Integrated Water Cycle Management Plan

Evaluation Study

VOLUME 2 – APPENDICES

Technical & Supporting Information

April 2010

DLM Environmental Consultants Pty Ltd
Strategies for a Water Efficient Future

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APPENDIX A

URBAN WATER SERVICES IN GRIFFITH

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1. GENERAL

Griffith City Council covers an area of 1,600 square kilometres and is located in the Murrumbidgee Irrigation Area (MIA).

The City of Griffith itself has a population of nearly 16,000 and is located in the Riverina region of NSW, 570 kilometres by road from Sydney. Some small towns and villages within the City are Yenda, Bilbul, Yoogali, Widgelli, Lake Wyangan, Hanwood, Beelbangera, Tharbogong and Warburn.

Water Supply

Griffith City Council provides water supply services to a population of 22,000 (9,540 assessments), with potable supplies from the Griffith and Yenda Water Treatment Plants.
Raw water supply for the City is provided by Murrumbidgee Irrigation's Main Northern Canal.
Water from the Canal is delivered to a 300 ML in ground storage (Hayes Lease Lagoon) for supply to the Griffith Filtration Plant and to an18 ML storage at the Yenda Plant.

Council also operates a raw water supply system for use on Council owned parks and gardens, schools, golf course and airport irrigation at Griffith.

Yenda has a full dual supply to the residential and business area of the village

The potable water supply system comprises:

- Griffith WTP (Dissolved Air Flotation): Capacity: 60 ML/d
- Yenda WTP (Microfiltration): Capacity: 2 ML/d
- 4 Service Reservoirs (Capacity: 55 ML)
- 1 Pump Station (Capacity: 63 ML/d)
- 50 Kms of transfer and trunk supply mains
- 433 Kms of trunk reticulation mains.

Sewerage

Council provides sewerage services to a population of 21,000 (7,790 Assessments) in Griffith, Yenda and Bilbul.
There are three (3) Treatment Plants:

Griffith STP:

- Trickling Filter (Secondary Treatment)
- Built in 1992
- Capacity: 65,000 EP

Note: As required by the PRP issued by DECCW, Council is building a new treatment plant, which will use MBR technology to replace the existing plant (capacity of new Plant: 65,000 + EP biological capacity). (The current peak biological load is approximately 24,000 EP which is a

direct result of efforts to reduce the trade waste loads. Stage 1 of the new plant has been designed to provide spare capacity for a minimum of 10 years).

Yenda STP:

- Oxidation Ponds, mechanically aerated
- Built in 1981
- Capacity: 34,000 EP

Bilbul STP:

- Oxidation Pond
- Built in 1990
- 310 EP Capacity

The Griffith and Yenda STPs discharge to Main Drain J, which drains to Mirrool Creek. Bilbul STP discharges to evaporation lagoons.

The overall sewerage system also comprises:

- 29 Pumping Stations (Capacity: 13 ML/d)
- 54 kms of Rising Mains
- 169 kms of Gravity Trunk Mains and Reticulation.

Biosolids Management

Biosolids from the three (3) plants are disposed of via landfill adjacent to the plants.

Council has significant land areas available and will continue to use these areas as the most economical means of disposal.

Potential Issue: Should Council develop a long term strategy for beneficial reuse of biosolids generated by the STPs?

2. CATCHMENT PERSPECTIVE

a. Location

Griffith LGA is located on the flat and expansive riverine plains in the central south of New South Wales.

The City itself is surrounded by irrigated farm lands and its primary role is, therefore, as an industrial and commercial centre for the Murrumbidgee Irrigation Area (MIA).

The locations of the principal towns in the Griffith LGA are shown in Figure A1 below. A satellite image of the area is presented in Figure A2(a). Figure A2(b) shows Griffith in relation to the Murrumbidgee River system, with the locations of Burrinjuck and Blowering Dams, various weirs and Barren Box Swamp.

