, ecological and economic factors relative to flood risk
- Floodplain Risk Management Plan: develops preferred options and publicly exhibits the Plan, which is formally approved by Council after the public exhibition and any necessary revisions are made.
- Plan Implementation: implementation of flood, response and property modification measures (including mitigation works, planning controls, flood warnings, flood readiness and response plans, environmental rehabilitation, on going data collection and monitoring) by Council

It is important to note that management of flood risk is a local government responsibility.

Singleton Council has not yet prepared its Floodplain Risk Management Study.

**Gap: Floodplain Risk Management Plan not completed.**

## 12C. SUMMARIES – DATA GAPS & POTENTIAL ISSUES

### Data Gaps:

Item	Comment
<ul style="list-style-type: none"> <li>current, updated, Levels of Service for Water supply &amp; Sewerage</li> </ul>	Council has committed to a review and update of the Strategic Business Plan in 2010
<ul style="list-style-type: none"> <li>Performance Report gaps relating to:  <u>Water Supply</u> <ul style="list-style-type: none"> <li>energy consumption per ML</li> <li>renewable energy consumption</li> <li>net greenhouse gas emissions</li> </ul> </li> </ul>	Council has committed to report on these items for 2009/10
<ul style="list-style-type: none"> <li> <u>Sewerage</u> <ul style="list-style-type: none"> <li>Biosolids reuse</li> <li>energy consumption per ML</li> <li>renewable energy consumption</li> <li>net greenhouse gas emissions</li> <li>loan payments per property</li> </ul> </li> </ul>	Council has committed to report on these items for 2009/10
<ul style="list-style-type: none"> <li>Stormwater Management Plan – update</li> </ul>	Not a LWU responsibility
<ul style="list-style-type: none"> <li>Floodplain Risk Management Strategy</li> </ul>	Not a LWU responsibility

### Potential Issues:

Item	Comment
<u>Water Quality:</u>	
<ul style="list-style-type: none"> <li>Non-compliance with total coliforms and fluoride concentrations in the Singleton water supply.</li> </ul>	Current testing & assessment programs to continue
<ul style="list-style-type: none"> <li>Non-compliances with lead concentrations in the Jerrys Plains water supply.</li> </ul>	Continued monitoring
<ul style="list-style-type: none"> <li>Development of a Water Quality Management Plan in accordance with the Australian water Quality Guidelines</li> </ul>	To be developed in 2010/11
<u>STP Licence Compliance</u>	
<ul style="list-style-type: none"> <li>History of non-compliances in relation to BOD, TSS, &amp; O&amp;G licence requirements.</li> </ul>	Plant to be augmented in 2010/11. EPA monitoring point considered inappropriate.
<ul style="list-style-type: none"> <li>Implementation of industry standard Levels of Service for water supply &amp; sewerage services.</li> </ul>	To be considered in current review of SBP
<u>Performance ranking</u> is below 20% for:	
<u>Water Supply</u>	
<ul style="list-style-type: none"> <li>customer interruption frequencies</li> <li>average annual water supplied to customers</li> <li>water losses</li> <li>residential revenue from usage charges</li> </ul>	
<u>Sewerage</u>	
<ul style="list-style-type: none"> <li>average length of sewerage interruptions</li> <li>debt to equity ratio</li> </ul>	

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Stormwater Management

Not a LWU responsibility

Issues for Council (not the LWU):

- updated Stormwater Management Plan
- lack of a Floodplain Risk Management Strategy

Legislative Requirements

- Fluoridation of Jerry's Plains water supply

No action currently planned

Other Compliance Aspects

- Development of a water recycling policy
- Potential for reuse of biosolids
- Urban salinity in Singleton

# **ATTACHMENT 1**

## **SINGLETON TBL REPORTS FOR 2007/08 & 2008/09**



# Singleton Shire Council TBL Water Supply Performance 2007/08

WATER SUPPLY SYSTEM - Singleton Shire Council serves a population of 17,600 (6,250 connected properties). Water is drawn from the Hunter River and Glennies Creek to supply Singleton. The Singleton Shire Council system comprises 1 direct filtration works (30 ML/d), 8 service reservoirs (25 ML) and 6 pumping stations, 97 km of transfer and trunk mains and 162 km of reticulation. The water supply is fully treated.

PERFORMANCE - Singleton Shire Council achieved 70% compliance with Best Practice requirements. The typical residential bill was \$355 which was close to the statewide median of \$370 (Indicator 14). The economic real rate of return was 0.9% which was greater than the statewide median (Indicator 43). The operating cost (OMA) per property was \$371 which was above the statewide median of \$300 (Indicator 49). Water quality complaints were less than the statewide median of 3 (Indicator 25). Compliance with microbiological water quality was 100% with 1 of 1 zones compliant (Indicator 20), physical compliance was 100% (Indicator 19) and chemical compliance was 100% with 1 of 1 zones compliant (Indicator 19b). Current replacement cost of system assets was \$77M (\$11,700 per assessment), cash and investments were \$16.4M, debt was nil and revenue was \$4.1M (excluding capital works grants).

## COMPLIANCE WITH BEST- PRACTICE MANAGEMENT GUIDELINES REQUIREMENTS

(1) Complete Current Strategic Business Plan & Financial Plan	YES	(3) Complete performance reporting (by 15 September)	YES
(2) Pricing - Full Cost-recovery, without significant cross subsidies	Yes	(4) Sound water conservation implemented	YES
(2a) & (2b) Pricing - Complying Residential Charges	Yes	(5) Sound drought management implemented	70%
(2c) Pricing - Complying non-Residential Charges	Yes	(6) Integrated water cycle management strategy commenced	
(2d) Pricing - DSP with Commercial Developer Charges	Yes	COMPLIANCE WITH ALL REQUIREMENTS	

## TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

NWI No.		LWU RESULT	RANKING		STATEWIDE MEDIAN
			3,001 to 10,000	All LWUs	
			Note 1	Note 2	Note 3
		Col 1	Col 2	Col 3	Col 4
UTILITY	C1 1	Population served: 17600			
	C4 2	Number of connected properties: 6250			
	Number of assessments: 6570				
	C2 3	Residential connected properties (% of total)	89		91
	4	New residences connected to water supply (%)	3.8	1	1.1
	A3 5	Properties served per kilometre of water main	24		33
	6	Rainfall (% of average annual rainfall)			110
	W11 7	Total urban water supplied at master meters (ML)	2,320		6,600
	8	Peak week to average consumption (%)	132	1	140
	9	Renewals expenditure (% of current replacement cost of system assets)	0.0	1	0.1
	10	Employees per 1000 properties	1.1	1	1.4
SOCIAL	P1	Residential tariff structure: inclining block; independent of land value			
	12	Residential water usage charge (c/kL) for usage All (Note 5)	83	2	130
	13	Residential access charge per assessment (\$)	180	1	110
	P3 14	Typical residential bill per assessment (\$)	355	1	370
	15	Typical developer charge per equivalent tenement (\$)	4,300	1	4,300
	18	Urban population without reticulated water supply (%)	2.9	1	0.8
	H6 18a	Risk based drinking water quality plan?	No		
	19	Physical water quality compliance (%)	100	1	100
	19a	Chemical water quality compliance (%)	100	1	100
	H4 19b	Number of zones with chemical compliance	1 of 1		
ENVIRONMENTAL	H3 20	Microbiological (E. coli) water quality compliance (%)	100	1	100
	20a	% population with microbiological compliance	100	1	100
	C9 25	Water quality complaints per 1000 properties	2	1	3
	C10 26	Water service complaints per 1000 properties	30	2	4
	C17 27	Customer interruption frequency per 1000 properties	320	5	37
	C15 28	Average duration of interruption (min)	120	1	120
	A8 30	Number of water main breaks per 100 km of water main	12	2	9
	31	Drought water restrictions (% of time)	95	1	75
	32	Total days lost (%)	4.1	5	2.8
	W12 33	Average annual residential water supplied per property (kL)	211	1	173
ECONOMIC	33a	Average annual residential water supplied - COASTAL (kL/property)	211	5	150
	33b	Average annual residential water supplied - INLAND (kL/property)			230
	A10 34	Real losses (leakage) (L/service connection/day)	120	5	80
	35	Energy consumption per Megalitre (kiloWatt hours)			710
	36	Renewable energy consumption (% of total energy consumption)			0
	E12 36a	Net greenhouse gas emissions - WS & Sge (net tonnes CO2 - equivalents per 1000 properties)			350
	F5 40	Revenue per property - water (\$)	650	1	546
	F4 41	Residential revenue from usage charges (% of residential bills)	49	5	71
	F17 43	Economic real rate of return - Water (%)	0.9	1	0.2
	44	Return on assets - Water (%)	2.4	1	-0.1
ECONOMIC	F22 45	Net Debt to equity - Water (%)	-25	5	-2.0
	F23 46	Interest cover - Water	>100	1	>100
	47	Loan payment per property - Water (\$)	0	1	26
	F24 47b	Net profit after tax - WS & Sge (\$'000)	1,760	1	415
	48	Operating cost (OMA) per 100km of main (\$'000)	895	1	1,040
	F11 49	Operating cost (OMA) per property (\$ ) (Note 6)	371	1	300
	50	Operating cost (OMA) per kilolitre (cents)	100	1	100
	51	Management cost per property (\$)	109	1	118
	52	Treatment cost per property (\$)	95	1	29
	53	Pumping cost per property (\$)	52	1	25
ECONOMIC	54	Energy cost per property (\$)	12	1	13
	55	Water main cost per property (\$)	73	2	49
	F14 56	Capital Expenditure per property (\$)	213	1	252

## NOTES:

- The ranking compared with LWUs with 3,001 to 10,000 connected properties (Col 2) is on a % of LWUs basis - relevant for comparing performance with similar sized LWUs - see attachment.
- The ranking compared with all LWUs (Col 3) is on a % of LWUs basis - relevant for comparing performance with all other LWUs - see attachment.
- The Statewide Median (Col 4) is on a % of connected properties basis. It best reveals statewide performance by giving due weight to larger LWUs & reducing the effect of smaller LWUs - see attachment.
- Annual review of key projections and actions in LWU's Strategic Business Plan (SBP) are required, together with annual updating of LWU's financial plan. The SBP should be updated after 3 years.
- Non-residential Tariff: Access Charge based on Meter Size\* (eg. 40mm \$720), Two Part Tariff; For all usage = 83c/kL.  
Water supplied to non-residential customers was 40% of potable water supplied excluding non-revenue water.  
Non-residential customers provided 40% of the revenue from annual charges and usage charges. Residential tariff
- The operating cost (OMA)/property was \$371. Components were: management (\$109), operation (\$142), maintenance (\$94), energy (\$12) & chemical (\$5) & bulk purchase (\$9)



# Singleton Shire Council TBL Sewerage Performance 2007/08

SEWERAGE SYSTEM - Singleton Council has 1 sewage treatment works providing advanced secondary treatment. The system comprises 20,000 EP treatment capacity (Intermittent Extended Aeration (Activated Sludge)), 14 pumping stations (9.1 ML/d), 19 km of rising mains and 116 km of gravity trunk mains and reticulation. Treated effluent is discharged to river.

PERFORMANCE - Residential growth for 2007/08 was 2.2% which is higher than the statewide median. Singleton Shire Council achieved 89% compliance with Best Practice requirements. The typical residential bill was \$373 which was less than the statewide median of \$440 (Indicator 12). The economic real rate of return was 2% which was greater than the statewide median (Indicator 46). The operating cost per property (OMA) was \$247 which was less than the statewide median of \$320 (Indicator 50). Sewage odour complaints were close to the statewide median of 0.4 (Indicator 21). Council complied with the environmental regulator for effluent discharge. The current replacement cost of system assets was \$52M (\$9,400 per assessment), cash and investments were \$9M, debt was nil and revenue was \$2.7M (excluding capital works grants).

## COMPLIANCE WITH BEST-PRACTICE MANAGEMENT GUIDELINES REQUIREMENTS

(1) Complete current strategic business plan & financial plan	YES	(2d) Pricing - DSP with commercial developer charges	Yes
(2) Pricing - full cost-recovery, without significant cross subsidies	Yes	(2e) Pricing - Liquid trade waste approvals & policy	Yes
(2a) Pricing - Complying Residential Charges	Yes	(3) Complete performance reporting (by 15 September)	YES
(2b) Pricing - Complying Non-Residential Charges	Yes	(4) Integrated water cycle management strategy commenced	89%
(2c) Pricing - Complying Trade Waste Fees and Charges	Yes	COMPLIANCE WITH ALL REQUIREMENTS	

## TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

NW1 No.		LWU RESULT	RANKING		STATEWIDE MEDIAN
			3,001 to 10,000 Note 1	All LWUs Note 2	Note 3
		Col 1	Col 2	Col 3	Col 4
UTILITY	C5	1 Population served: 14900			
	C8	2 Number of connected properties: 5310			Number of assessments: 5530
	C6	3 Number of residential connected properties: 4720			
		4 New residences connected to sewerage (%)	2.2	1	1.5
	A6	5 Properties served per kilometre of main	39		40
	W18	6 Volume of sewage collected (ML)	1,280		4,300
		7 Renewals expenditure (% of current replacement cost of system assets)	0.9	1	0.0
		8 Employees per 1000 properties	0.9	1	1.6
SOCIAL	P4	Description of residential tariff structure: access charge per property; independent of land value (Note 5)			
	P4.1	11 Residential access charge / assessment (\$)	373	2	2
	P6	12 Typical residential bill / assessment (\$)	373	2	2
		13 Typical developer charge / equivalent tenement (\$)	2,550	4	3
		14 Non-residential sewer usage charge (c/kL)	85	3	3
		16 Urban properties without reticulated sewerage service (%)	6.3	4	3
	E3	17 Percent of sewage treated to a tertiary level (%)	100	1	1
	E4	18 Percent of sewage volume treated that complied (%)	100	1	1
	E5	19 Sewage treatment works compliant at all times	1 of 1		
		21 Odour complaints per 1000 properties	0.4	4	4
ENVIRONMENTAL	C11	22 Service complaints per 1000 properties	9	2	2
	C16	23a Average sewerage interruption (minutes)	180	5	5
		25 Total days lost (%)	5.0	5	5
	W19	26 Volume of sewage collected per property (kL)	241	5	5
	W26	26a Total recycled water supplied (ML)	430	2	2
	W27	27 Recycled water (% of effluent recycled)	33	2	2
	E8	28 Biosolids reuse (%)			
		30 Energy consumption per Megalitre (kiloWatt hours)			
		31 Renewable energy consumption (% of total energy consumption)			
	E12	32 Net greenhouse gas emissions - WS & Sge (net tonnes CO2 equivalents per 1000 properties)			
ECONOMIC		33 90 Percentile licence limits for effluent discharge: BOD 30 mg/L; SS 30 mg/L; Total N 15 mg/L; Total P 10 mg/L			
		34 Compliance with BOD in licence (%)	100	1	1
		35 Compliance with SS in licence (%)	100	1	1
	A12	36 Sewer main chokes and collapses per 100 km of main	18	1	2
	E13	37 Sewer overflows per 100 km of main	10	3	4
	E4	38 Sewage treated that was compliant (%)	100	1	1
	F6	42 Revenue per property - Sge (\$)	510		
		43 Revenue from non-residential plus trade waste charges (% of total revenue)	15	4	4
		44 Revenue from trade waste charges (% of total revenue)	0.8	3	2
	F18	46 Economic real rate of return - Sge (%)	2.0	2	1
EFFICIENCY		46a Return on assets - Sge (%)	3.6	1	1
	F22	47 Net Debt to equity - Sge (%)	-25	5	5
	F23	48 Interest cover - Sge	>100	1	1
		48a Loan payment per property - Sge (\$)			
	F24	47b Net profit after tax - WS & Sge (\$'000)	1,760	1	1
		49 Operating cost (OMA) per 100 km of main (\$'000)	980	2	3
	F12	50 Operating cost (OMA) per property (\$) Note 8	247	1	2
		51 Operating cost (OMA) per kilolitre (cents)	103	2	2
		52 Management cost per property (\$)	80	2	2
		53 Treatment cost per property (\$)	77	2	2
		54 Pumping cost per property (\$)	18	1	1
		55 Energy cost per property (\$)	14	2	1
		56 Sewer main cost per property (\$)	68	4	5
	F15	57 Capital Expenditure per property (\$)	180	3	3

## NOTES:

- Council's ranking in Col 2 is based on a comparison of its result in Col 1 with the percentiles for LWUs with 3,001 to 10,000. This is on a % of LWUs basis - see also Note 2.
- Council's ranking in Col 3 is based on a comparison of its result in Col 1 with the percentiles for all LWUs. This is also on a % of LWUs basis as this is relevant for comparing the performance of an LWU with all other LWUs - see attachment.
- The Statewide Median (Col 4) is on a % of connected properties basis. It best reveals statewide performance giving due weight to larger LWUs & reducing the effect of smaller LWUs.
- Annual review of the key projections & actions in LWU's Strategic Business Plan (SBP) are required, together with annual updating of LWU's Financial Plan. The SBP should be updated after 3 years.
- Non-residential: Access Charge based on square of size of service connection, sewer usage charge - 85c/kL.
- Non-residential customers provided 15% of the revenue from annual charges, usage and trade waste charges.
- Compliance with Total N in Licence was 100%. Compliance with Total P in Licence was 100%.
- The operating cost (OMA)/property was \$247. Components were: management (\$80), operation (\$49), maintenance (\$104), energy (\$14) and chemical (\$1).



## Singleton Shire Council

## TBL Water Supply Performance

2008-09

WATER SUPPLY SYSTEM - Singleton Shire Council serves a population of 18,400 (6,300 connected properties). Water is drawn from the Hunter River and Glennies Creek to supply Singleton. The Singleton Shire Council system comprises 1 direct filtration works (30 ML/d), 8 service reservoirs (25 ML) and 7 pumping stations, 97 km of transfer and trunk mains and 163 km of reticulation. The water supply is fully treated.

PERFORMANCE - Singleton Shire Council achieved 90% compliance with Best Practice requirements. The typical residential bill was \$419 which was close to the statewide median of \$430 (Indicator 14). The economic real rate of return was 0.2% which was less than the statewide median (Indicator 43). The operating cost (OMA) per property was \$432 which was above the statewide median of \$330 (Indicator 49). Water quality complaints were less than the statewide median of 3 (Indicator 25). Compliance with microbiological water quality was 100% with 1 of 1 zones compliant (Indicator 20), physical compliance was 100% (Indicator 19) and chemical compliance was 100% with 1 of 1 zones compliant (Indicator 19b). Current replacement cost of system assets was \$80M (\$12,100 per assessment), cash and investments were \$17.9M, debt was nil and revenue was \$4.2M (excluding capital works grants).

## COMPLIANCE WITH BEST- PRACTICE MANAGEMENT GUIDELINES REQUIREMENTS

(1) Complete Current Strategic Business Plan & Financial Plan	YES	(3) Sound water conservation implemented	YES
(2) (2a) Pricing - Full Cost Recovery, without significant cross subsidies	Yes	(4) Sound drought management implemented	YES
(2b) & (2c) Pricing - Complying Residential Charges		(5) Complete performance reporting (by 15 September)	YES
(2c) Pricing - Complying non-Residential Charges	Yes	(6) Integrated water cycle management strategy	YES
(2d) Pricing - DSP with Commercial Developer Charges	Yes	COMPLIANCE WITH ALL REQUIREMENTS	90%

## TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

NW1 No.		LWU RESULT		RANKING		STATEWIDE MEDIAN	
		3,001 to 10,000		All LWUs			
		Note 1		Note 2		Note 3	
		Col 2		Col 3		Col 4	
UTILITY	C1	1	Population served: 17900				
	C2	2	Number of connected properties: 6300				
	C2	3	Residential connected properties (% of total)				
	C4	4	New residences connected to water supply (%)				
	A3	5	Properties served per kilometre of water main				
	6		Rainfall (% of average annual rainfall)				
	W11	7	Total urban water supplied at master meters (ML)				
	8		Peak week to average consumption (%)				
	9		Renewals expenditure (% of current replacement cost of system assets)				
	10		Employees per 1000 properties				
SOCIAL	P1		Residential tariff structure: inclining block; independent of land value				
	12		Residential water usage charge (c/kL) for usage <450 c/kL (Note 5)				
	13		Residential access charge per assessment (\$)				
	P3	14	Typical residential bill per assessment (\$)				
	15		Typical developer charge per equivalent tenement (\$)				
	18		Urban population without reticulated water supply (%)				
	H6	18a	Risk based drinking water quality plan?				
	19		Physical water quality compliance (%)				
	19a		Chemical water quality compliance (%)				
	H4	19b	Number of zones with chemical compliance				
ENVIRONMENTAL	H3	20a	% population with microbiological compliance				
	C9	26	Water quality complaints per 1000 properties				
	C10	26	Water service complaints per 1000 properties				
	C17	27	Average frequency of unplanned interruptions per 1000 properties				
	C15	28	Average duration of interruption (min)				
	A8	30	Number of water main breaks per 100 km of water main				
	31		Drought water restrictions (% of time)				
	32		Total days lost (%)				
	W12	33	Average annual residential water supplied per property (kL)				
	33a		Average annual residential water supplied - COASTAL (kL/property)				
ECONOMIC	33b		Average annual residential water supplied - INLAND (kL/property)				
	A10	34	Real losses (leakage) (L/service connection/day)				
	35		Energy consumption per Megalitre (kiloWatt hours)				
	36		Renewable energy consumption (% of total energy consumption)				
	E12	36a	Net greenhouse gas emissions - WS & Sge (net tonnes CO2 - equivalents per 1000 properties)				
	F5	40	Revenue per property - water (\$)				
	F4	41	Residential revenue from usage charges (% of residential bills)				
	F17	43	Economic real rate of return - Water (%)				
	44		Return on assets - Water (%)				
	F22	45	Net Debt to equity - Water (%)				
EFFICIENCY	F23	46	Interest cover - Water				
	47		Loan payment per property - Water (\$)				
	F24	47b	Net profit after tax - WS & Sge (\$'000)				
	48		Operating cost (OMA) per 100km of main (\$'000)				
	F11	49	Operating cost (OMA) per property (\$ ) (Note 6)				
	50		Operating cost (OMA) per kilolitre (cents)				
	51		Management cost per property (\$ )				
	52		Treatment cost per property (\$ )				
	53		Pumping cost per property (\$ )				
	54		Energy cost per property (\$ )				
	55		Water main cost per property (\$ )				
	F14	56	Capital Expenditure per property (\$ )				

## NOTES:

- The ranking compared with LWUs with 3,001 to 10,000 connected properties (Col 2) is on a % of LWUs basis - relevant for comparing performance with similar sized LWUs - see attachment.
- The ranking compared with all LWUs (Col 3) is on a % of LWUs basis - relevant for comparing performance with all other LWUs - see attachment.
- The Statewide Median (Col 4) is on a % of connected properties basis. It best reveals statewide performance by giving due weight to larger LWUs & reducing the effect of smaller LWUs - see attachment.
- Annual review of key projections and actions in LWU's Strategic Business Plan (SBP) are required, together with annual updating of LWU's financial plan. The SBP should be updated after 3 years.
- Non-residential Tariff: Access Charge based on Meter Size\* (eg. 40mm \$720), Two Part Tariff, For all usage = 89c/kL.  
Water supplied to non-residential customers was 38% of potable water supplied excluding non-revenue water.  
Non-residential customers provided 31% of the revenue from annual charges and usage charges. Residential tariff
- The operating cost (OMA)/property was \$432. Components were: management (\$135), operation (\$166), maintenance (\$101), energy (\$11) & chemical (\$10) & bulk purchase (\$9).



## Singleton Shire Council      TBL Sewerage Performance      2008-09

**SEWERAGE SYSTEM** - Singleton Council has 1 sewage treatment works providing advanced secondary treatment. The system comprises 20,000 EP treatment capacity (Intermittent Extended Aeration (Activated Sludge)), 14 pumping stations (9.1 ML/d), 19 km of rising mains and 116 km of gravity trunk mains and reticulation. Treated effluent is discharged to river.

**PERFORMANCE** - Residential growth for 2008-09 was 0.8% which is similar to the statewide median. Singleton Shire Council achieved 100% compliance with Best Practice requirements. The typical residential bill was \$387 which was less than the statewide median of \$470 (Indicator 12). The economic real rate of return was 0.5% which was less than the statewide median (Indicator 46). The operating cost per property (OMA) was \$275 which was less than the statewide median of \$340 (Indicator 50). Sewage odour complaints were less than the statewide median of 0.4 (Indicator 21). Council complied with the environmental regulator for effluent discharge. The current replacement cost of system assets was \$55M (\$9,800 per assessment), cash and investments were \$9M, debt was nil and revenue was \$2.5M (excluding capital works grants).

### COMPLIANCE WITH BEST-PRACTICE MANAGEMENT GUIDELINES REQUIREMENTS

(1) Complete current strategic business plan & financial plan	YES	(2e) Pricing - DSP with commercial developer charges	Yes
(2) (2a) Pricing - Full Cost Recovery without significant cross subsidies	Yes	(2f) Pricing - Liquid trade waste approvals & policy	Yes
(2b) Pricing - Complying Residential Charges	Yes	(3) Complete performance reporting (by 15 September)	YES
(2c) Pricing - Complying Non-Residential Charges	Yes	(4) Integrated water cycle management strategy	YES
(2d) Pricing - Complying Trade Waste Fees and Charges	Yes	<b>COMPLIANCE WITH ALL REQUIREMENTS</b>	<b>100%</b>

### TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

NW1 No.				LWU RESULT		RANKING		STATEWIDE MEDIAN
						3,001 to 10,000		All LWUs
						Note 1		Note 2
						Col 1		Col 2
						Col 3		Col 4
						Note 3		Note 4

## **ATTACHMENT 2**

# **FORWARD CAPITAL WORKS PROGRAMS FOR WATER SUPPLY AND SEWERAGE**



Legislatives / Department of Commerce		GRAND TOTAL																														
		38145	1091	876	2228	2922	1274	1186	499	644	3016	613	631	644	685	724	718	626	921	2909	449	783	1306	494	1877	694	618	876	449	5494	613	2688
		Singapore Capital Works 0809_To Council Oct09																														
		24/05/2010																														



[illegible]

# APPENDIX D

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## DEMAND MANAGEMENT & PROJECTIONS

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## **PURPOSE**

This Appendix presents the results of demand management modelling of the Singleton water supply system and identifies and addresses the potential for the introduction of demand management measures over the next 30 years.

The Document will form part of the IWCM Evaluation Study Report and is provided initially for review and comment.

If no comment or feedback is received from Council, the document will be used to develop the Evaluation Report and will form an Appendix to that Report



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## Attachments

Attachment A: Definitions

Attachment B: Assumptions Used in Demand Management Model

Attachment C: End Use Model Tables

## DEMAND MANAGEMENT MODELLING

### 1. INTRODUCTION

#### 1.1 BACKGROUND

Singleton Council (SC) is responsible for the management and operation of water supply and sewerage in the Singleton Local Government Area.

This Demand Management Strategy identifies and addresses the potential for the introduction of demand management measures in the Singleton service area over the next 30 years.

#### 1.2 METHODOLOGY AND DATA

The following aspects have been undertaken as part of this assessment:

- 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 and analysis of integrated scenarios, each containing different water demand management measures. The Traditional Scenario, which provides baseline data against which the impacts of different water demand management measures can be compared, was also assessed.
- Analysis of the water management scenarios. The following aspects have been assessed:
  - preliminary cost/benefit ratios and water savings for the individual water demand management measures that were included in the integrated scenarios; and
  - water demand and effluent generation forecasts for the next 30 years for each of the scenarios.

**[Note:** The cost/benefit ratios are calculated by the Model, utilising Council's OMA costs and a range of assumptions. Basically, the ratios reflect the relative ranking of various demand measures, if they were to be implemented by Council. Definitions of the various aspects incorporated in the Model are included as Attachment A and the basis for assessing the cost/benefit ratios are appended as Attachment B]

Water production and consumption data for the various customer categories were sourced from BRC's data base and other sources. The relevant data are summarised in Table D1.

The DWE Demand Side Management Decision Support System Software-Simplified (Version S1.1) (DEUS, 2006), supplemented with additional data, was used to assess the water management scenarios.

Item	Source	Comments
Climate & Daily Weather	Climate data (daily rainfall, evaporation & maximum daily temperature) was obtained from the Jerrys Plains Post Office Weather Station (No. 061086) records and the Singleton STP Station (No. 061397). Data was cross-checked against data from the Cessnock Airport weather Station (No. 061260)	The historical demand was not climate corrected (insufficient reliable historical water production data) Climate data is included here for information only.
Population Data	Population data for Singleton was accessed from the 2006 Bureau of Statistics Census Tables.	The total population of Singleton urban area was reported as 13,664. Current 2008/09 population is estimated at 17,919
Demographic Data	From Council's customer data base.	A population growth rate of 0.8 % <sup>(1)</sup> pa was used.
Daily Water Production ML/d	Daily meter readings of water treated at the Water Treatment Plants.	Daily data is available from January 1990.
Water Consumption	Water consumption records were obtained from Council's data base.	Consumption data was allocated across the key customer categories.
Water Losses	Recorded consumption (billing records) and production data from the Treatment Plant was used.	Water losses were assessed as the difference between treated and consumption billed for.
Other Data	Relevant data was sourced from Council's data bases.	<ul style="list-style-type: none"> <li>• Pumping &amp; treatment costs for both water supply and sewerage.</li> <li>• Augmentation costs for planned 30 Year Capital Works.</li> <li>• Water Prices (volumetric charge per kilolitre).</li> </ul>

**Table D1: Data Used in Modelling**

**Note (1):**

Based on Census information, population in Singleton has increased at an average rate of 1.75% pa since 2001. For the purposes of this Water Demand analysis, a growth rate of 0.8% pa has been used for population growth and 1.0% pa for growth I dwellings.

## 2. CURRENT WATER PRODUCTION AND CONSUMPTION

### 2.1 WATER CONSUMPTION PROFILE

Council's bulk supply is drawn from Glennies Creek Dam, operated by NSW State Water

The total usage in Singleton in 2008/09 was 2,414 ML (including losses)

Details of customers supplied are shown in Table D2.

Population (Served with Water)	17,919
Assessments	
- Total	6,628
- Residential	5,839
- Non Residential	789

**Table D2: Population Supplied with Filtered Water (2008/09)**

(Source: SC)

Water consumption data for the various customer categories was provided by Council and is reproduced below.

The following categories are included in Council's customer data base:

• Residential Single	Residential dwellings
• Residential Multi	Residential Strata and multi flats, aged units and boarding houses.
• Commercial	Workshops, offices and retail, hotels and motels, caravan parks, bowling and golf clubs, private recreation, agriculture and vacant businesses.
• Industrial	Heavy and light industry, industrial vacant and strata.
• Institutional	Educational establishments, hospitals (private and public), Council buildings, Church and religious buildings and public buildings.
• Parks and Open Space	Public open space
• Rural	Rural and village residential
• Other Treated Water Users	Uncategorised water uses.

Water consumption, by customer categories for the **2008/09** billing period, are shown in Table D3 below:

<i>Category</i>	<i>No. of Accounts</i>	<i>Consumption (ML)</i>	<i>%</i>
Residential (total)	5,839	1,490	61.7
Commercial	544	428	17.7
Industrial	1	46	1.9
Public	161	169	7.0
Parks & Open Space	-	-	-
Rural	92	41	1.7
Other – non rateable	-	-	-
Unaccounted for Water (Losses)	Unknown	240	9.9
Totals	6,637	2,414	100

***Table D3: Potable Water Consumption by Customer Category (2007/08)***

**[Note:** The data provided for 2008/09 doesn't match that reported in the Performance Report submitted to the Office of Water].

## **2.2 UNACCOUNTED FOR WATER**

Unaccounted for water (UFW) **is the difference between the water treated at the Filtration Plant and actual metered consumption**. It can include unbilled authorised consumption, unauthorised consumption, apparent losses and real (system) losses.

Data for the period from 2003/04 to 2007/08 indicates a range of UFW results – from 6.1% to 10.8%. The average UFW over the period was 8.0%; as shown in Table D4.

This water loss has been used in the modelling.

Council is implementing its own (in-house) leak detection program (involving inspection of supply zones and isolated rising mains). Some positive results in detecting and repairing leaks have already been achieved.

Year	Singleton Treated Water Production (ML/annum)	Potable Water Consumption (ML/annum)	Potable Water Losses	
			ML	%
1991/92	3,092			
1992/93	2,828			
1993/94	2,913			
1994/95	3,331			
1995/96	3,111			
1996/97	2,991			
1997/98	3,885			
1998/99	3,250			
1999/00	2,875			
2000/01	2,872			
2001/02	2,984			
2002/03	3,185			
2003/04	2,801	2,284	517	8.5
2004/05	2,719	2,477	242	8.9
2005/06	3,138	2,798	338	10.8
2006/07	2,779	2,303	476	7.1
2007/08	2,313	1,940	373	6.1
2008/09	2,587	2,414	173	6.7
Annual Average	2,981	2,369	353	8.0

**Table D4: Water Production, Consumption & Losses (Singleton WTP)**

### 3. ANALYSIS OF HISTORICAL WATER PRODUCTION

#### 3.1 INTRODUCTION

Analysis of historical water production for Singleton was based on actual, observed production data. Due to the limited annual consumption data available, it is considered that there is not likely to be a significant difference between the observed and climate corrected data.

#### 3.2 CLIMATE DATA

Key climate characteristics are summarised in Table D5.

Rainfall is relatively low; at an annual average of 641 mm. The wettest months are January and February, although rainfall is reasonably consistent from October to March. The lowest rainfall month is August. Average annual evaporation exceeds annual rainfall by almost 1000 mm annually. The data presented is long term (1884 to 2009).

**Table D5: Climate Data***(Source: Bureau of Meteorology – Jerrys Plains & Cessnock Weather Stations)*

Month	Mean Daily Maximum Temp. (°C)	Decile 9 Max. Temp. (°C)	Mean Daily Minimum Temp. (°C)	Mean Monthly Rainfall (mm)	Lowest Recorded Rainfall (mm)	Daily Evaporation (mm)
January	31.7	37.9	17.1	76.9	0 (1903)	220
February	30.9	36.6	17.1	72.5	0 (1940)	168
March	28.9	33.7	15.0	59.1	0 (1909)	155
April	25.3	29.8	10.9	44.1	0 (1980)	120
May	21.3	25.0	7.5	40.4	0 (1957)	90
June	18.0	21.0	5.3	47.6	2.3 (1953)	60
July	17.4	20.2	3.8	43.3	0.3 (1972)	71
August	19.4	23.3	4.4	36.4	0 (1982)	81
September	22.9	27.9	7.0	41.7	0 (1980)	111
October	26.3	31.7	10.3	51.9	1.4 (1988)	164
November	29.2	35.3	13.2	59.8	1.0 (1915)	195
December	31.3	36.7	15.7	67.7	0 (1884)	205
<b>Annual</b>	<b>25.2</b>	<b>-</b>	<b>10.6</b>	<b>641.4</b>	<b>234.2 (1950)</b>	<b>1640</b>

Climate data for the 12 months from January 2009 to December 2009 is presented for comparison in the Table below.

It is interesting to note that 2009 was cooler than the long term averages (6.7% lower mean maximum temperatures), but much warmer overnight – 16.4% higher mean daily minimum temperatures than the long term mean.

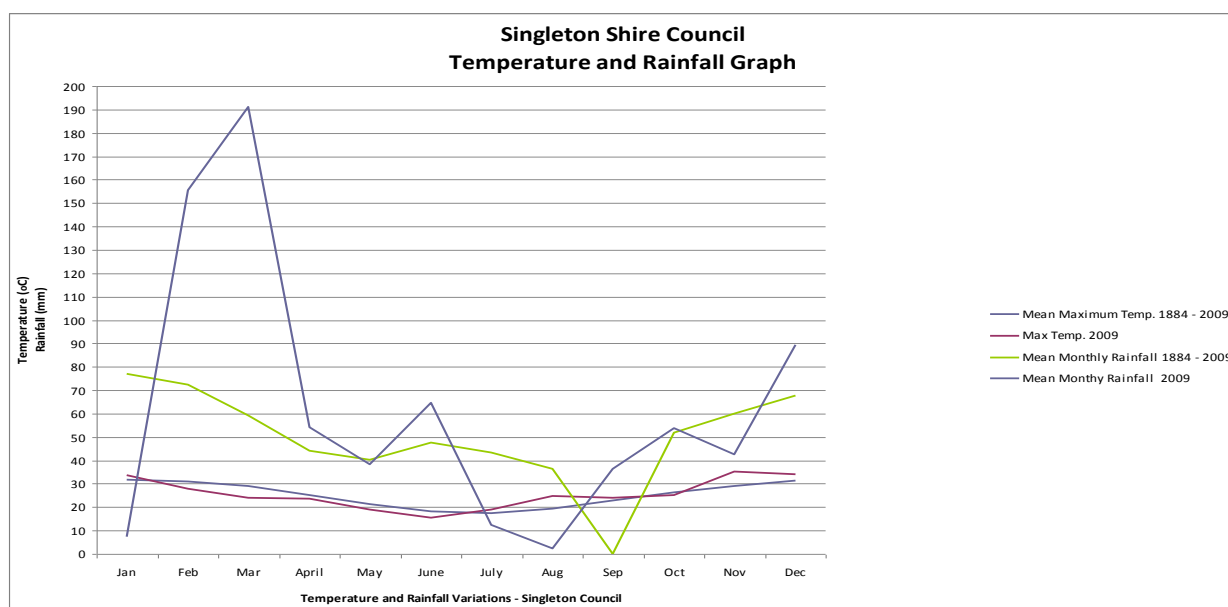
Rainfall was also significantly higher (16.5%) than the long term mean.