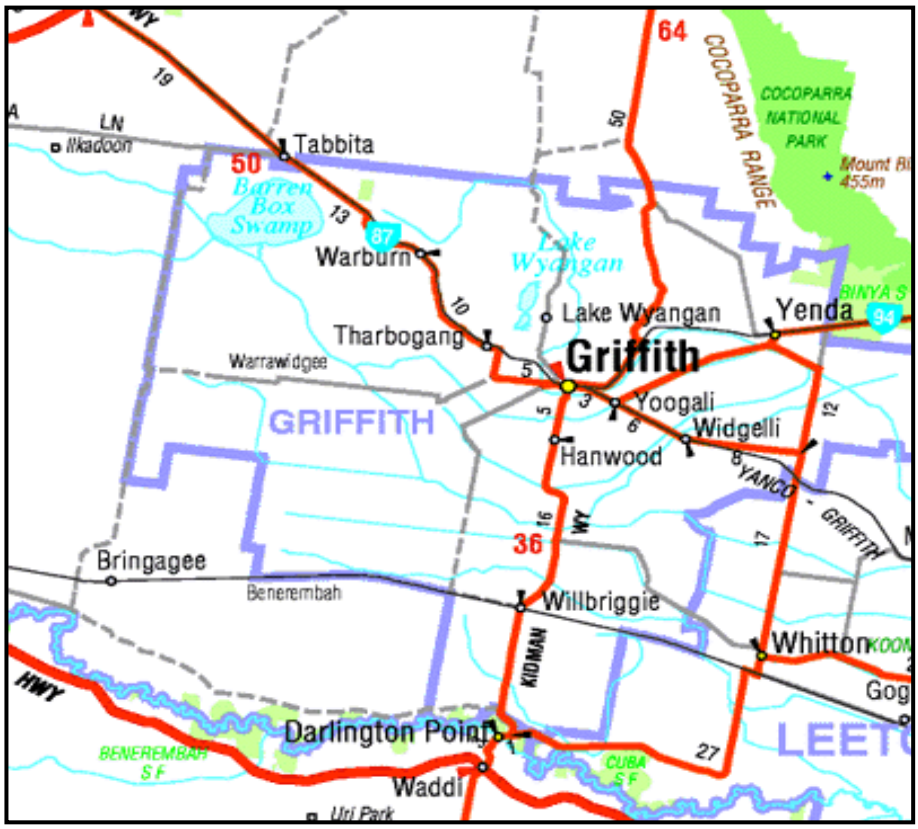

Figure A1: Principal Towns in Griffith LGA

Figure A2(a): Satellite Image of Griffith

(Source: Google Earth)