**Table D5: Climate Data (cont'd)**

**RECENT DATA (2009)**

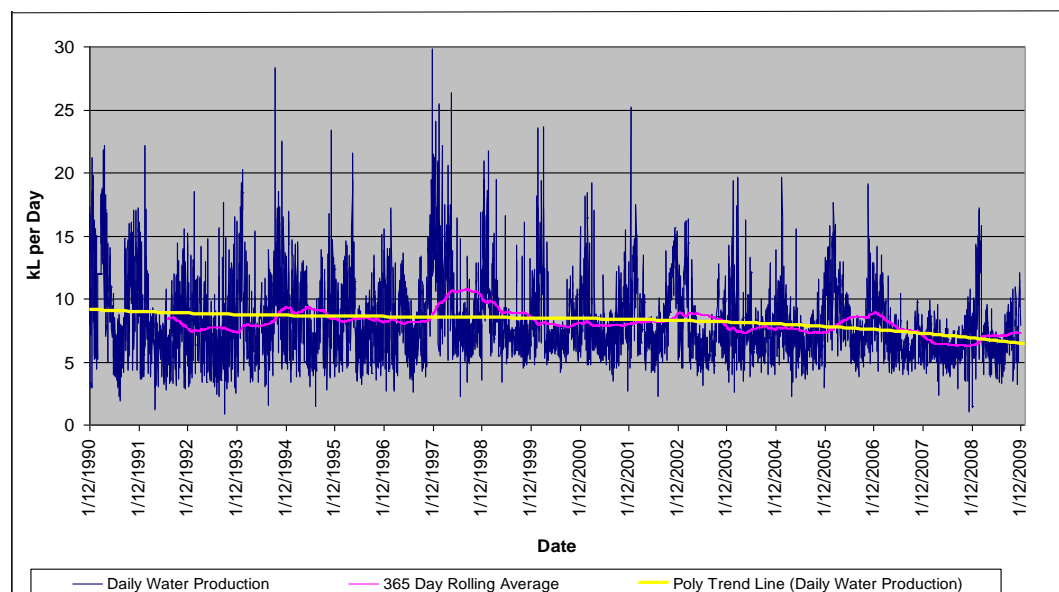
Month	Mean Daily Maximum Temp. (°C)	Mean Daily Minimum Temp. (°C)	Mean Monthly Rainfall (mm)
January	33.7	17.9	7.4
February	27.7	17.0	155.6
March	24.0	16.1	191.1
April	23.7	11.4	54.1
May	19.0	9.2	38.3
June	15.5	6.5	64.7
July	19.0	4.5	12.3
August	24.9	7.4	2.3
September	24.0	12.0	36.3
October	25.0	13.5	53.8
November	35.3	15.5	42.4
December	34.0	17.0	89.2
<b>Annual</b>	<b>23.5</b>	<b>12.3</b>	<b>747.5</b>
<b>Variation to Long Term Average.</b>	<b>-6.7%</b>	<b>+16.4%</b>	<b>+16.5%</b>



**Figure D1: Monthly Temperature and Rainfall variations (showing changes to long-term averages from 1995)**

### 3.3 MODEL RESULTS

Figure D2 below shows the observed potable water production for Singleton.

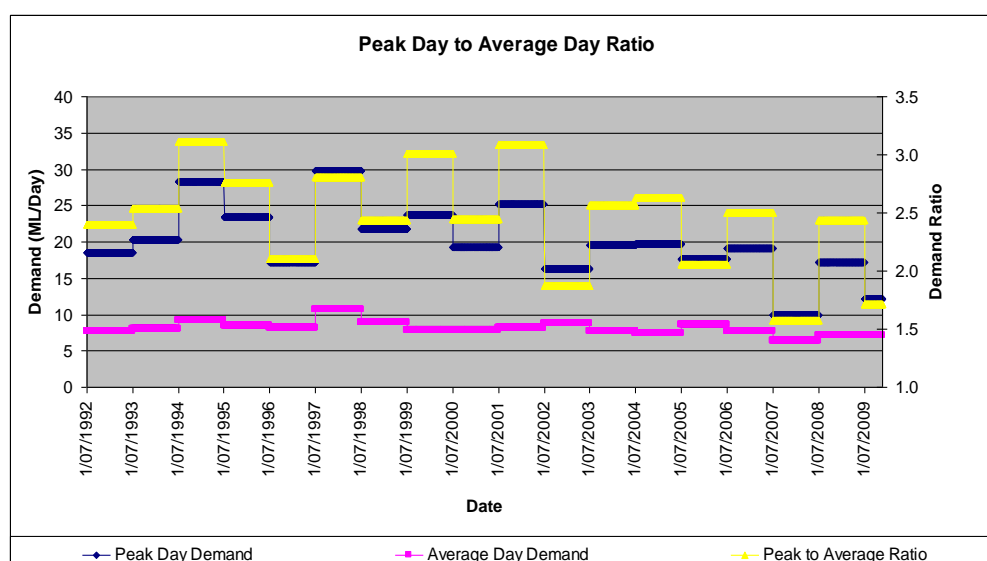


**Figure D2: Total Annual Treated Water Production - Singleton**

There is a distinct drop in water production from about 2002 to 2009, reflecting the demand management initiatives implemented (water restrictions, pricing increases and water conservation and education campaigns).

### 3.4 PEAK DAY TO AVERAGE DAY DEMAND RATIOS

The observed peak to average day demand ratio for Singleton is shown in Figure D3.



**Figure D3: Peak day to Average Day Ratio**

The observed peak day to average day demand ratio ranged from 1.6 to 3.1 for the period from 1 July 1992 to 30 June 2009, with an average value of 2.5.

The peak to average demand ratio for 2008/09 was 2.4.

## **4. WATER DEMAND AND WASTEWATER FLOW FORECASTS**

### **4.1 INTRODUCTION**

The purpose of forecasting future water demands and wastewater flows is to determine the future requirements of Singleton Council as a service provider and its ability to supply its customers in terms of both the source of water and the capability of the water supply and sewer infrastructure.

Water demand and wastewater flow forecasts for the next 30 years were estimated for several water management scenarios. The scenarios included the Traditional Scenario, which provides baseline data against which the impacts of different water demand management measures could be compared; and four integrated scenarios. An integrated scenario consists of one or more individual water demand management measures, including source substitution measure

The scenarios were assessed to:

- Estimate preliminary cost/benefit ratios for the water demand management measures that were included in the integrated scenarios; and
- Develop water demand and effluent generation forecasts for the next 30 years (2008/09 to 2038/2039) for each of the scenarios.

The Demand Side Management Decision Support System Software-Simplified (Version S1.1), supplemented with additional data, was used to assess the scenarios. The DWE (NSW Office of Water) model estimates costs/benefits for the water demand management measures that were included in the integrated scenarios, costs/benefits of each scenario and annual water demand and wastewater flow forecasts.

### **4.2 DATA**

The following data were inputted to the model to calculate the Traditional Scenario:

- Demographics;
- Current water use;
- Evaporative cooling;
- Assumed residential internal water use;
- Details of current infrastructure and planned upgrades; and
- Details of current water prices.

Data for 2007/08 and 2008/09 was used. The data used are summarised as follows:

#### **4.2.1 DEMOGRAPHICS**

The demographic data are shown in Table D6.

Element	
Current Year	2010
Current population served with water	17,919
People per residential assessment	3.1
Assumed change in people per residential assessment	-5.0%
Anticipated population growth	0.8% pa pop'n 1.0% dwellings

**Table D6: Demographic Data Used in Model**

(Notes: The Model calculated the number of persons per residential assessment, based on Council's 2008/09 Performance Reports).

**4.2.2: WATER USE DATA**

The Model requires current water use data as well as segregation of water use into customer categories.

Element	
Current annual water supplied (treated water)	2,981 <sup>(1)</sup>
System Losses	8%
Peak to average day water demand ratio (2008/09)	2.4
Change in baseline per capita demand over next 30 years	0%
Total length of water mains in system	260km

**Table D7: Water Use Data**

Water use by customer category is presented in Table D8, based on 2002/03 to 2008/09 data as provided by Singleton Council.

The number of accounts is based on the 2008/09 Performance Report submitted by Council.

<b>Customer Category</b>	<b>% of Total Water Consumed</b>	<b>Total number of accounts</b>	<b>Proportion of Customers Connected to Sewerage</b>	<b>Consumption per Account (L/d)</b>
Residential	61.7%	5,839	98%	793
Commercial	17.7%	428	100%	3,105
Industrial	1.9%	1	100%	142,664
Public	7.0%	161	100%	3,265
Parks and Open Space	0%	0	20%	0
Rural	1.7%	92	0%	1,387
Other	10.0%	1	0%	750,861
Unmetered	0	0	0%	0
Total	100.0%			

**Table D8: Water Used By Paying Customers & Other Users (2007/08)**

[Assumptions: i) rural properties are not connected to sewer  
 ii) no bulk water is supplied outside the municipality  
 iii) "other" are losses, unaccounted for water and standpipe use.]

#### **4.2.3: EVAPORATIVE COOLING**

Council has advised that there are very few evaporative coolers in Singleton. An allowance of 1% of residential customers has been allowed for evaporative coolers.

#### **4.2.4: RESIDENTIAL INTERNAL WATER USE**

<b>Residential Internal Water Use</b>	
Assumed level of internal residential water use per person:	160
Calculated percentage of indoor residential use:	60%

Internal water usage is typically between 160 and 190 L/day and the percentage indoor use would normally be between 50 and 70%. The percentage of indoor use is calculated by multiplying the internal residential water use per person by the number of persons per account and dividing by the total residential consumption per account.

#### **4.2.5: OPERATIONS AND TREATMENT COSTS**

The model uses current water supply and sewerage operating and treatment costs to determine cost benefits of implementing various demand management options.

The Singleton data is shown in Tables D9 below.

Current water pumping costs	\$98,000
Current annual water treatment costs	\$130,000
Current sewage pumping costs	\$46,000
Current annual sewage treatment costs	\$300,000

***Table D9: Operating and Treatment Costs (2009)***

- (Note:** 1. Water & sewer pumping costs are power costs only  
2. Water & sewage treatment costs include chemicals, power, load based fees and Biosolids disposal)

#### ***4.2.6: FUTURE INFRASTRUCTURE WORKS***

Potential and planned future **major** water and sewerage infrastructure projects (**as required by the Model**) are shown in Tables D10 and D11 below.



Type	Element	Reason	Replace existing?	Current capacity	Augmented capacity	Cost
Headworks	Service Reservoirs	Peak	No	25ML	40ML	\$6,000,000
Bulk water transfer	Pump Stations & Mains	Peak	No	29ML/d	45ML/d	\$13,500,000
Water treatment	Water Treatment Plant	Peak	No	30ML/d	45ML/d	\$6,500,000

**Table D10: Planned Future Major Water Infrastructure Projects**

Type	Element	Reason	Replace existing?	Current capacity	Augmented capacity	Cost
Sewage treatment	STP Augmentation	Peak	No	20,000 EP	40,000 EP	\$7,000,000
Sewage transfer	Pumping Stations & Transfer Mains	Peak	No	9ML/d	20ML/d	\$8,000,000

**Table D11: Planned Future Major Wastewater Infrastructure Projects**

**Note:** Current Plant Capacities: WFP: 30 ML/d; STP: 20,000 EP (5 -6 ML/d)

**4.2.7: WATER PRICING**

The water pricing data used in the Model is shown in Table D12 below:

<b>Element</b>	<b>2009/10</b>
<u>Residential Filtered Water</u> up to 450 kL/a	\$0.89/kL
> 450 kL/a	\$1.66/kL
<u>Access Charge:</u> Varies Base: 20 mm service	\$180.00

**Table D12: Water Charges**

It should be noted that these prices for consumption (at \$0.89/kL) are significantly lower than the State wide median (in 2007/08) of \$1.30/kL. This is the median for first tier charges and is based on a percentage of connected properties (that is, it is a weighted median)

**4.3 UNDERLYING ASSUMPTIONS**

The simplified version of the Model makes a number of assumptions regarding water use. These underlying assumptions are as outlined in the Model Instruction Manual (DEUS 2006) and are reproduced in Table D13 below.

[**Note:** The assumptions rely on a Domestic water use study undertaken in Perth in 1998 – 2001. An ABS study in 2004 reported the following per capita water consumption as:

<b>Location</b>	<b>Percentage Use (NSW)</b>
Bathroom	26.3%
Toilet	23.2%
Laundry	16.2%
Kitchen	10.0%
Outdoor	25.3%
Total	101%

(Source: Derived from Tables 9.6 & 9.7 in ABS 2004)

These percentage uses were largely confirmed in an IPART study carried out in 2004.

The results are not directly comparable with the Perth study because they include outdoor use – but in terms of in-house use, there is reasonable correlation.]

Type of Data	Derivation	Water Use Assumed														
Internal residential consumption	Totals used are broadly based on the Perth Domestic Water Use Study (Water Corp., 2003). Adapted for increased levels of leakage and a lower market penetration of some fixtures and appliances.	Can be set by the user in the Setup Sheet. Typically from 170 to 190 L/d. 180 L/d is the recommended number for regional NSW.														
Breakdown in Internal residential consumption	Breakdown used from the Perth study (Water Corp., 2003). Combined bath and shower use in the Perth study was assumed split 95% for showers, 5% for baths. Adjusted for change in the level of leakage outlined above.	<table><tr><td>Toilets</td><td>19.0%</td></tr><tr><td>Baths</td><td>1.9%</td></tr><tr><td>Showers</td><td>36.1%</td></tr><tr><td>Taps/Sinks</td><td>11.4%</td></tr><tr><td>Dishwashers</td><td>1.9%</td></tr><tr><td>Washing Machine</td><td>24.7%</td></tr><tr><td>Leakage</td><td>5.0%</td></tr></table>	Toilets	19.0%	Baths	1.9%	Showers	36.1%	Taps/Sinks	11.4%	Dishwashers	1.9%	Washing Machine	24.7%	Leakage	5.0%
Toilets	19.0%															
Baths	1.9%															
Showers	36.1%															
Taps/Sinks	11.4%															
Dishwashers	1.9%															
Washing Machine	24.7%															
Leakage	5.0%															
Breakdown in internal use in commercial and public sectors	Breakdown used from the North American Commercial and Institutional End Uses Study (AWWARF, 2000)	<table><tr><td>Toilets</td><td>26.5</td></tr><tr><td>Urinals</td><td>6.6</td></tr><tr><td>Showers</td><td>4.0%</td></tr><tr><td>Taps/Sinks</td><td>20.1%</td></tr><tr><td>Dishwashers</td><td>3.8%</td></tr><tr><td>Washing Machine</td><td>34.0%</td></tr><tr><td>Internal Leakage</td><td>5.0%</td></tr></table>	Toilets	26.5	Urinals	6.6	Showers	4.0%	Taps/Sinks	20.1%	Dishwashers	3.8%	Washing Machine	34.0%	Internal Leakage	5.0%
Toilets	26.5															
Urinals	6.6															
Showers	4.0%															
Taps/Sinks	20.1%															
Dishwashers	3.8%															
Washing Machine	34.0%															
Internal Leakage	5.0%															
Outdoor Use – Non-Residential Customer Categories	There is little data on levels of non-residential use in different climatic zones. In the absence of this information, assumptions are required that are reasonable. In this case, the approach has been to use some standard assumptions for some types of users and for others to provide a link to the level of residential use.	Outdoor use for non-residential customer categories is assumed to be: <ul style="list-style-type: none"><li>• 50% of the proportion of residential use for commercial and public users.</li><li>• 90% for parks and open space uses.</li><li>• 25% of the proportion of residential use for industrial users.</li></ul>														

**Table D13: Underlying Assumptions (Water Use) used in DEUS End Use Model**

#### 4.4 IWCM SCENARIOS

##### 4.4.1: SCENARIOS

The Scenarios used in the model are presented in Table D14.

Management Measures	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Community Education	X	X	X	X
Permanent (Low Level) Water Saving Measures				X
Conservation Pricing for Residential Users			X	X
Non-Residential Water Audits			X	X
System Water Loss Management	X	X	X	X
Rainwater Tanks for all New Residential Development				X
Dual Reticulation for all New Residential Development				X
BASIX - Fixture Efficiency with Rainwater Use			X	X
BASIX - Fixture Efficiency with Dual Reticulation			X	X
Evaporative Cooling Unit and Cooling Tower Audit		X	X	X

**Table D14: IWCM Scenarios**

The year 2010 was adopted as the starting year for estimating future water demands for each of the scenarios.

The rationale for adopting the integrated scenarios in the above table is as follows:

- Scenario 1: Continuing community education, system water loss management and on-going Government initiatives.
- Scenario 2: Additional low cost management measure -conservation pricing.
- Scenario 3: Includes water audits for non residential customers, fixture efficiency with the use of rain water and dual reticulation.
- Scenario 4: Includes rainwater tanks and dual reticulation for new developments.

Definitions of these demand management measures (Source: DEUS, Demand Side Management Decision Support System) are reproduced in Table D14 below:

<b>Community Education (basic)</b>	Council would provide materials, training and technical assistance to implement a basic ongoing community education program.
<b>Community Education (intensive)</b>	Council would provide materials, training and technical assistance to implement a comprehensive ongoing community education program.
<b>Residential Retrofit Program</b>	During an audit or upon request, a Council approved plumber would install a retrofit kit in an existing residential premise. The kit could contain a low flow shower head, tap flow restrictors and a cistern weight for older style toilets
<b>National Mandatory Water Efficiency Labelling Scheme (Already in place – therefore, not modelled)</b>	A mandatory water efficiency labelling scheme (WELS) for toilets, washing machines, shower roses, taps, urinals and dishwashers was introduced in 2005
<b>BASIX</b>	The NSW Governments program to achieve a 20% reduction in water use in new residences
<b>Rainwater Tanks on all New Residential Development</b>	Council would mandate the need for rainwater tanks on all new development. For supply to toilet flushing, washing machine use and outdoor use
<b>Dual Reticulation for New Subdivisions</b>	Council would require all new subdivisions to be fitted with dual reticulation systems with recycled water to be used for toilet flushing and irrigation
<b>Permanent Restrictions on Water Use</b>	Council would introduce a water waste regulation to prohibit irrigation during times of the day with highest evaporation; mandate the use of trigger nozzles when washing cars; prohibit the practice of hosing down hard surfaces
<b>Conservation Pricing</b>	Involves an inclining block tariff for single family, residential customers, with the price per kL for the second tier charge at least 2 times base price. The first tier limit generally based on internal use requirements only.
<b>Active Leak Detection &amp; Repair</b>	Introduce a more active detection and repair program
<b>Non-residential Water Audits</b>	Allows for water audits for non-residential customers
<b>Grey Water Reuse</b>	Residences would install grey water treatment & recycling facilities for outdoor use

**Table D15: Descriptions of Water Demand Management Measures**

[Refer also to Attachment B – for assumptions]

**4.4.2: ASSESSMENT OF SCENARIOS**

Estimates of preliminary costs/benefit ratios and water savings for individual water demand management measures and water demand and effluent regeneration forecasts for each of the scenarios are presented below.

Management Measure	B/C Ratio		Average Annual Water Saving (ML/year)
	Utility	Total Community	
Community Education	14.5	17.7	42.6
Permanent (Low Level) Water Saving Measures	69.4	69.4	93.0
Conservation Pricing for Residential Users	339.8	340.0	105.7
Non-Residential Water Audits	6.5	4.6	8.2
System Water Loss Management	0.1	0.1	11.8
Rainwater Tanks for all New Residential Development	1.2	0.0	88.0
Dual Reticulation for all New Residential Development	84.3	3.4	108.6
BASIX - Fixture Efficiency with Rainwater Use	7.1	0.9	124.9
BASIX - Fixture Efficiency with Dual Reticulation	79.5	4.1	145.5
Evaporative Cooling Unit and Cooling Tower Audit	0.2	0.2	3.2

**Table D16: Water Savings and B/C ratios for Demand Management Measures**

The data in the above table indicates that, based on an 0.8% growth rate, BASIX fixture efficiency with dual reticulation (that is a potable supply and a recycled water supply), BASIX fixture efficiency with rainwater use, conservation pricing for residential users and dual reticulation for all new residential developments, have the greatest benefits in terms of water savings. All the options (except audits of cooling units/cooling towers and non-residential water audits) are predicted to provide substantial water savings.

[Refer Attachments A & B for definitions of these demand management measures]

BASIX fixture efficiency with dual reticulation is shown to yield the highest annual water saving, but the highest **utility and community benefit to cost** ratio is for conservation pricing for residential customers. Permanent (low level) water saving measures for residential customers also demonstrates high B/C ratios.

**4.4.3: FUTURE WATER DEMANDS**

- Total Water Demand Forecasts

The average (2010 to 2040) water demands and water savings for each of the IWCM scenarios are summarised in the table below:

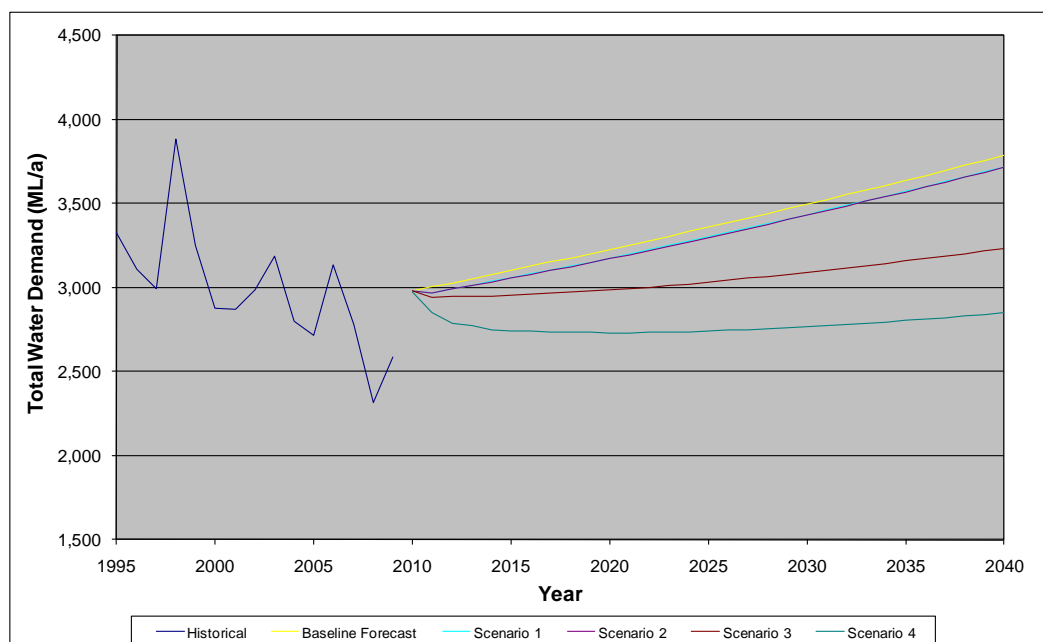
IWCM Scenario	Total Water Used (ML/Year)	Average Water Saved	
		(ML/Year)	%
Baseline	2981		
Scenario 1	2927	54	1.8
Scenario 2	2923	58	2.0
Scenario 3	2666	315	10.6
Scenario 4	2391	590	19.8

**Table D17: Average Annual Water Demands and Assessed Water Savings**

The results indicate that significant water savings can be realised by implementing water conservation and demand management initiatives.

Savings of up to 19.8 are achievable (according to the Model) depending on which of the scenarios is adopted. Clearly, Scenario 4 is predicted to yield the highest savings.

The modelled demand from 2010 to 2040 for the various scenarios is shown in Figure D4 below.



**Figure D4: Total Water Demand Forecasts – 0.8% Growth**

- Peak Day Demand Forecasts

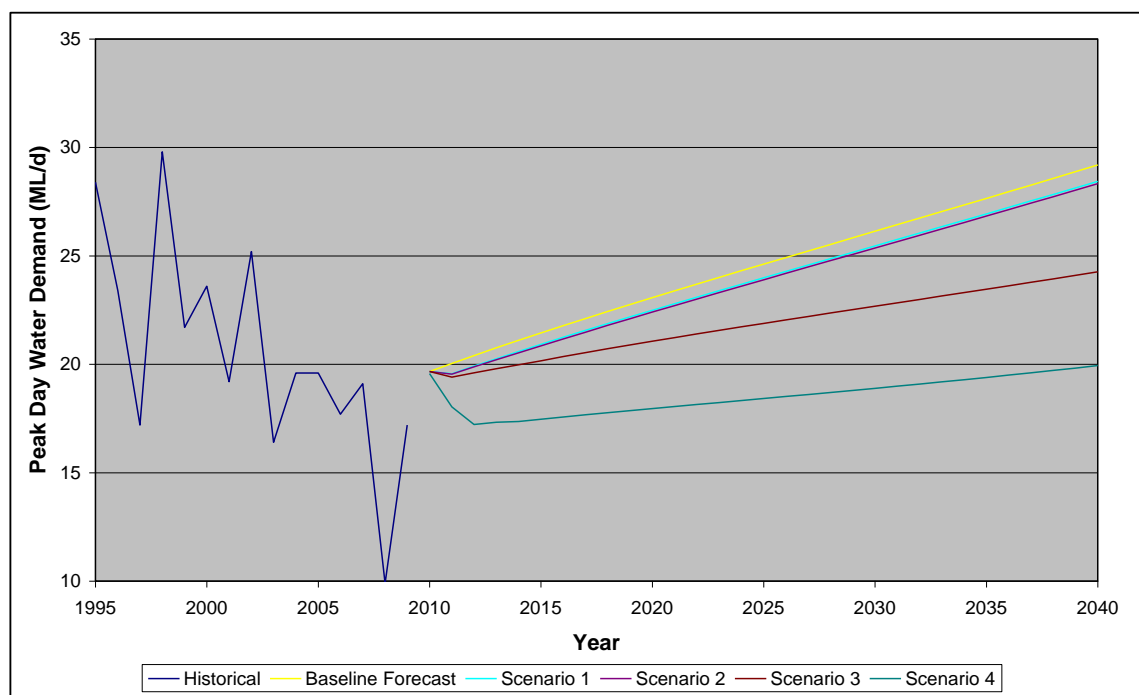


The Peak Daily Demand forecasts for the scenarios considered are shown in Figure D5.

The Peak Daily Demands are used to determine when the capacity of the Water Treatment Plant will be exceeded.

The results indicate that the Plant (capacity 30 ML/d) will have sufficient capacity beyond 2040, even under the “do nothing”, Baseline scenario.

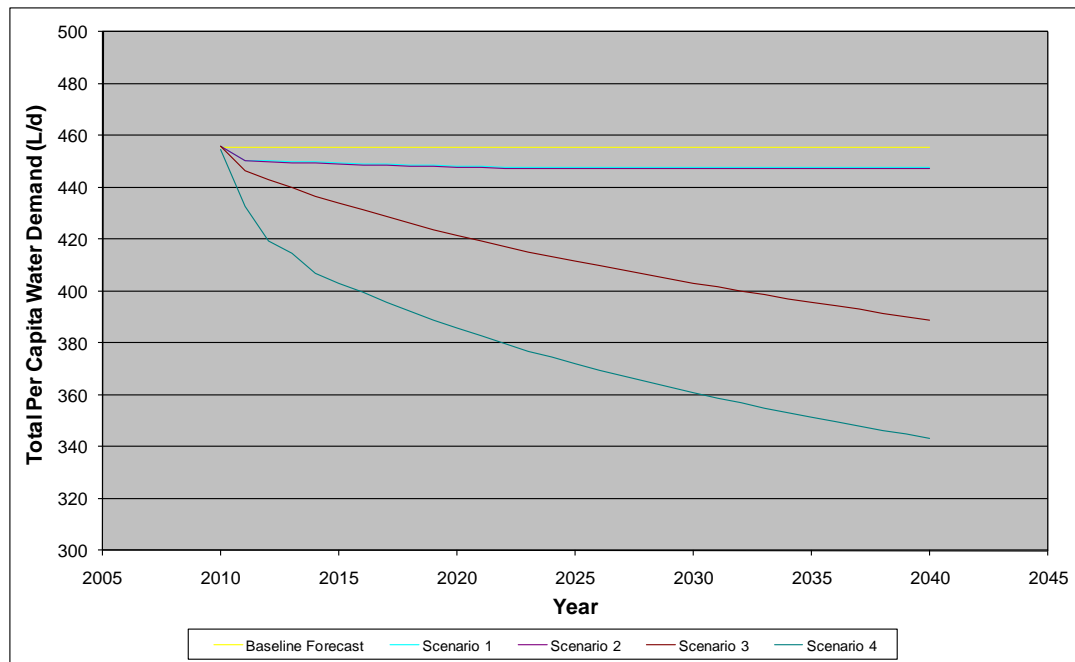
Implementation of the demand management measures listed in the four scenarios will extend the life of the Plant even further



**Figure D5: Peak Day Demand Forecasts – 0.8% Growth**

- Total Per Capita Water Demand

Figure D6 shows the impact of the various demand management scenarios on per capita water demand to 2040. There is a reduction in demand under all scenarios, relatively minor under Scenarios 1 and 2, but becomes particularly significant under Scenarios 3 and 4.



**Figure D6: Total Per Capita Water Demand Forecast Scenarios – 0.8% Growth**

- Future Wastewater Flows

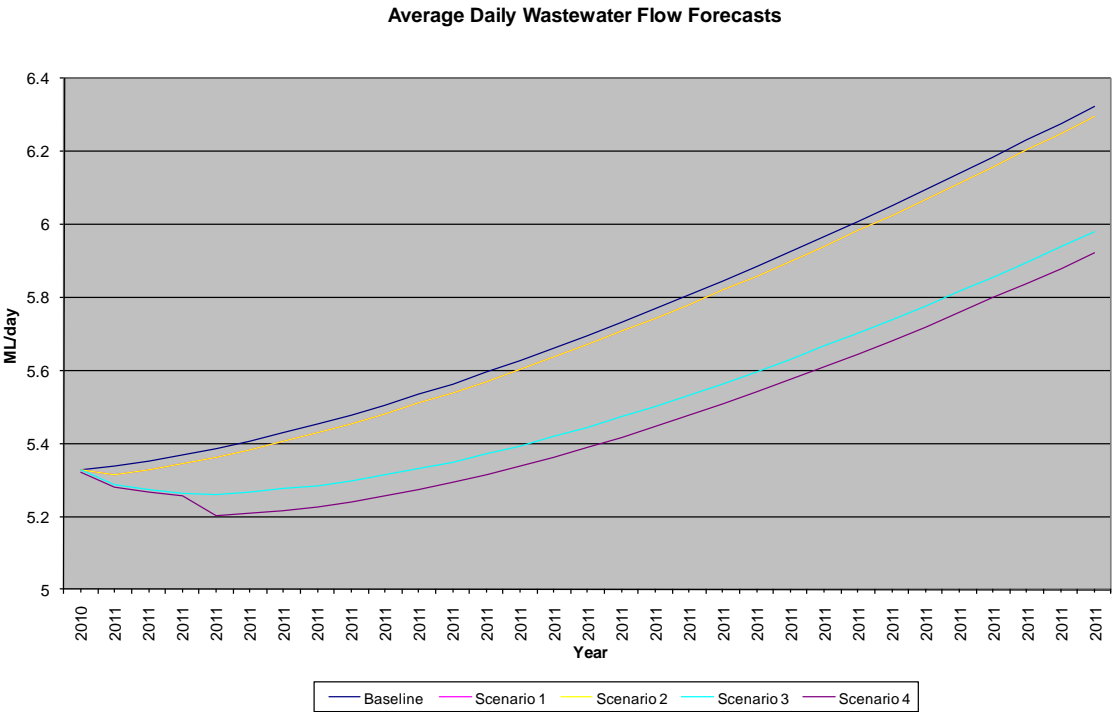
Wastewater Flows to the Sewage Treatment Plant have been modelled for the various scenarios considered.

Average daily flows are shown in Figure D7 and peak wet weather flows are shown in Figure D8.

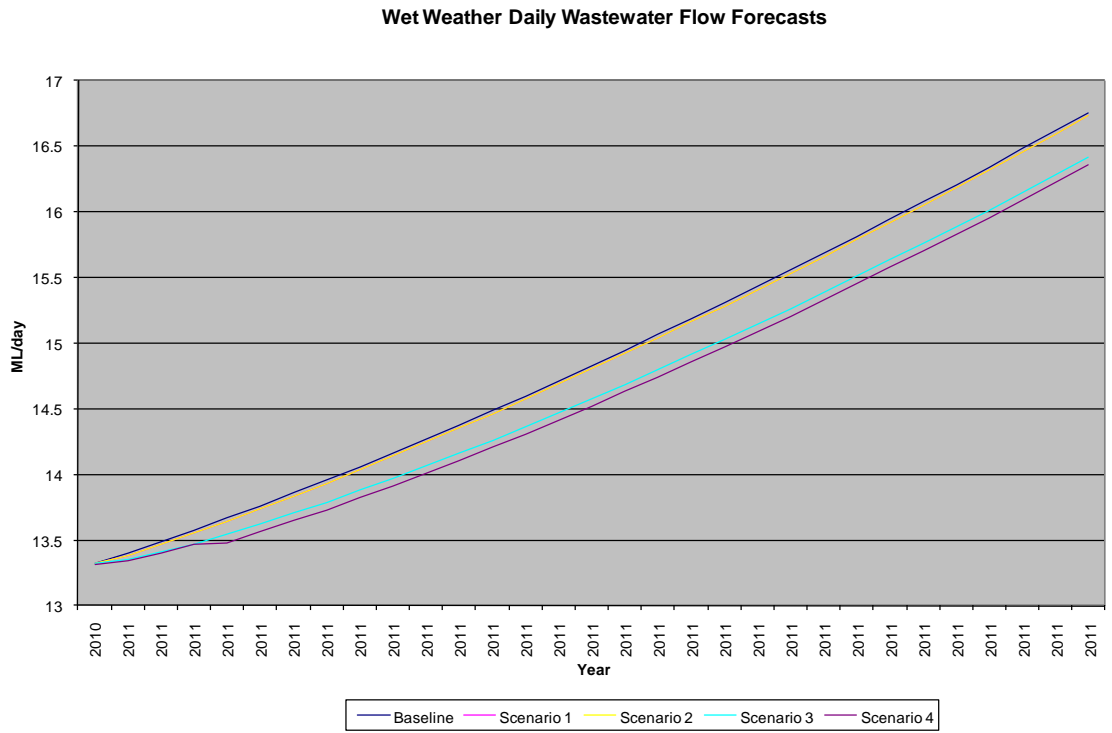
The existing Sewage Treatment Plant has a nominal capacity of 20,000EP. This capacity has been re-assessed by Parsons Brinkerhoff at nearly 19,000EP. The demand management modelling confirms that the Plant is currently at or exceeding its capacity and that augmentation is now required.

Council has resolved to proceed with detailed design of plant modifications and extensions, to provide capacity for 27,500EP (which, based on the assessment by Parsons Brinkerhoff is expected to provide sufficient capacity until 2030).

**Council has resolved to proceed with these works in 2010/11 and has engaged Parsons Brinkerhoff to complete detailed designs and to proceed to the calling of Tenders for the work.**



**Figure D7: Wastewater Flows Scenarios – 0.8% Growth**



**Figure D8: Wastewater Wet Weather Flows Scenarios – 0.8% Growth**

## 5. CURRENT WATER CONSERVATION INITIATIVES

As generally discussed in Section C: “Water Conservation and Demand Management: General Concepts”, Singleton Council has embraced water conservation and has developed a number of programs aimed at providing information to residents about ways of reducing their water consumption, as well as, in some cases, incentives to participate.

The information includes brochures and pamphlets and is made available to residents and businesses via widespread distribution of the material, advertisements and a number of Council websites.

These initiatives include:

### ➤ **Active membership and involvement in the Savewater program.**

The Savewater Alliance is a not-for-profit association of water businesses, government agencies and product companies which aims to deliver water conservation programs throughout Australia. The organisation promotes water conservation behaviour change and water saving product purchasing.

Specifically, the Savewater program:

- Manages the savewater.com.au website
- Conducts major water conservation exhibitions
- Manages the annual Savewater awards
- Undertakes programs for businesses and schools
- Conducts ongoing competitions and prize giveaways, as well as quantitative market research.

Members, like Singleton Council, have their own dedicated website within the Savewater parent website where residents, businesses and schools can readily access information about the supply system, as well as, obtain valuable water conservation information, product details and take part in the ongoing rounds of competitions.

### ➤ **Water Loss Program**

Singleton Council has developed its own (in house) water loss and detection program. The investigation is identifying the sources and magnitude of leaks and other water losses.

### ➤ **Reuse Options**

Council is currently investigating cost effective options for effluent reuse and/or stormwater harvesting, particularly in the watering of parks and reserves

### ➤ **Brochures**

Council has a series of Brochures available to the public, including:

- Water Quality – providing general information about the water treatment processes and the quality provided to residents
- Your Water Meter – providing information to residents about their water meter, how to read it and to how to use it to test for leaks
- Water Saving Tips
- Information about BASIX
- Production and distribution in October/November of each year of an information brochure which is delivered to every residence in Singleton, Broke and Jerrys Plains.

➤ **Advertising**

As well as the advertising program conducted under the Savewater program, Council conducts its own annual advertising campaigns in local radio and print media.

There are regular media articles to alert the community about trends in consumption, particularly when usage exceeds targets.

➤ **Flush Toilets**

Council offers a rebate of \$120 to residents who purchase and install a dual flush toilet

➤ **Rainwater tank Rebates**

In addition to the rebates provided by State and Commonwealth Government Departments, Singleton Council provides its own rebate for purchase and installation of rainwater tanks.

The rebates are:

Tank(s) Capacity	Rebate
2000-3999 litres	\$100
4000-8999 litres	\$250
9000 litres and above	\$450
	\$120 if all toilets are connected.
	\$50 if washing machine is connected

➤ **Water Restrictions**

During this drought Council has utilised its Drought Management Plan and has introduced water restrictions, as required.

- Level 3 Restrictions were imposed in 2008/09

➤ **Pricing Policy**

As outlined in Section C6, demand management is essential for effective and efficient management. Council is increasing the water usage component of the bill and reading meters and billing three (3) times per year to encourage 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 introducing a pricing regime over the next 2 years which will recover 75% of costs via **consumption charges**, which is a powerful demand management initiative.