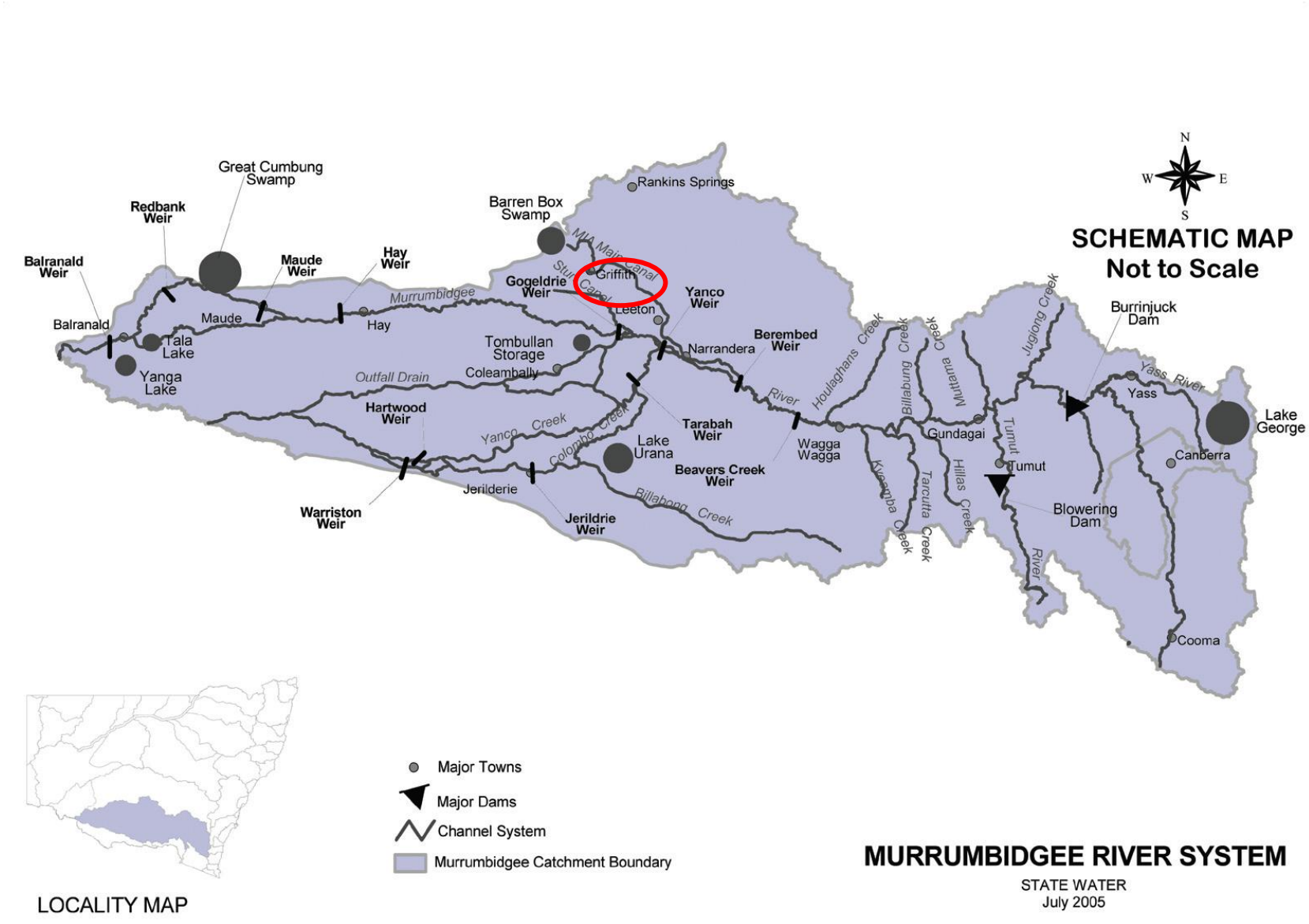

Figure A2(b): Griffith in Relation to the Murrumbidgee River System

- **Climate**

Key climate characteristics for Griffith are summarised in Tables A1 below:

Table A1: Climate by Month (1909 to 2009)

Month	Mean Daily Maximum Temp. ^{o}C	Mean Daily Minimum Temp. ^{o}C	Mean Monthly Rainfall mm	Daily Evaporation mm
January	31.6	16.3	29.2	8.7
February	31.3	16.4	27.8	8.0
March	28.1	13.6	34.4	6.0
April	22.9	9.4	33.0	3.5
May	18.4	6.4	37.8	2.0
June	14.8	4.0	37.2	1.4
July	13.9	2.9	33.2	1.6
August	16.2	4.0	40.9	2.3
September	19.6	6.0	32.5	3.4
October	23.2	9.1	41.3	4.9
November	27.0	11.9	28.5	7.1
December	30.1	14.7	30.7	8.1
Annual	23.1	9.6	406.0	4.8

(Source: Bureau of Meteorology)

The climate in Griffith is seasonally consistent across the region.

Generally, summers are hot and winters are mild to cold, although extreme frosts in the winter months are not uncommon.

January and February are the hottest months with mean daily temperatures varying from 16.3^{o}C to 31.6^{o}C.

July is the coldest month, where mean temperatures vary from 2.9 ^{o}C to 14.3 ^{o}C.

Rainfall throughout the year is low; with a mean annual rainfall of 406 mm. Rainfall is also reasonably consistent across the LGA, similar to temperature variability; with annual rainfall increasing slightly to the south. Long term average annual rainfall in Narrandera is 469 mm and in Griffith 432 mm. Annual evaporation exceeds annual rainfall by more than 1300 mm.

Since 1997/98, the region has been experiencing extreme drought conditions. This is reflected to some extent in Table A2 below, which compares the long term average rainfall with that for 2008. Rainfall over this period has been only 86% of average.

Table A2: Rainfall Comparison –2008 to Long Term Averages

Recent Rainfall		**Long Term Average**	
Year 2008	**Monthly Rainfall (mm)**		**Monthly Rainfall (mm)**
January	51.6	January	29.2
February	18.2	February	27.8
March	8.4	March	34.4
April	24.2	April	33.0
May	9.0	May	37.8
June	34.0	June	37.2
July	29.8	July	33.2
August	20.8	August	40.9
September	22.0	September	32.5
October	20.2	October	41.3
November	6701	November	28.5
December	45.8	December	30.7
Totals	**351**		**406.0**

(Source: Bureau of Meteorology)

c. Population Growth & Development

The total population of the City, as reported by the 2006 Census, was 23,799– an increase of 0.5% (115people) since the 2001 Census (Refer Table A3 below)

The City of Griffith itself had a population of 15,826, compared with 16,004 in 2001 – a decline of 1.1% (or 0.2% pa on average). Interestingly, although there has been a reported decline in population, ABS reports a growth of 3.8% in dwellings in Griffith (0.8% pa).