Currently, 60% of revenue is derived from consumption charges.

## 6. SUMMARY AND CONCLUSIONS

Singleton Council provides water supply and sewerage services to a current population of 17,919 people. The Town is continuing to grow, with an annual increase in population of around 0.8%.

The main points arising from this Report are:

- Water consumption over the past 6 years has varied from a high of 2,798 ML/y in 2005/06 to a low of 1940 ML/y in 2007/08, with an average over that time of 2,369 ML/y.
- The average annual water production (water treated) since 1991/92, has been 2,981 ML;
- Unaccounted for water (UFW) since 2003/04 has averaged 8.0%. System losses in 2008/09 were approximately 6.7%. This is a reasonable water loss and reflects the good condition of the supply system. It would be reasonable to aim to reduce this water loss to less than 5% by the implementation of an effective water loss reduction program
- Residential water consumption is relatively high by national standards at 793 L/per residential property per day or 255 L/person/d (2007/08). Approximately 40% of this water is used outside the home (lawns, gardens, pools etc)
- The peak to average day usage ratio is 2.4 (2008/09), which is similar to similarly sized cities throughout NSW
- Council's water usage charges are based on an inclining block tariff, with the first 450 kL provided at \$0.89/kL. Thereafter, the charge is \$1.66/kL (2009/10 charges).
- These charges are low in comparison with other regional cities and towns in NSW. The State wide median consumption charge in 2007/08 was \$1.30/kL

Water demand and wastewater forecasts were modelled using the DWE (NSW Office of Water) Demand Side Management Decision Support System (Simplified Version S1.1). The modelling has indicated that:

- i) BASIX fixture efficiency with dual reticulation, BASIX fixture efficiency with rainwater use, conservation pricing for residential users and dual reticulation (that is a potable supply and a recycled water supply) for all new residential developments have the greatest benefits in terms of **water savings**.  
BASIX fixture efficiency with dual reticulation is shown to yield the highest annual water saving, but the highest utility and community benefit to cost ratios are for conservation pricing for residential customers. Permanent (low level) water saving measures for residential customers also demonstrates high B/C ratios.
- ii) Full uptake of the demand management initiatives modelled may deliver significant water savings – up to 590 ML/year (or a 19.8% reduction) for Scenario 4 initiatives, or 315 ML/year (or a 10.6% reduction) for Scenario 3 initiatives.
- iii) The results indicate that the Water Treatment Plant will have sufficient capacity beyond 2040, even under the “do nothing” Baseline case.



- iv) The Sewage Treatment Plant has effectively reached capacity. Council has resolved to augment the Plant's capacity in 2010/11 (from the existing nominal capacity of 20,000 EP to 27,500 EP) Implementation of Scenarios 3 or 4 demand management initiatives is expected to extend the life of the plant (in terms of capacity) beyond 2032/33.

Council has a commitment to water conservation in the Town and has implemented a range of initiatives which, based on the general reduction in water consumption since 2003/04, has been quite successful, particularly with a consistent growth in population.

These initiatives include most of the elements which the model predicts will deliver the greatest water savings, namely, BASIX requirements for all new homes, progressive implementation of conservation pricing and water restrictions, the latter probably being the most effective in recent years.

The modelling has indicated that the greatest cost benefit outcomes in the future will be derived from full implementation of residential conservation pricing and permanent (low level) water saving measures.

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# ATTACHMENTS

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## **ATTACHMENT A: DEFINITIONS**

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## 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.

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## **ATTACHMENT B: ASSUMPTIONS USED IN DEMAND MANAGEMENT MODEL**

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

Description	Assumed Market Penetration	Assumed potable water Savings	Assumed Implementation Costs
<u>Residential Retrofit Program</u> 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: <ul style="list-style-type: none"> <li>Based on average use volumes for each type of shower</li> <li>5% of participants in the program are free-riders.</li> </ul> For taps: <ul style="list-style-type: none"> <li>20% reduction in Taps/Sink uses per account.</li> </ul> For leakage: <ul style="list-style-type: none"> <li>5% reduction lasting for 5 years.</li> </ul>	For showerheads: <ul style="list-style-type: none"> <li>\$100 cost to utility per showerhead retrofitted.</li> </ul> For leakage: <ul style="list-style-type: none"> <li>\$5 cost to utility per account.</li> </ul>
<u>National Mandatory Water Efficiency Labelling Scheme</u> 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: <ul style="list-style-type: none"> <li>20% for taps;</li> <li>30% for dishwashers;</li> <li>30% for washing machines; and</li> <li>30% for efficient showerheads.</li> </ul>	<ul style="list-style-type: none"> <li>Costs to utility - to enhance and promote scheme:</li> <li>Setup - \$3,000 plus 20 cents for each person in the supply area.</li> <li>Annual outlay - \$500 plus 5 cents for each person in the supply area.</li> </ul>
<u>Rainwater Tanks on all new Residential Development</u> 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.	<ul style="list-style-type: none"> <li>100% of new residential customers from 2006.</li> <li>10 year pump life.</li> </ul>	<ul style="list-style-type: none"> <li>60% reduction in targeted water uses under average conditions, zero under peak conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Cost of installation is \$2,500 per account (utility or household).</li> <li>\$30 per year per customer for operation.</li> </ul>
<u>Dual Reticulation for New Subdivisions</u> 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.	<ul style="list-style-type: none"> <li>\$3,000 net per account for additional costs of dual reticulation.</li> </ul>

Description	Assumed Market Penetration	Assumed potable water Savings	Assumed Implementation Costs
<p><u>BASIX – Fixture Component</u> The NSW Government's BASIX program will be implemented.</p>	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).	<p>Costs to utility:</p> <ul style="list-style-type: none"> <li>• Setup - \$10,000 plus 20 cents for each person in the supply area.</li> <li>• Annual administration/enforcement \$3,000 plus 5 cents for each person in the supply area.</li> </ul> <p>Cost to community (excluding rainwater tank and/or dual reticulation costs):</p> <ul style="list-style-type: none"> <li>• \$10 additional for low flow showerhead.</li> <li>• \$10 for tap flow regulators.</li> <li>• \$100 for water efficient planting/landscaping.</li> </ul>
<p><u>Community Education</u> Council would provide materials, training and technical assistance to implement a comprehensive ongoing community education program.</p>	20% of all customers in each customer category influenced by the community education effort.	Water savings vary dependent on the customer category and end use.	<p>Costs to utility:</p> <ul style="list-style-type: none"> <li>• Setup - \$10,000 plus 20 cents for each person in the supply area.</li> <li>• Annual administration, \$3,000 plus 5 cents for each person in the supply area.</li> </ul>
<p><u>Permanent Restriction on Water use</u> Council would introduce a water waste regulation that would:</p> <ul style="list-style-type: none"> <li>• prohibit irrigation during the times of the day with the highest evaporation;</li> <li>• mandate the use of trigger nozzle when washing cars; and</li> <li>• prohibit irrigation that fell on hard surfaces or hosing down of footpaths or driveways.</li> </ul>	50% of all customers would adhere to the regulation.	10% reduction in external use in participating customers.	<p>Cost to utility:</p> <ul style="list-style-type: none"> <li>• Setup - \$10,000 plus 20 cents for each person in the supply area.</li> <li>• Annual administration/enforcement - \$2,000 plus 5 cents for each person in the supply area.</li> </ul>

Description	Assumed Market Penetration	Assumed potable water Savings	Assumed Implementation Costs
<u>Inclining Block Water Pricing Structure</u> 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: <ul style="list-style-type: none"> <li>• Setup only - \$5,000 plus 20 cents for each person in the supply area.</li> </ul>
<u>Active Leak Detection and Repair</u> 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.	<ul style="list-style-type: none"> <li>• Leakage assumed to be half of all NRW.</li> <li>• One third of the system targeted each year for leak detection and repair.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces leakage by 75% in targeted areas upon completion of work.</li> <li>• Impact of leakage reduction effort will last 3 years.</li> </ul>	<ul style="list-style-type: none"> <li>• Leak detection and repair assumed to be carried out over 10% of system each year.</li> <li>• \$280/km detection cost.</li> <li>• \$230/km repair cost.</li> </ul>
<u>Non Residential Water Audits</u> This measure allows for water audits for non-residential customers.	<ul style="list-style-type: none"> <li>• 10% of non residential customers participating.</li> </ul>	<ul style="list-style-type: none"> <li>• 10% saving in non-leakage consumption per customer</li> <li>• 75% reduction in customer leakage – but savings only last 2 years.</li> </ul>	Costs to utility: <ul style="list-style-type: none"> <li>• Setup - \$5,000 plus 20 cents for each person in the supply area.</li> <li>• Annual administration/enforcement - \$1,000 plus 5 cents for each person in the supply area.</li> <li>• \$300 cost to each customer for implementation of audit recommendations.</li> </ul>
<u>Evaporative Cooling Unit and Cooling Tower audit</u> This measure allows for water audits for evaporative cooling units and cooling towers for both residential and non-residential customers.	<ul style="list-style-type: none"> <li>• 4% of customers participating in any one year.</li> </ul>	<ul style="list-style-type: none"> <li>• 20% reduction in cooling uses.</li> <li>• Measure life of 5 years.</li> </ul>	Costs to utility: <ul style="list-style-type: none"> <li>• Setup - \$5,000 plus 20 cents for each person in the supply area.</li> <li>• Annual administration/enforcement - \$1,000 plus 5 cents for each person in the supply area.</li> </ul> Cost to each customer for implementation of audit recommendations: <ul style="list-style-type: none"> <li>• \$100 for residential</li> <li>• \$300 for non-residential.</li> </ul>

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**ATTACHMENT C: End Use Model Tables**

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# Demand Management Least Cost Planning - Decision Support System

## Baseline Forecasts

### Existing Demand Measures:

Community Education  
Water Restrictions

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Resident Population Served with water						17,919	18,062	18,207	18,353	18,499	18,647	18,796	18,947	19,098	19,251	19,405	19,560	19,717
Persons per Residential Account						3.07	3.07	3.06	3.06	3.06	3.05	3.05	3.05	3.04	3.04	3.04	3.04	3.03
Annual Average Water Consumption (ML/year)																		
Historical	2,719	3,136	2,779	2,313	2,587	0												
Baseline Forecast						2981.0	3004.8	3028.9	3053.1	3077.5	3102.2	3127.0	3152.0	3177.2	3202.6	3228.3	3254.1	3280.1
Peak Day Demand (ML)																		
Historical	19.60	17.70	19.10	9.90	17.20	0.00												
Baseline Forecast						19.66	19.99	20.31	20.62	20.93	21.22	21.51	21.79	22.06	22.33	22.60	22.86	23.12
Per Capita Demand (L/person/day)																		
Baseline Forecast						455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47
Forecast Waste Water Flows (ML/day)																		
Daily Average						5.33	5.34	5.35	5.37	5.39	5.41	5.43	5.45	5.48	5.51	5.53	5.56	5.60
Design Wet Weather						13.32	13.40	13.49	13.58	13.67	13.76	13.86	13.96	14.06	14.16	14.27	14.38	14.49

## a) Baseline (0.8% pa Growth)

2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
20,034	20,194	20,356	20,518	20,683	20,848	21,015	21,183	21,352	21,523	21,695	21,869	22,044	22,220	22,398	22,577	22,758
3.03	3.02	3.02	3.02	3.01	3.01	3.01	3.00	3.00	3.00	3.00	2.99	2.99	2.99	2.98	2.98	2.98
3332.8	3359.5	3386.3	3413.4	3440.7	3468.3	3496.0	3524.0	3552.2	3580.6	3609.2	3638.1	3667.2	3696.5	3726.1	3755.9	3786.0
23.62	23.87	24.12	24.37	24.61	24.85	25.09	25.33	25.57	25.81	26.05	26.29	26.53	26.77	27.01	27.25	27.49
455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47
5.66	5.70	5.73	5.77	5.81	5.85	5.88	5.93	5.97	6.01	6.05	6.10	6.14	6.18	6.23	6.28	6.32
14.71	14.83	14.94	15.06	15.18	15.31	15.43	15.56	15.68	15.81	15.94	16.08	16.21	16.34	16.48	16.62	16.76

**a) Baseline (cont'd) (0.8% pa Growth)**

# Demand Management Least Cost Planning - Decision Support System

## Scenario 1

### New Demand Measures:

Community Education  
System Water Loss Management

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
<b>Demand Measures Water Savings (ML/year)</b>																	
Community Education	0.00	36.64	37.23	37.81	38.37	38.92	39.46	39.98	40.50	41.00	41.50	42.00	42.48	42.96	43.44	43.91	44.38
System Water Loss Management	0.00	0.00	0.00	1.37	2.77	4.19	5.63	7.09	8.58	10.09	11.62	13.18	14.76	14.88	15.00	15.12	15.24
Caculated Total Savings	0.00	36.64	37.23	39.18	41.14	43.11	45.09	47.07	49.08	51.09	53.13	55.17	57.24	57.84	58.43	59.03	59.61
<b>Total Water Savings Scenario 1 (Modelled)</b>	<b>0.00</b>	<b>36.64</b>	<b>37.23</b>	<b>39.18</b>	<b>41.14</b>	<b>43.11</b>	<b>45.09</b>	<b>47.07</b>	<b>49.08</b>	<b>51.09</b>	<b>53.13</b>	<b>55.17</b>	<b>57.24</b>	<b>57.84</b>	<b>58.43</b>	<b>59.03</b>	<b>59.61</b>
<b>Annual Average Water Consumption (ML/year)</b>																	
Baseline Forecast	2981.0	3004.8	3028.9	3053.1	3077.5	3102.2	3127.0	3152.0	3177.2	3202.6	3228.3	3254.1	3280.1	3306.4	3332.8	3359.5	3386.3
Integrated Scenario 1	2981.0	2968.2	2991.7	3013.9	3036.4	3059.1	3081.9	3104.9	3128.1	3151.5	3175.1	3198.9	3222.9	3248.5	3274.4	3300.4	3326.7
Total Water Savings	0.0	36.6	37.2	39.2	41.1	43.1	45.1	47.1	49.1	51.1	53.1	55.2	57.2	57.8	58.4	59.0	59.6
<b>Peak Day Demand (ML)</b>																	
Baseline Forecast	19.66	19.99	20.31	20.62	20.93	21.22	21.51	21.79	22.06	22.33	22.60	22.86	23.12	23.37	23.62	23.87	24.12
Integrated Scenario 1	19.66	19.50	19.81	20.11	20.40	20.68	20.96	21.23	21.49	21.75	22.01	22.26	22.51	22.75	23.00	23.24	23.48
<b>Per Capita Demand (L/person/day)</b>																	
Baseline Forecast	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47
Integrated Scenario 1	455.78	450.22	450.18	449.93	449.69	449.45	449.21	448.97	448.74	448.51	448.28	448.05	447.83	447.81	447.79	447.77	447.76
<b>Waste Water Flows (ML/day)</b>																	
Daily Average Baseline	4.49	4.50	4.51	4.53	4.54	4.56	4.58	4.59	4.62	4.64	4.66	4.69	4.71	4.74	4.77	4.80	4.83
Integrated Scenario 1	5.33	5.32	5.33	5.34	5.36	5.38	5.41	5.43	5.45	5.48	5.51	5.54	5.57	5.60	5.64	5.67	5.71
Design Wet Weather Baseline	11.24	11.30	11.38	11.45	11.53	11.60	11.69	11.77	11.85	11.94	12.03	12.12	12.21	12.31	12.40	12.50	12.60
Integrated Scenario 1	13.32	13.38	13.46	13.55	13.64	13.74	13.83	13.93	14.03	14.14	14.24	14.35	14.46	14.57	14.69	14.80	14.92

## b) Option 1 (0.8% pa Growth)



2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	
44.84	45.30	45.76	46.22	46.67	47.12	47.58	48.03	48.48	48.93	49.38	49.83	50.29	50.74	EDUC
15.36	15.48	15.61	15.73	15.86	15.98	16.11	16.24	16.37	16.50	16.63	16.77	16.90	17.04	LOSS
60.20	60.78	61.37	61.95	62.53	63.11	63.69	64.27	64.85	65.43	66.02	66.60	67.19	67.78	Calc
<b>60.20</b>	<b>60.78</b>	<b>61.37</b>	<b>61.95</b>	<b>62.53</b>	<b>63.11</b>	<b>63.69</b>	<b>64.27</b>	<b>64.85</b>	<b>65.43</b>	<b>66.02</b>	<b>66.60</b>	<b>67.19</b>	<b>67.78</b>	BCP1
3413.4	3440.7	3468.3	3496.0	3524.0	3552.2	3580.6	3609.2	3638.1	3667.2	3696.5	3726.1	3755.9	3786.0	BAS
3353.2	3380.0	3406.9	3434.1	3461.4	3489.1	3516.9	3545.0	3573.3	3601.8	3630.5	3659.5	3688.7	3718.2	BCP1
60.2	60.8	61.4	61.9	62.5	63.1	63.7	64.3	64.9	65.4	66.0	66.6	67.2	67.8	BCP1
24.37	24.61	24.85	25.09	25.33	25.57	25.81	26.05	26.29	26.53	26.77	27.01	27.25	27.49	BAS
23.72	23.95	24.19	24.42	24.66	24.89	25.12	25.36	25.59	25.82	26.05	26.28	26.52	26.75	BCP1
455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	BAS
447.74	447.73	447.72	447.70	447.69	447.68	447.67	447.66	447.66	447.65	447.64	447.63	447.63	447.62	SET
4.86	4.89	4.92	4.95	4.99	5.02	5.06	5.09	5.13	5.17	5.21	5.24	5.28	5.32	BAS
5.74	5.78	5.82	5.86	5.90	5.94	5.98	6.03	6.07	6.11	6.16	6.20	6.25	6.30	BCP1
12.70	12.80	12.90	13.01	13.11	13.22	13.33	13.44	13.55	13.66	13.78	13.89	14.01	14.13	BAS
15.04	15.16	15.28	15.41	15.53	15.66	15.79	15.92	16.05	16.18	16.32	16.45	16.59	16.73	BCP1

**b) Option 1 (cont'd) (0.8% pa Growth)**

**Demand Management Least Cost Planning - Decision Support System**

**Scenario 2**

**Demand Measures:**

**Existing**      Community Education  
System Water Loss Management

**New**      Evaporative Cooling Unit and Cooling Tower Audit

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
<b>Demand Measures Water Savings (ML/year)</b>																				
Total Water Savings Scenario 1	0.0	36.6	37.2	39.2	41.1	43.1	45.1	47.1	49.1	51.1	53.1	55.2	57.2	57.8	58.4	59.0	59.6	60.2	60.8	61.4
Evaporative Cooling Unit and Cooling Tower Audit	0.00	0.58	1.18	1.80	2.43	3.08	3.13	3.18	3.22	3.27	3.31	3.36	3.40	3.44	3.48	3.52	3.56	3.60	3.64	3.68
Caculated Total Savings	0.00	37.22	38.41	40.98	43.57	46.19	48.21	50.25	52.30	54.36	56.44	58.53	60.64	61.28	61.92	62.55	63.18	63.80	64.42	65.04
<b>Total Water Savings Scenario 2 (Modelled)</b>	<b>0.00</b>	<b>37.22</b>	<b>38.41</b>	<b>40.98</b>	<b>43.57</b>	<b>46.18</b>	<b>48.21</b>	<b>50.24</b>	<b>52.29</b>	<b>54.36</b>	<b>56.43</b>	<b>58.53</b>	<b>60.64</b>	<b>61.28</b>	<b>61.91</b>	<b>62.54</b>	<b>63.17</b>	<b>63.79</b>	<b>64.42</b>	<b>65.04</b>
<b>Annual Average Water Consumption (ML/year)</b>																				
Baseline Forecast	2981.0	3004.8	3028.9	3053.1	3077.5	3102.2	3127.0	3152.0	3177.2	3202.6	3228.3	3254.1	3280.1	3306.4	3332.8	3359.5	3386.3	3413.4	3440.7	3468.3
Integrated Scenario 2	2981.0	2967.6	2990.5	3012.1	3034.0	3056.0	3078.8	3101.8	3124.9	3148.3	3171.8	3195.6	3219.5	3245.1	3270.9	3296.9	3323.2	3349.6	3376.3	3403.2
Total Water Savings	0.0	37.2	38.4	41.0	43.6	46.2	48.2	50.2	52.3	54.4	56.4	58.5	60.6	61.3	61.9	62.5	63.2	63.8	64.4	65.0
<b>Peak Day Demand (ML)</b>																				
Baseline Forecast	19.66	19.99	20.31	20.62	20.93	21.22	21.51	21.79	22.06	22.33	22.60	22.86	23.12	23.37	23.62	23.87	24.12	24.37	24.61	24.85
Integrated Scenario 2	19.66	19.49	19.79	20.08	20.36	20.63	20.90	21.17	21.44	21.69	21.95	22.20	22.45	22.69	22.94	23.18	23.42	23.66	23.89	24.13
<b>Per Capita Demand (L/person/day)</b>																				
Baseline Forecast	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47
Integrated Scenario 2	455.78	450.13	450.00	449.66	449.33	449.00	448.75	448.51	448.28	448.04	447.81	447.58	447.35	447.33	447.31	447.29	447.28	447.26	447.25	447.23
<b>Waste Water Flows (ML/day)</b>																				
Daily Average Baseline	4.49	4.50	4.51	4.53	4.54	4.56	4.58	4.59	4.62	4.64	4.66	4.69	4.71	4.74	4.77	4.80	4.83	4.86	4.89	4.92
Integrated Scenario 2	5.33	5.32	5.33	5.34	5.36	5.38	5.41	5.43	5.45	5.48	5.51	5.54	5.57	5.60	5.64	5.67	5.71	5.74	5.78	5.82
Design Wet Weather Baseline	11.24	11.30	11.38	11.45	11.53	11.60	11.69	11.77	11.85	11.94	12.03	12.12	12.21	12.31	12.40	12.50	12.60	12.70	12.80	12.90
Integrated Scenario 2	13.32	13.38	13.46	13.55	13.64	13.74	13.83	13.93	14.03	14.14	14.24	14.35	14.46	14.57	14.69	14.80	14.92	15.04	15.16	15.28

**c) Option 2 (0.8% pa Growth)**

2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	
61.9	62.5	63.1	63.7	64.3	64.9	65.4	66.0	66.6	67.2	67.8	BCP1
3.71	3.75	3.79	3.82	3.86	3.90	3.93	3.97	4.00	4.04	4.07	COOL
65.66	66.28	66.90	67.51	68.13	68.75	69.36	69.98	70.60	71.23	71.85	Calc
<b>65.65</b>	<b>66.27</b>	<b>66.89</b>	<b>67.51</b>	<b>68.12</b>	<b>68.74</b>	<b>69.36</b>	<b>69.98</b>	<b>70.60</b>	<b>71.22</b>	<b>71.84</b>	BCP2
3496.0	3524.0	3552.2	3580.6	3609.2	3638.1	3667.2	3696.5	3726.1	3755.9	3786.0	BAS
3430.4	3457.7	3485.3	3513.1	3541.1	3569.4	3597.9	3626.6	3655.5	3684.7	3714.1	BCP2
65.7	66.3	66.9	67.5	68.1	68.7	69.4	70.0	70.6	71.2	71.8	BCP2
25.09	25.33	25.57	25.81	26.05	26.29	26.53	26.77	27.01	27.25	27.49	BAS
24.36	24.59	24.83	25.06	25.29	25.52	25.75	25.98	26.22	26.45	26.68	BCP2
455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	BAS
447.22	447.21	447.20	447.19	447.18	447.17	447.16	447.15	447.14	447.14	447.13	SET
4.95	4.99	5.02	5.06	5.09	5.13	5.17	5.21	5.24	5.28	5.32	BAS
5.86	5.90	5.94	5.98	6.03	6.07	6.11	6.16	6.20	6.25	6.30	BCP2
13.01	13.11	13.22	13.33	13.44	13.55	13.66	13.78	13.89	14.01	14.13	BAS
15.41	15.53	15.66	15.79	15.92	16.05	16.18	16.32	16.45	16.59	16.73	BCP2

**c) Option 2 (cont'd) (0.8% pa Growth)**

# Demand Management Least Cost Planning - Decision Support System

## Scenario 3

### Demand Measures:

#### Existing

Community Education  
System Water Loss Management  
Evaporative Cooling Unit and Cooling Tower Audit

#### New

Non-Residential Water Audits  
BASIX - Fixture Efficiency with Rainwater Use  
BASIX - Fixture Efficiency with Dual Reticulation

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
<b>Demand Measures Water Savings (ML/year)</b>																			
Total Water Savings Scenario 2	0.0	37.2	38.4	41.0	43.6	46.2	48.2	50.2	52.3	54.4	56.4	58.5	60.6	61.3	61.9	62.5	63.2	63.8	64.4
Non-Residential Water Audits	0.0	3.0	6.1	8.3	10.5	9.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7
BASIX - Fixture Efficiency with Rainwater Use	0.00	9.60	18.95	28.09	37.03	45.79	54.39	62.85	71.18	79.39	87.50	95.52	103.45	111.32	119.13	126.89	134.61	142.29	149.95
BASIX - Fixture Efficiency with Dual Reticulation	0.00	10.76	21.32	31.70	41.92	51.98	61.91	71.71	81.40	90.99	100.50	109.92	119.28	128.59	137.84	147.05	156.23	165.39	174.53
Calculated Total Savings	0.00	60.60	84.77	109.03	132.97	153.49	173.12	193.42	213.50	233.37	253.06	272.61	292.02	309.84	327.54	345.15	362.68	380.14	397.56
<b>Total Water Savings Scenario 3 (Modelled)</b>	<b>0.00</b>	<b>60.09</b>	<b>83.60</b>	<b>107.06</b>	<b>130.09</b>	<b>149.59</b>	<b>168.11</b>	<b>187.21</b>	<b>206.00</b>	<b>224.51</b>	<b>242.77</b>	<b>260.81</b>	<b>278.65</b>	<b>294.83</b>	<b>310.83</b>	<b>326.67</b>	<b>342.37</b>	<b>357.95</b>	<b>373.41</b>
<b>Annual Average Water Consumption (ML/year)</b>																			
Baseline Forecast	2981.0	3004.8	3028.9	3053.1	3077.5	3102.2	3127.0	3152.0	3177.2	3202.6	3228.3	3254.1	3280.1	3306.4	3332.8	3359.5	3386.3	3413.4	3440.7
Integrated Scenario 3	2981.0	2944.8	2945.3	2946.1	2947.5	2952.6	2958.9	2964.8	2971.2	2978.1	2985.5	2993.3	3001.5	3011.5	3022.0	3032.8	3044.0	3055.5	3067.3
Total Water Savings	0.0	60.1	83.6	107.1	130.1	149.6	168.1	187.2	206.0	224.5	242.8	260.8	278.6	294.8	310.8	326.7	342.4	357.9	373.4
<b>Peak Day Demand (ML)</b>																			
Baseline Forecast	19.66	19.99	20.31	20.62	20.93	21.22	21.51	21.79	22.06	22.33	22.60	22.86	23.12	23.37	23.62	23.87	24.12	24.37	24.61
Integrated Scenario 3	19.66	19.37	19.55	19.72	19.88	20.05	20.22	20.38	20.53	20.68	20.83	20.97	21.11	21.24	21.38	21.51	21.64	21.77	21.89
<b>Per Capita Demand (L/person/day)</b>																			
Baseline Forecast	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47
Integrated Scenario 3	455.78	446.67	443.20	439.80	436.51	433.80	431.28	428.71	426.23	423.83	421.50	419.25	417.06	415.14	413.27	411.46	409.70	407.99	406.32
<b>Waste Water Flows (ML/day)</b>																			
Daily Average	4.49	4.50	4.51	4.53	4.54	4.56	4.58	4.59	4.62	4.64	4.66	4.69	4.71	4.74	4.77	4.80	4.83	4.86	4.89
Integrated Scenario 3	5.33	5.29	5.27	5.26	5.26	5.27	5.28	5.29	5.30	5.31	5.33	5.35	5.37	5.39	5.42	5.44	5.47	5.50	5.53
Design Wet Weather Baseline	11.24	11.30	11.38	11.45	11.53	11.60	11.69	11.77	11.85	11.94	12.03	12.12	12.21	12.31	12.40	12.50	12.60	12.70	12.80
Integrated Scenario 3	13.32	13.35	13.41	13.47	13.54	13.62	13.70	13.79	13.88	13.97	14.06	14.16	14.26	14.36	14.47	14.58	14.69	14.80	14.91

## d) Option 3 (0.8% pa Growth)

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	
65.0	65.7	66.3	66.9	67.5	68.1	68.7	69.4	70.0	70.6	71.2	71.8	BCP2
8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	AUDITp
157.58	165.20	172.81	180.41	188.02	195.63	203.25	210.88	218.53	226.20	233.89	241.61	BASIX-HR
183.65	192.78	201.90	211.02	220.16	229.31	238.48	247.68	256.90	266.15	275.44	284.76	BASIX-HD
414.94	432.30	449.65	467.00	484.36	501.74	519.15	536.59	554.08	571.62	589.23	606.89	calc
<b>388.79</b>	<b>404.07</b>	<b>419.29</b>	<b>434.44</b>	<b>449.55</b>	<b>464.61</b>	<b>479.64</b>	<b>494.64</b>	<b>509.62</b>	<b>524.59</b>	<b>539.56</b>	<b>554.53</b>	BCP3
3468.3	3496.0	3524.0	3552.2	3580.6	3609.2	3638.1	3667.2	3696.5	3726.1	3755.9	3786.0	BAS
3079.5	3091.9	3104.7	3117.7	3131.0	3144.6	3158.5	3172.6	3186.9	3201.5	3216.4	3231.4	BCP3
388.8	404.1	419.3	434.4	449.5	464.6	479.6	494.6	509.6	524.6	539.6	554.5	BCP3
24.85	25.09	25.33	25.57	25.81	26.05	26.29	26.53	26.77	27.01	27.25	27.49	BAS
22.02	22.14	22.27	22.39	22.51	22.63	22.75	22.87	23.00	23.12	23.24	23.36	BCP3
455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	BAS
404.69	403.10	401.55	400.04	398.56	397.11	395.69	394.30	392.94	391.61	390.30	389.02	SET
4.92	4.95	4.99	5.02	5.06	5.09	5.13	5.17	5.21	5.24	5.28	5.32	BAS
5.56	5.60	5.63	5.67	5.70	5.74	5.78	5.82	5.86	5.90	5.94	5.98	BCP3
12.90	13.01	13.11	13.22	13.33	13.44	13.55	13.66	13.78	13.89	14.01	14.13	BAS
15.03	15.14	15.26	15.38	15.51	15.63	15.76	15.89	16.02	16.15	16.28	16.42	BCP3

**d) Option 3 (cont'd) (0.8% pa Growth)**

# Demand Management Least Cost Planning - Decision Support System

## Scenario 4

### Demand Measures:

Existing	Community Education
	System Water Loss Management
	Evaporative Cooling Unit and Cooling Tower Audit
	Non-Residential Water Audits
	BASIX - Fixture Efficiency with Rainwater Use
New	BASIX - Fixture Efficiency with Dual Reticulation
	Permanent Low Level Restrictions on Water Use
	Conservation Pricing for Residential Users
	Rainwater Tanks for all New Residential Development
	Dual Reticulation for all New Residential Development

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
<b>Demand Measures Water Savings (ML/year)</b>																
Total Water Savings Scenario 3	0.0	60.1	83.6	107.1	130.1	149.6	168.1	187.2	206.0	224.5	242.8	260.8	278.6	294.8	310.8	326.7
Permanent Low Level Restrictions on Water Use	0.0	77.3	78.9	80.5	82.0	83.5	84.9	86.3	87.6	88.9	90.2	91.4	92.7	93.8	95.0	96.2
Conservation Pricing for Residential Users	8.2	8.3	75.8	77.2	99.4	100.7	102.0	103.3	104.6	105.8	107.0	108.3	109.4	110.6	111.8	113.0
Rainwater Tanks for all New Residential Development	0.0	5.4	10.9	16.5	22.0	27.7	33.3	39.0	44.8	50.6	56.4	62.3	68.2	74.2	80.2	86.3
Dual Reticulation for all New Residential Development	0.0	6.6	13.3	20.1	26.9	33.8	40.8	47.9	55.0	62.2	69.4	76.7	84.1	91.5	98.9	106.4
Calculated Total Savings	8.19	157.72	262.51	301.29	360.45	395.30	429.21	463.74	498.00	532.03	565.87	599.53	633.06	664.98	696.80	728.52
<b>Total Water Savings Scenario 4 (Modelled)</b>	<b>8.19</b>	<b>152.10</b>	<b>242.69</b>	<b>276.74</b>	<b>329.49</b>	<b>358.65</b>	<b>386.56</b>	<b>414.76</b>	<b>442.37</b>	<b>469.44</b>	<b>496.01</b>	<b>522.11</b>	<b>547.79</b>	<b>571.58</b>	<b>594.99</b>	<b>618.03</b>
<b>Annual Average Water Consumption (ML/year)</b>																
Baseline Forecast	2981.0	3004.8	3028.9	3053.1	3077.5	3102.2	3127.0	3152.0	3177.2	3202.6	3228.3	3254.1	3280.1	3306.4	3332.8	3359.5
Integrated Scenario 4	2972.8	2852.7	2786.2	2776.4	2748.1	2743.5	2740.4	2737.2	2734.8	2733.2	2732.2	2732.0	2732.3	2734.8	2737.8	2741.4
Total Water Savings	8.2	152.1	242.7	276.7	329.5	358.7	386.6	414.8	442.4	469.4	496.0	522.1	547.8	571.6	595.0	618.0
<b>Peak Day Demand (ML)</b>																
Baseline Forecast	19.66	19.99	20.31	20.62	20.93	21.22	21.51	21.79	22.06	22.33	22.60	22.86	23.12	23.37	23.62	23.87
Integrated Scenario 4	19.57	17.96	17.15	17.24	17.28	17.37	17.46	17.55	17.64	17.72	17.80	17.88	17.95	18.03	18.10	18.17
<b>Per Capita Demand (L/person/day)</b>																
Baseline Forecast	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47
Integrated Scenario 4	454.53	432.71	419.26	414.47	406.98	403.09	399.44	395.81	392.32	388.97	385.75	382.65	379.66	376.99	374.41	371.93
<b>Waste Water Flows (ML/day)</b>																
Daily Average	4.49	4.50	4.51	4.53	4.54	4.56	4.58	4.59	4.62	4.64	4.66	4.69	4.71	4.74	4.77	4.80
Integrated Scenario 4	5.32	5.28	5.27	5.26	5.20	5.21	5.22	5.23	5.24	5.26	5.27	5.29	5.31	5.34	5.36	5.39
Design Wet Weather Baseline	11.24	11.30	11.38	11.45	11.53	11.60	11.69	11.77	11.85	11.94	12.03	12.12	12.21	12.31	12.40	12.50
Integrated Scenario 4	13.31	13.34	13.40	13.47	13.48	13.56	13.65	13.73	13.82	13.91	14.01	14.11	14.21	14.31	14.41	14.52

## e)Option 4 (0.8% pa Growth)

2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	
342.4	357.9	373.4	388.8	404.1	419.3	434.4	449.5	464.6	479.6	494.6	509.6	524.6	539.6	554.5	BCP4
97.3	98.4	99.5	100.6	101.7	102.8	103.9	104.9	106.0	107.0	108.1	109.1	110.1	111.2	112.2	PERM
114.1	115.3	116.4	117.6	118.7	119.9	121.0	122.1	123.3	124.4	125.6	126.7	127.8	129.0	130.1	PRI
92.4	98.5	104.7	110.9	117.2	123.5	129.9	136.3	142.7	149.2	155.8	162.4	169.0	175.7	182.5	RAIN
114.0	121.6	129.3	137.0	144.8	152.6	160.5	168.4	176.4	184.5	192.6	200.8	209.0	217.3	225.6	DUAL
760.18	791.78	823.36	854.92	886.48	918.06	949.66	981.31	1013.02	1044.78	1076.63	1108.55	1140.58	1172.70	1204.94	calc
640.73	663.12	685.22	707.06	728.64	749.99	771.12	792.06	812.81	833.39	853.81	874.09	894.23	914.25	934.15	BCP4
3386.3	3413.4	3440.7	3468.3	3496.0	3524.0	3552.2	3580.6	3609.2	3638.1	3667.2	3696.5	3726.1	3755.9	3786.0	BAS
2745.6	2750.3	2755.5	2761.2	2767.4	2774.0	2781.0	2788.5	2796.4	2804.7	2813.4	2822.5	2831.9	2841.7	2851.8	BCP4
640.7	663.1	685.2	707.1	728.6	750.0	771.1	792.1	812.8	833.4	853.8	874.1	894.2	914.2	934.1	BCP4
24.12	24.37	24.61	24.85	25.09	25.33	25.57	25.81	26.05	26.29	26.53	26.77	27.01	27.25	27.49	BAS
18.24	18.32	18.39	18.46	18.53	18.60	18.67	18.75	18.82	18.89	18.97	19.04	19.12	19.20	19.27	BCP4
455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	455.47	BAS
369.54	367.24	365.01	362.86	360.79	358.78	356.84	354.96	353.14	351.37	349.66	348.01	346.40	344.84	343.32	SET
4.83	4.86	4.89	4.92	4.95	4.99	5.02	5.06	5.09	5.13	5.17	5.21	5.24	5.28	5.32	BAS
5.42	5.45	5.48	5.51	5.54	5.57	5.61	5.65	5.68	5.72	5.76	5.80	5.84	5.88	5.92	BCP4
12.60	12.70	12.80	12.90	13.01	13.11	13.22	13.33	13.44	13.55	13.66	13.78	13.89	14.01	14.13	BAS
14.63	14.74	14.85	14.97	15.09	15.21	15.33	15.45	15.57	15.70	15.83	15.96	16.09	16.22	16.36	BCP4

**e) Option 4 (cont'd) (0.8% pa Growth)**



# **APPENDIX E**

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## **INFORMATION & DATA ASSESSMENT**

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## INFORMATION & DATA SOURCED

### ✧ From Singleton Council

<b>Data/Information</b>	<b>Detail</b>	<b>Assessment</b>	<b>Comments/Gaps</b>
▪ NOW (DWE) Performance Reports	TBL Water & Sewerage Performance Reports for:	✓	-
	✧ 2006/07		
	✧ 2007/08		
	✧ 2008/09 as submitted		
▪ State of the Environment Reports	Reports for 2007/08 & 2008/09	✓	-
▪ Annual Reports	Council Reports for DLG – 2005/06, 06/07 & 07/08	✓	-
▪ Asset Management Plans – Water & Sewerage	✧ Waste Water Assets 2008/09	✓	-
	✧ Water Assets 2008/09		
	✧ Singleton Asset renewal Plan, 2009		
	✧ Obanvale (WTP) Asset Management Plan, 2009		
	✧ Sewer Mains Asset Management Program, 2007/08		
	✧ Singleton 2030; Water Infrastructure Requirements, 2004		
	✧ Singleton 100 Year Asset Renewal Summary for Water Supply & Sewerage Services, 2009		
▪ Community Consultation	✧ Community Survey Results, 2009		
▪ Drought Management	Drought Management & Emergency Response Plan, 2008	✓	
▪ Demand Management	✧ Long Term Demand Assessment, 2008/09		
▪ Financial Information	✧ Financial Planning Report for Water Supply & Sewerage Services, 2005		
	✧ Financial Statements, 2007/08 and 2008/09		

<b>Data/Information</b>	<b>Detail</b>	<b>Assessment</b>	<b>Comments/Gaps</b>
<ul style="list-style-type: none"> <li>▪ Sewerage Management</li> <li>▪ Water Supply Services</li> </ul>	✧ Sewage Treatment Report for Developer Services Plan, 2005		
	✧ Water Treatment Report for Developer Services Plan, 2005		
	✧ Water & Sewerage Developer Charges (calculations & Plans), 2003/04		
	✧ Water & Sewerage Treatment Reports for Developer Services Plan, 2005		
	✧ Finmod modelling files, 2005		
	✧ Pipes ++ network files, 2004		
	✧ Supplementary Report to the Developer Services Plan, 2005		
	✧ Singleton Financial Plan for Water Supply & Sewerage Services, 2005		
	✧ Onsite Sewage Management Strategy & Policy, 2002		
	✧ Sewer Inflow Data, 1991 - 2009		
	✧ Singleton Villages Sewerage Schemes: Strategy Study, 2009		
	✧ Singleton Sewer & Liquid Trade Waste Services Policy		
	✧ Singleton Liquid Trade Waste Policy (undated)		
	✧ Singleton Sewage Treatment Plant upgrade: Capacity Assessment & Concept Design Report, 2009, Parsons Brinckerhoff		
	✧ Water Production Records, 1991 – 2009		

<b>Data/Information</b>	<b>Detail</b>	<b>Assessment</b>	<b>Comments/Gaps</b>
▪ Planning	✧ Bulga Water Strategy, 2009 (Work-in-progress Papers)		
	✧ Camberwell Water Strategy, 2009 (Work-in-progress Papers)		
	✧ Water Consumption by Category, 2005/06; 06/07; 07/08; 08/09		
	✧ Water Production Records, 1991/2009		
	✧ Sedgefield Structure Plan (Res. development area), 2009		
	✧ Singleton DCP, 2009		
	✧ Singleton Land Use Strategy, 2001 & 2008		
	✧ Singleton Local Environment Plan, 1996		
	✧ Plans of Service Areas (Broke, Jerrys Plains, Mount Thorley, Northern Singleton & surrounds)		
	✧ Singleton Zoning Maps, 2009		
▪ Flooding & Stormwater	✧ Population Projections, Newcastle & Hunter Region, 2008/09		
	✧ Singleton Floodplain Management Plan & DCP, 1998		
▪ Management	✧ Singleton Stormwater Management Plan, 2003		
	✧ Singleton Management Plan, 2009 - 10		
	✧ Singleton Strategic Business Plan for Water Supply, 1998/99		
	✧ Singleton Strategic Business Plan for Sewerage Supply, 1998/99		

✧ **From Other Sources**

<b>Data/Information</b>	<b>Detail</b>	<b>Source</b>	<b>Assessment</b>	<b>Comments</b>
<b>i) Catchment Context</b>				
▪ Environmentally Sensitive Zones – Singleton	UPSS Environmentally Sensitive 20m Map for Singleton	<a href="http://www.environment.nsw.gov.au/clm/upssensitivezones">www.environment.nsw.gov.au/clm/upssensitivezones</a>		
▪ POEO Register	Activities in Singleton licensed under the POEO Act	DECCW		
▪ Population Data	Demographic data Census Tables & Quick Stats 1996, 2001, 2006	Australian Bureau of Statistics		
▪ Population projections	NSW State & Regional Population Projections, 2001 – 2051	NSW Department of Planning		
▪ Weather Data	Weather Station Data for Singleton	BOM		-
▪ Natural Resources Atlas	Australian Natural Resources	<a href="http://www.anra.gov.au/topics/water/overview/nsw/swma-murrumbidgee-river">www.anra.gov.au/topics/water/overview/nsw/swma-murrumbidgee-river</a>		-
▪ Catchment Action Plans	<ul style="list-style-type: none"> <li>▪ Hunter Central Rivers CMA Action Plan, 2006 – 2015</li> <li>▪ Management Targets</li> <li>▪ Vegetation</li> <li>▪ Geology</li> <li>▪ Flora / Fauna</li> <li>▪ Integrated Catchment Management Plan, 2002</li> </ul>	Hunter Central Rivers CMA  Hunter Central Rivers CMA Hunter Central Rivers CMA Hunter Central Rivers CMA Hunter Catchment Management Trust		
▪ Climate Change	<ul style="list-style-type: none"> <li>▪ Climate Change in the Hunter – Central Rivers Catchment</li> <li>▪ Climate Change Impacts in the Hunter</li> </ul>	CSIRO, 2007 for the NSW Government  R Jones & K Hennessy, CSIRO 2000		

<b>Data/Information</b>	<b>Detail</b>	<b>Source</b>	<b>Assessment</b>	<b>Comments</b>
	Valley			
	▪ Future Climate & Runoff Projections for NSW & ACT	DWE, 2008		
▪ Vegetation & Biodiversity	Regional Environmental Management Strategy, Biodiversity	<a href="http://www.huntercouncils.com.au/">www.huntercouncils.com.au/</a>		
	Native Vegetation Management, Hunter Region	Greening Australia Environment 2003		
▪ Threatened Species	Singleton Council – Threatened Species	DECCW: <a href="http://www.threatenedspecies.environment.nsw.gov.au">www.threatenedspecies.environment.nsw.gov.au</a>		
▪ Geology	Hunter Geology	Upper Hunter River Rehabilitation Initiative & Hunter – Central Rivers CMA		
▪ National Parks	National Parks in Hunter Region	DECCW <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a>		
<b>ii) Water Resources Context</b>				
▪ Water Sharing Plans	▪ Water Sharing Plan for the Hunter Regulated River Water Source, 2004	NSW DIPNR (now NSW Office of Water)		
	▪ Water Sharing Plan for the Hunter Unregulated & Alluvial Water Sources, 2009	NSW Legislation		
▪ Water Sharing General	▪ Water Sharing in the Hunter Regulated River, Progress Report, 2004 - 2008	NSW Office of Water (formerly DWE)		
	▪ A Guide to the Water Sharing Plan	DIPNR, 2004		
	▪ Water Sharing Plan in the Glennies Creek Water Source	DNR, 2001		

<b>Data/Information</b>	<b>Detail</b>	<b>Source</b>	<b>Assessment</b>	<b>Comments</b>
<ul style="list-style-type: none"> <li>Water Planning</li> </ul>	<ul style="list-style-type: none"> <li>Critical Water Planning for the Hunter Valley – 2007</li> <li>Glennies Creek Dam               <ul style="list-style-type: none"> <li>Facts &amp; Figures</li> <li>Data</li> <li>Catchment Management Strategy</li> <li>Natural Resources Report</li> </ul> </li> </ul>	NSW Office of Water  State Water NSW Office of Water, 2010 Hunter Central Rivers CMA, 2004 Hunter Catchment Management Trust, 2003		
<ul style="list-style-type: none"> <li>Water Resources Availability</li> </ul>	Water Resources Availability – Hunter River Regulated, Australian Natural Resources Atlas	<a href="http://www.anra.gov.au">www.anra.gov.au</a>		
<ul style="list-style-type: none"> <li>Water Quality</li> </ul>	Hunter River Water Quality & River Flow Objectives	DECCW		
<ul style="list-style-type: none"> <li>Water Quality &amp; River Flows</li> </ul>	<ul style="list-style-type: none"> <li>NSW Water Quality &amp; River Flow Objectives</li> </ul>	<a href="http://www.environment.nsw.gov.au/">www.environment.nsw.gov.au/</a>		
<ul style="list-style-type: none"> <li>Nutrient Loads</li> </ul>	<ul style="list-style-type: none"> <li>Water Quality Monitoring Data</li> <li>Nutrient Loads &amp; Transport - Hunter River</li> </ul>	Water Info., DWE <a href="http://www.anra.gov.au">www.anra.gov.au</a>		
<ul style="list-style-type: none"> <li>River Condition Assessment</li> </ul>	Assessment of River Condition – Hunter River, Australian Natural Resources Atlas	<a href="http://www.anra.gov.au">www.anra.gov.au</a>		
<ul style="list-style-type: none"> <li>Environmental Water</li> </ul>	Environmental Water Requirements to Maintain Wetlands of National & International Importance, National River Health Program, 2001	Natural Heritage Trust		
<ul style="list-style-type: none"> <li>Climate &amp; Runoff Projections</li> </ul>	Future projections to 2030 for NSW & ACT, 2008	NSW Office of Water		



<b>Data/Information</b>	<b>Detail</b>	<b>Source</b>	<b>Assessment</b>	<b>Comments</b>
▪ Water Quality & Flow Data	Water information Data Base, 2003-2007	NSW Office of Water		
▪ Valuations	NSW Reference Rates Manual Valuation of Water Supply, Sewerage & Stormwater Assets, 2003	NSW Ministry of Energy & Utilities (now NSW Office of Water)		
▪ Future Planning	Future Directions for Regional NSW, 2008	PIA NSW		
<b>iii) Urban Context</b>				
▪ EPA Licences	▪ Licence No. 3088 ▪ POEA Licences - Singleton	DECCW NSW  DECCW NSW		
▪ Resources	▪ Land, Water, Climate, Population & Demography, Economy & Industries	Hunter Valley Research Foundation, 2008/09		
▪ Water Sustainability	Sustainable Urban Water Program	HCCREMS <a href="http://www.hecrems.com">www.hecrems.com</a>		
<b>iv) General</b>				
▪ Environmental Assessment	Glennies Creek Open Cut Coal Mine	Integra Coal, 2007		

**DATA GAPS**

<b>Section</b>	<b>Reference</b>	<b>Data Gap</b>	<b>Ranking (H, M or L)</b>	<b>Recommended Action</b>
Appendix A	Page A38	Outdated Strategic Business Plan (1998)	H	Council is currently updating the SBP. Completion & sign off by Council late 2010
Appendix A	Page A43	Quantified water losses	M	Investigation & report on locations & extent of water losses, leading to a planned rectification program
Appendix A	Page A44	Peak demands by user category	M	Investigate & develop a data base to capture information
Appendix A	Page A44	Water usage on public parks and open space areas	M	Investigate & report on strategy to reduce usage
Appendix A	Page A48	Assessment details of sewerage system infiltration	H	Investigate and develop a rectification program of sewer replacement or relining
Appendix A	Page A50	Update of 2005 Trade Waste Policy in accordance with the revised Guidelines issued by the NSW Office of Water (2009)	L	To be completed in 2011/12
Appendix A	Page A51	Details of trade waste discharges to the sewerage system	M	Develop data base to capture information
Appendix A	Page A51	Update of the 2003 Stormwater Management Plan	M	To be completed in 2011/12 – not a LWU responsibility. Refer this matter to Council

Appendix A	Page A52	Floodplain Management Plan	M	To be completed in 2011/12 – not a LWU responsibility. Refer this matter to Council
Appendix A	Page A52	No Council endorsed Levels of Service for stormwater.	M	Refer to Council for attention
Appendix C	Page C12	Current updated Levels of Service for water supply and sewerage	M	As above, Council has committed to a review and update of the Strategic Business Plan in 2010
Appendix C	Page C25	Performance Report gaps relating to: <u>Sewerage</u> <ul style="list-style-type: none"> <li>- Biosolids reuse</li> <li>- energy consumption per ML</li> <li>- renewable energy consumption</li> <li>- net greenhouse gas emissions</li> <li>- loan payments per property</li> </ul>	M	Council has committed to report on these items for 2009/10
Appendix C	Page C27	Performance Report gaps relating to: <u>Water Supply</u> <ul style="list-style-type: none"> <li>- energy consumption per ML</li> <li>- renewable energy consumption</li> <li>- net greenhouse gas emissions</li> </ul>	M	Council has committed to report on these items for 2009/10

# APPENDIX F

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## IWCM & OTHER ISSUES

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    A. IWCM Urban issues ..... 1

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## 1. GENERAL

The key aspect of the IWCM process is to identify solutions to urban water servicing problems or Issues.

Issues are defined as any non-compliances with a utility's urban water service targets, both now and within the 30 year planning horizon.

During the processes of defining targets, assessing compliance and identifying issues, two categories of ISSUES typically arise – namely, specific IWCM Issues and also, non-urban Water Service Issues.

The IWCM is interested specifically in the IWCM Urban Issues.

Other, non-urban Issues need to be referred to the relevant authorities and agencies for their consideration.

For completeness, the non-urban Issues identified during the Singleton IWCM Evaluation Study are also listed here with the Department / Agency to which they should be referred.

### A. IWCM URBAN ISSUES

<i>Item</i>	<i>Reference</i>	<i>Issue Description</i>	<i>Will BaU Address the Issues</i>	<i>Comment</i>
			<b>Refer Minutes of PRG – Appendix G below</b>	
1.	Section 2A – Catchment Perspective: Population Growth (Page A7)	Increasing customer base resulting in increases in water consumption & wastewater generation over the next 30 years.	<b>N</b>	
2.	Section 2A – Catchment Perspective: Geology & Soils (Page A9)	Potential for urban salinity with potential impacts on water & sewerage infrastructure.	<b>N</b>	
3.	Section 2A – Catchment Perspective: Geology & Soils (Page A9)	Potential for groundwater recharge and/or pollution from septic tank systems and leaking wastewater lagoons.	<b>Y</b>	
4.	Section 2A – Catchment Perspective Land Use (Page A19)	High current & future water consumption by the mining industry, with potential demand impacts on the water resource	<b>-</b>	
5.	Section 4A – Urban Water Systems: Sewerage to Villages (Page A33)	Four Villages (Broke, Jerrys Plains, Bulga & Camberwell are not sewered.	<b>N</b>	
6.	Section 4A – Urban Water Systems: Levels of Service (Page A39) & Section C12	Relevance of current Levels of Service (framed in 1998).	<b>N</b>	
7.	Section 4A – Urban Water Systems: Land Uses (Page A43)	Non-compliances with Licences issued by DECCW under the Protection of the Environment Act, 1997. [Refer Appendix C: IWCM	<b>-</b>	

[illegible]

19.	Section C: IWCM Related Targets, Obligations, Responsibilities & Requirements: Legislative Requirements (Page C15)	- Fluoridation of Jerrys Plains water supply	-	
20.	Section C: IWCM Related Targets, Obligations, Responsibilities & Requirements: Other Compliance Aspects (Page C19 & C20)	<ul style="list-style-type: none"> <li>- Development of a water recycling policy</li> <li>- Potential for reuse of biosolids</li> <li>- Urban salinity in Singleton</li> </ul>	-	



**B. NON-URBAN WATER SERVICING ISSUES**

<b><i>Item</i></b>	<b><i>Issue</i></b>	<b><i>Relevant Department/Agency for Referral</i></b>
Section 2A – Catchment Perspective: Geology & Soils (Page A9)	- Potential gully erosion & stream erosion	Singleton Council
Section 2A – Catchment Perspective: Vegetation (Page 16)	- Eight (8) vegetative species listed as vulnerable or endangered.	CMA/Singleton Council
Section 4A – Urban Water Systems: Stormwater Levels of Service (Page A53)	- No Stormwater Levels of Service have been adopted by Council	Singleton Council
Section C: IWCM Related Targets, Obligations, Responsibilities & Requirements: Stormwater Management (Page C21)	- Update of Stormwater Management Plan	Singleton Council
Section C: IWCM Related Targets, Obligations, Responsibilities & Requirements: Stormwater Management (Page C21)	- Develop Floodplain Risk Management Strategy	Singleton Council

# APPENDIX G

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## PRG MEETING – MINUTES

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# **Singleton Council**

## **IWCM Evaluation Study**

### **PRG Meeting**

#### **Singleton Council Chambers**

**At 10 am**

**On 3 June 2010**

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### **Minutes of Meeting**

DLM Environmental Consultants Pty Ltd  
*Strategies for a Water Efficient Future*

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## **1. PRESENT**

<b><u>Name</u></b>	<b><u>Organisation</u></b>
Cr John Martin	Singleton Council
Andrew Speechly	Rio Tinto Coal Australia
Arthur Burns	Coastal Valleys Customer Service Committee
Bob Moore	Singleton Resident
Dr Geoff Martin	Mushroom Composters P/L
Noel Downs	Wanaruah Land Council
Peter Eason	Australian Mining Services International P/L
Brian Carter	Singleton Council
Daryl McGregor	DLM Environmental Consultants

## **2. APOLOGIES**

<b><u>Name</u></b>	<b><u>Organisation</u></b>
Ian Burton	NSW Office of Water
Mitchell Bennett	DECCW
Philippe Porigneaux	NSW Health – Hunter New England Region
Gary Thompson	Singleton Council Director Assets & Facilities
Mark Ihlein	Singleton Council, Director Planning & Regulations

## **3. WELCOME**

Cr John Martin welcomed everyone to the IWCM Project Reference Group Meeting

## **4. OBJECTIVES**

- to understand the IWCM Process
- to review Singleton's water supply, sewerage and stormwater systems
- to review and discuss IWCM Issues
- to raise, discuss and consider additional Issues
- to identify and discuss possible solution options.

## **5. AGENDA**

- Introduction, Welcome and Apologies –Cr John Martin, Singleton Council
- Outline of IWCM Process – Daryl McGregor, DLM Environmental Consultants
- Purpose of Meeting and PRG Role – Daryl McGregor, DLM Environmental Consultants
- Overview of Water Supply, Sewerage and Drainage Systems – Brian Carter, Manager Water and Waste Projects, Singleton Council
- Council's Obligations as LWU – Daryl McGregor, DLM Environmental Consultants
- IWCM Issues and Data Gaps – Facilitated by Daryl McGregor, DLM Environmental Consultants
- Discussion
- Close

## **6. ROLE OF PRG**

The role of the Project Reference Group in the IWCM process was explained by Daryl McGregor of DLM Environmental Consultants, namely:

- ❖ Provide input on all existing and potential issues that affect the community relating to provision of the urban water service over the next 30 years;
- ❖ Help identify suitable options for managing these issues;
- ❖ Evaluate and compare scenarios built from mixes of options on the basis of their social, environmental and economic impacts;
- ❖ Review the evaluation and comparison of scenarios in the IWCM Strategy in order to determine the preferred scenario to recommend for adoption and implementation by the water utility.

## **7. SINGLETON'S WATER SUPPLY, SEWERAGE AND STORMWATER SYSTEMS**

Brian Carter (Singleton Council) gave an overview of Singleton's water supply, sewerage and drainage systems and options that may be available to Council:

- Water for the town area of Singleton is via pipeline from Glennies Creek Dam. The Water Treatment Plant is in close proximity to the town.
- Water is piped to surrounding villages and Mt Thorley Industrial Estate.
- Jerrys Plains is on town water, with water being taken from the Hunter River which has been treated, through an arrangement with Macquarie Generation.
- A decision from Council is required to determine if Bulga and Camberwell will be connected to town water.
- Council has a high security licence to supply water to the town. The licence is 5000 megalitres per annum. Currently Council does not use all the allotment and it is not envisaged that even with the growth of Singleton over the next 30 years that Council will need more than 5000 megalitres per annum.
- Council has a ground water licence that is used for Parks eg. James Cook Park and Civic Centre.

- Council operates some business type activities where water is pumped to Mt Thorley and water is sent to several mines using their water licences. This activity has nothing to do with town water and therefore cannot be incorporated in the IWCM.
- Preliminary talks have been held with Hunter Water Corporation looking at long term options of interconnection of water sharing. Currently Council has a pipeline out to Mitchell Line Road and the Golden Highway, next to Hunter Water Corporation supply boundary.
- The Sewage Treatment Plant operates under an EPA licence. The Plant is reaching capacity and will soon be upgraded.
- A study has been completed considering the cost and feasibility of providing sewer services to villages and Mt Thorley industrial area. A Council decision is now required to determine if these services will be provided.

A discussion took place on the use of treated water used for irrigation by farmers along Doughboy Hollow and if there would be a reduction in water allocation to farmers once the new golf course was built or any other reuse of treated waste water occurred. Cr John Martin stated that Council had resolved that existing customers would still continue to be supplied a reasonable quantity of water, however solutions were under consideration which would use this water more efficiently and eliminate losses in evaporation and soil infiltration.

Grey Water Systems are not currently used by many residents in the local government area. Brian Carter advised that stringent controls are required and this would be one of the options to be looked at by Council.

Discussion took place on the viability of a second recycled water reticulation system around the town. Brian Carter stated that it would be a major cost to Council and that some of the older parts of the town would not be suitable. Again this is an option that would be considered by Council.

Stormwater harvesting was discussed and the viability of doing this for Singleton was considered. The interception and reuse system developed by Orange Council was discussed.

## 8. OUTCOMES

General definitions applicable to IWCM were presented and discussed, namely:

- **IWCM:** Integrated Water Cycle Management
- **TARGETS:** Are obligations which a Local Water Utility (ie. Singleton Council) must meet (eg. public health, environmental, levels of service provided to community (community objectives), contracts, standards etc
- **IWCM ISSUES:** Identified system problems and/or non-compliance with Targets. Some Issues that are identified in the evaluation process are not the responsibility of the Local Water Utility (defined as Non-IWCM Issues in the Table of Outcomes on Page 4) and these are referred to the relevant organisation (eg. CMA, Council (in the case of stormwater drainage, for example), etc)
- **DATA GAPS:** where information needed to determine Targets & Issues is not available from the Local water Utility
- **DEALING WITH ISSUES:** If the Issues can be dealt with by Business as Usual actions (these must be existing, formally committed actions or works; or formally adopted by resolution of Council as matters Council WILL attend to and a budget amount has been made available for) then there are no other actions required.

If BaU does not address the Issues, then Council will be required to proceed to develop a FULL IWCM Strategy (either a Simplified Plan or Detailed Plan).

The **Outcomes** from the Project Reference Group (PRG) Meeting held on 3 June 2010 are included in the tables below:

## 8. OUTCOMES (CONT'D)

### A: IWCM Issues

	Issue	IWCM Issue	Non IWCM	Non-Urban Issue	BaU	Possible Solutions to IWCM Issues Raised
1.	<u>Catchment Perspective: Population Growth</u> Increasing customer base resulting in increases in water consumption & wastewater generation over the next 30 years.	Y	-	-	N	Extend planning beyond 30 years. Consider sensitivity scenarios
2.	<u>Geology &amp; Soils</u> Potential for urban salinity with potential impacts on water & sewerage infrastructure.	Y	-	-	N	Survey & investigation required
3.	<u>Geology &amp; Soils</u> Potential for groundwater recharge and/or pollution from septic tank systems and leaking wastewater lagoons.	Y	-	-	Y	
4.	<u>Geology &amp; Soils</u> Potential gully & stream erosion	Y	Y		-	Refer to CMA & singleton Council
5.	<u>Land Use</u> High current & future water consumption by the mining industry, with potential demand impacts on the water resource	Y	-	Y	-	Refer to State Government. Need to consider the impact of discharges to the River
6.	<u>Sewerage to Villages</u> Four Villages (Broke, Jerrys Plains,	Y	-	-	N	Studies complete – awaiting Council decision



	Issue	IWCM Issue	Non IWCM	Non-Urban Issue	BaU	Possible Solutions to IWCM Issues Raised
	Bulga & Camberwell are not sewered.					
7.	<u>Levels of Service</u> Relevance of current Levels of Service (framed in 1998). Implementation of industry standard LOSs	Y	-	-	N	Council to adopt new Levels of Service
8.	<u>Land Uses</u> Non-compliances with Licences issued by DECCW under the Protection of the Environment Act, 1997.	Y	-	?	-	Refer to DECCW & Council
9.	<u>Urban Water Systems</u> Non-compliances with DECCW (EPA) STP Licence.	Y	-	-	Y	New STP to be constructed – approved by Council & budgeted for Non-compliances are insignificant
10.	<u>Trade Waste Policy</u> Current Trade Waste Policy not in accordance with revised (2009) Guidelines	Y	-	-	N	Policy to be updated
11.	<u>Sewerage Asset Condition</u> Condition of sewerage infrastructure	Y	-	-	Y	Financial management plan has been adopted by Council which addresses sewerage infrastructure replacement/refurbishment. Asset condition assessments completed. Council to provide appropriate budget.
12.	<u>Climate Change Aspects</u> Council endorsed strategy for managing potential climate change impacts. Assessment of “secure yield” of existing	Y	-	-	N	Ensure Drought Plan actions implemented and Demand management targets are met. Monitor “secure yield” studies

	Issue	IWCM Issue	Non IWCM	Non-Urban Issue	BaU	Possible Solutions to IWCM Issues Raised
	water source (Glennies Creek Dam).					
13.	<u>Water Quality</u> Non-compliance with total coliforms and fluoride concentrations in the Singleton water supply.	Y	-	-	Y	Corrective actions taken – sampling methods enhanced
14.	<u>Water Quality</u> Non-compliances with lead concentrations in the Jerrys Plains water supply.	Y	-	-	Y	No longer an issue
15.	<u>Water Quality</u> Development of a Water Quality Management Plan in accordance with the Australian Water Quality Guidelines.	N	-	-	Y	Water Quality Plan being drafted and planned completion by December 2010
16.	<u>TBL Performance Reports</u> <u>Water Supply</u> - customer interruption frequencies - average annual water supplied to customers - water losses - residential revenue from usage charges <u>TBL Performance Reports</u> <u>Sewerage</u> - average length interruptions	Y	-	-	Y	Singleton applying a continuous improvement approach to performance
17.	<u>Legislative Requirements</u> Fluoridation of Jerrys Plains water supply	N			-	Not an issue for the community. High natural levels of fluoride in the water.
18.	<u>Other Compliance Aspects</u> Development of a water recycling policy Potential for reuse of biosolids	N N	-	-	-	Not considered as issues by the PRG

**B: Issues Raised by PRG**

Issue	IWCM Issue	Community Preference	BaU	Possible Solution
19. Use of Town water supply by new/large industries	Y	Y	Y	Council can & does require new industries to purchase water entitlements on the market
20. Collection of Source Water <ul style="list-style-type: none"> <li>rain/stormwater</li> <li>ground water</li> </ul> - incentives by Council	Y	Y	Y	Incentives are currently provided by Council to install rainwater tanks
21. Aquifer recharge in Valley for wetlands.	Y	Y	N	To be considered when action plan developed under IWCM Strategy
22. Water restrictions – uniformity required & restrictions tied to water licences of other users	Y	Y	Y	Drought Plan makes full provision for implementation of water restrictions

## **9. MAJOR ISSUES**

The following were identified as the major issues facing the Singleton LWU:

- ❖ Security of Water Supply in the face of potential impacts of climate change;
- ❖ Age & condition of existing sewerage infrastructure
- ❖ Potential servicing impacts of growth in the Shire

The Meeting closed at 2.45 pm

# APPENDIX H

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## GLOSSARY & ABBREVIATIONS

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### 9.1.1 GLOSSARY

This Glossary contains terms included within and additional to those contained in the text.

<b>Acid sulphate (sulfate) soils</b>	<p>Includes acid sulphate soils and potential acid sulphate soils.</p> <p>Acid sulphate soils contain highly acidic layers resulting from the aeration of materials that are rich in iron sulphates. This oxidation produces hydrogen ions in excess of the capacity of the sediment to neutralise the acidity resulting in soils of pH of 4 or less when measured in dry season conditions.</p>
<b>Alluvial</b>	<p>Deposited by rivers in low-lying areas and flood plains.</p>
<b>Aquifer</b>	<p>A layer of rock or sediment that allows water to move through it and from which water can be extracted. Confined aquifers have a layer of rock or clay above them, which is impermeable to water.</p>
<b>Basix</b>	<p>A planning tool developed by the NSW Government used by development applicants to measure their compliance with environmental guidelines covering water and greenhouse gas efficiency and other related building aspects. Required for building (and renovation) approval.</p>
<b>Best Practice</b>	<p>An industry standard recognising the most effective management methods of the time.</p>
<b>Biodiversity</b>	<p>The variety of life forms, the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form.</p>
<b>Capital works program</b>	<p>A schedule of planned capital expenditure, normally over a period of thirty years for water supply and sewerage businesses.</p>
<b>Catchment</b>	<p>The area of land drained by a river and its tributaries.</p>
<b>Colluvial (deposits)</b>	<p>Deposits of loose material that have been carried by gravity and are usually found at foot slopes of hills.</p>
<b>Dissolved oxygen</b>	<p>The concentration of oxygen which is dissolved in water and compared with oxygen 'saturation' at a particular temperature.</p>
<b>Dual reticulation</b>	<p>The provision of reclaimed water through a second set of pipes for non-potable uses, in addition to potable water through the first set of pipes.</p>
<b>Electrical conductivity</b>	<p>The most widely used and convenient method of measuring the salinity of water is by electrical conductivity. One measure of electrical conductivity is 'micro-Siemens per centimetre'. The shorthand expression for this is the 'electrical conductivity unit', 'EC unit' or just 'EC'.</p>

<b>Faecal coliform</b>	A type of bacteria found in the faecal material of humans and other mammals that is an indicator of faecal pollution.
<b>Floodplain</b>	Flat land beside a river that is inundated when the river overflows its banks during a flood.
<b>Fractured rock strata</b>	These occur in rocks eg slate, phyllite and basalt, and allow water to move through broken joints, bedding planes or faults.
<b>Geology</b>	Science of learning about the earth: its origin, structures, composition, historical changes and processes.
<b>Greywater</b>	Water from a household, excluding toilet water.
<b>Groundwater</b>	Water beneath the surface held in or moving through saturated layers of soil, sediment or rock.
<b>Ground water flow system</b>	The term ground water flow system (GWFS) refers to the underground extent of a hydrological system, including places that water enters, is transmitted, stored and departs. It also refers to the particular physical attributes of that system, including geophysical characteristics, geology, regolith and topography.
<b>Hydrogeology</b>	The science pertaining to ground water in or moving through soils and rock formations and the transport of materials that are either in suspension or dissolved in the water.
<b>Landscape</b>	An area of land and its physical features. A term that we use to describe an area that has common features. For example Leeton Shire may be in a range of landscapes, depending on whether we are looking at the type of agricultural production, vegetation or landforms.
<b>Local water utility</b>	The water supply and sewerage businesses of a local council.
<b>Nutrients</b>	A source of nourishment. Key nutrients in wastewaters are phosphorus and nitrogen.
<b>Piezometer</b>	A tube inserted into an aquifer to measure the ground water. When the ground water is under pressure the piezometer measures the hydraulic head or level.
<b>Permeability</b>	The capacity of a substance (for example, soil or rock) to allow water to pass through it. Sand, for example, is said to have high permeability.
<b>Potable water</b>	Water of a standard fit to drink.
<b>Rainwater tank</b>	Storage tank for collecting rainwater from the roofs of buildings.
<b>Recharge</b>	Water that infiltrates through the soil surface to the watertable.



<b>Recharge area</b>	The area where water can enter and move downward to the ground water.
<b>Reuse</b>	The use of treated sewage effluent or treated stormwater to replace the use of potable water.
<b>Runoff</b>	The proportion of rainfall that flows across the ground surface, generally to enter drainage lines.
<b>Salination</b>	The process by which land becomes salt-affected or salinised.
<b>Salinised land</b>	Land affected by salinity.
<b>Salinity</b>	The concentration of salts in land and water, usually expressed in EC units.
<b>Salinity hazard</b>	Factor that contributes to salinity risk.
<b>Salinity risk</b>	When applied to a catchment refers to a subcatchment the relative risk of land salinisation, or saline discharge of a concentration that is high in comparison with the rest of the catchment or adjacent catchments.
<b>Salt concentration</b>	Level of salts on the land surface or in soil, rocks or water.
<b>Salt load</b>	The amount of salt carried in water flow in rivers, ground water or off the soil surface, in a given time period.
<b>Sewage</b>	The used water supply of a community including water-carried waste matter from homes and businesses.
<b>Sewage treatment plant</b>	A facility to treat sewage to produce treated effluent and biosolids.
<b>Sewerage</b>	Drainage system for taking sewage away from the community to a sewage treatment plant.
<b>Soil profile</b>	A vertical section of earth from the soil surface to parent rock material that shows the different soils horizons.
<b>Stormwater</b>	Rain water that flows over hard surfaces in urban areas and is collected in drainage systems for disposal.
<b>Stormwater detention</b>	Holding stormwater on-site for a period of time before releasing it downstream.
<b>Stormwater retention</b>	Keeping stormwater on-site for reuse.
<b>Subsoil</b>	The layer of soil below the topsoil, generally deeper than 10cm.
<b>Surface water</b>	Water on the surface of the land, for example in rivers, creeks, lakes and dams.

<b>Suspended solids</b>	The smaller, lighter material such as clay, silt and fine sand carried in suspension in water.
<b>Topsoil</b>	The surface or upper level of soil, generally within 10cm of the surface.
<b>Topography</b>	The detailed description and analysis of the features of a relatively small area, district or locality.
<b>Typical residential bill</b>	The annual bill paid by a residential customer that is not a pensioner or the owner of a vacant block.
<b>Water balance</b>	A state of equilibrium when rainfall or irrigation water in a landscape is accounted for by the sum of runoff, plant water use, evaporation, recharge and changes in soil moisture content.
<b>Water demand</b>	The water needs of a town including homes, businesses and public organisations.
<b>Water table</b>	The watertable is the upper surface of ground water. The soil profile is fully saturated below the watertable and unsaturated above it.
<b>Water quality</b>	The biological, chemical and physical properties of water.
<b>Water supply</b>	The available water sources, water extraction, storage, transfer and treatment systems to supply town water.
<b>Water treatment plant</b>	A facility to treat raw water to a potable water quality.
<b>Wastewater</b>	<i>See sewage.</i>
<b>Weathering</b>	Chemical, physical and biological decomposition of rocks. This can result in the formation of a soil profile.

**ABBREVIATIONS**

a	Annum
ABS	Australian Bureau of Statistics
ADWG	Australian Drinking Water Guidelines
ARI	Average Recurrence Interval
BASIX	Building Sustainability Index
BOD	Biological Oxygen Demand
BPM	Best Practice Management
c	Centigrade
CAP	Catchment Action Plan
Cfu/100 mL	Number of colony forming units per 100 millilitres
CMA	Catchment Management Authority
cm	Centimetre
COAG	Council of Australian Governments
CTWS&SP	Country Towns Water Supply and Sewerage Program
d	Day
DA	Development Application
DCP	Development Control Plan
DEC	Department of Environment & Conservation
DECC	Department of Environment & Climate Change
DECCW	Department of Environment, Climate Change & Water
DEUS	Department of Energy, Utilities & Sustainability
DIPNR	Department of Infrastructure, Planning & Natural Resources
DLG	Department of Local Government
DLWC	Department of Land and Water Conservation

DNR	Department of Natural Resources
DWE	Department of Water and Energy
EC	Electrical Conductivity
E coli	Escherichia coli
EIP	Environmental Improvement Program
EP	Equivalent person
EPA	Environmental Protection Authority
ET	Equivalent Tenement
FSC	Forbes Shire Council
GL	Gigalitre
GMA	Groundwater Management Area
GWMP	Groundwater Management Plan
ha	Hectare
IWCM	Integrated Water Cycle Management
kg	Kilogram
KPI	Key Performance Indicator
KRA	Key Result Area
kL	Kilolitre
kW	Kilowatt
L	Litre
LEP	Local Environmental Plan
LGA	Local Government Area
LWU	Local Water Utility
mg/L	Milligram per litre
MI	Murrumbidgee Irrigation
mL	millilitre

ML	Megalitre
mm	Millimetre
NFR	Non Filterable Residue
NPV	Net Present Value
NPWS	National Parks & Wildlife Service
NSW	New South Wales
NTU	Nephelometric Turbidity Unit
OH&S	Occupational Health and Safety
pa	Per annum
POEO	Protection of the Environment Operations Act, 1997, NSW
PRG	Project Reference Group
PRP	Pollution Reduction Program
PWWF	Peak Wet Weather Flow
REP	Regional Environmental Plan
RTA	Roads and Traffic Authority
RWPS	Raw Water Pumping Station
s	Second
SBP	Strategic Business Plan
SEPP	State Environmental Planning Policy
SMP	Stormwater Management Plan
SOE	State of the Environment Report
STP	Sewage Treatment Plant
TBL	Triple Bottom Line
TDS	Total Dissolved Solids
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids

µg	Microgram
µS	Microsiemen
UFW	Unaccounted For Water
WFP	Water Filtration Plant
WQO	Water Quality Objectives
WSP	Water Sharing Plan
WSUD	Water Sensitive Urban Design
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
yr	Year