Table A3: Griffith Population – Census Results for 2001 & 2006

Location:	Population 2001 Census:	Population 2006 Census
Griffith **LGA**	23,684	23,799
Griffith **City**	16,004	15,826

Source: ABS 2008

Additional details include:

- The population of the Griffith LGA in 2006 was approximately 0.12% of Australia's national population
- Even gender distribution within the region: 11,904 males to 11,895 females
- Above average proportion of indigenous persons: 3.8% (Griffith); 2.3% (National)
- Median age of persons just below average: 35 (Griffith); 37 (National)
- At least three quarters of Griffith residents were born in Australia and only speak English at home. Italian was the second most represented language (10.9%) and ethnicity (5.9%) in Griffith.

In 2008, Council engaged McCrindle Research to carry out a demographic analysis of the Griffith LGA. (Reference: McCrindle Research, October 2008, Griffith Land Use Strategy: *Demographic Analysis of the Griffith LGA)*
The aim was to predict growth trends over a 25 to 30 year timeframe.
The McCrindle report assessed the net undercount rate for the 2006 Census was approximately 2.4%, yielding a "true" population for the Griffith LGA of between 24,110 and 24,372 utilising Series B data from the ABS population projections document (ABS, Population Projections, Australia, 2006-2010). McCrindle's estimated the population of the LGA would be:

Year

- 2033 34,905
- 2038 36,587

These growths represent a growth rate of approximately 1.4% pa, which seems somewhat optimistic.

Council has since adopted an annual growth rate of 0.7% pa for its planning purposes. The population projections presented in Table A4(1) below are based on Council's currently adopted growth rates for planning purposes.

Table A4(1): Population Projections for Griffith (assuming growth at 0.7%pa)

	2006 Census	2011	2016	2021	2026	2031	2036	2041
Griffith **LGA**	23,799	24,644	25,519	26,425	27,362	28,333	29,339	30,380
Griffith **City**	15,826	16,388	16,970	17,572	18,196	18,842	19,510	20,203

The NSW Department of Planning's projections for population growth in the Murrumbidgee Region (NSW State and Regional Population Projections, 2006 – 2036, Department of Planning, 2008) include:

- a population growth rate of 7% over the 30 year period (2006 – 3036)
- the percentage of people aged 65 and over is expected to rise from 14% in 2006 to 25.2% in 2036
- population growth rates lower than NSW as a whole (not explained).

The most recent DoP population projections for the Griffith LGA (DoP, 2008) are presented in Table A4(2) below:

Table A4(2): DoP Population projections for Griffith LGA

Griffith	2006	2011	2021	2026	2031	2036
LGA	24,900	25,900	27,700	28,400	29,000	29,500

These projections are below those of McCrindle but very close to those adopted by Council and presented in Table A4(1) above.
It is considered appropriate that Council revisit and review population projections after the 2011 Census.

Potential Issue: Determination of growth rate for Griffith.

d. Topography

Griffith is located in the Murrumbidgee Catchment on the boundary between the Mid-Murrumbidgee section and the Lower Murrumbidgee section (Refer Figure A3 below). The topography is generally characterised as *Riverine Plain.*

The Murrumbidgee River originates on the edge of the Great Dividing Range in the Kosciusko National Park, south east of Tumut. The river system drains 84,000 km^2 and is a major tributary of the Murray-Darling River system.
Burrinjuck Dam divides the upper and lower catchments where the river flows through a narrow gorge. The valley begins to widen from near Gundagai into alluvial plains; and then continues westward to its junction with the Murray and Lachlan Rivers. Yanco Creek is a major effluent stream which joins Billabong Creek.

Five broad geographic regions have been identified which are further subdivided into a total of 62 catchments.

Griffith is located within the Riverine Plains which stretch west from Narrandera some 306 kilometres to the junction with the Murray.

The plains are very flat, with an average fall of 0.02% to the west. The Plains have a general slope away from the River to the North West and South West, which has enabled the development of large irrigation areas.

Below Narrandera, Yanco Creek breaks away from the main river to the south and forms the beginning of a large effluent system which runs between the Murray and Murrumbidgee Rivers.

In Griffith the topography is generally flat, being located on the north eastern edge of the Riverine Plain.

e. Geology, Soils & Physical Characteristics

Geology

The Lower Murrumbidgee is located within the Murray Basin, a geological area that covers 300,000 km^2 of south eastern Australia. The Murray Basin is essentially a closed system, which is saucer shaped and consists of bedrock that has been filled with fluvial and marine sediments over time. These semi-consolidated, flat sedimentary deposits have a maximum thickness of approximately 300 -350 metres in the Lowbidgee area, 320 metres in the Hay area, 200 – 300 metres in the Coleambally area and 300 metres in the Griffith/Wah Wah area.

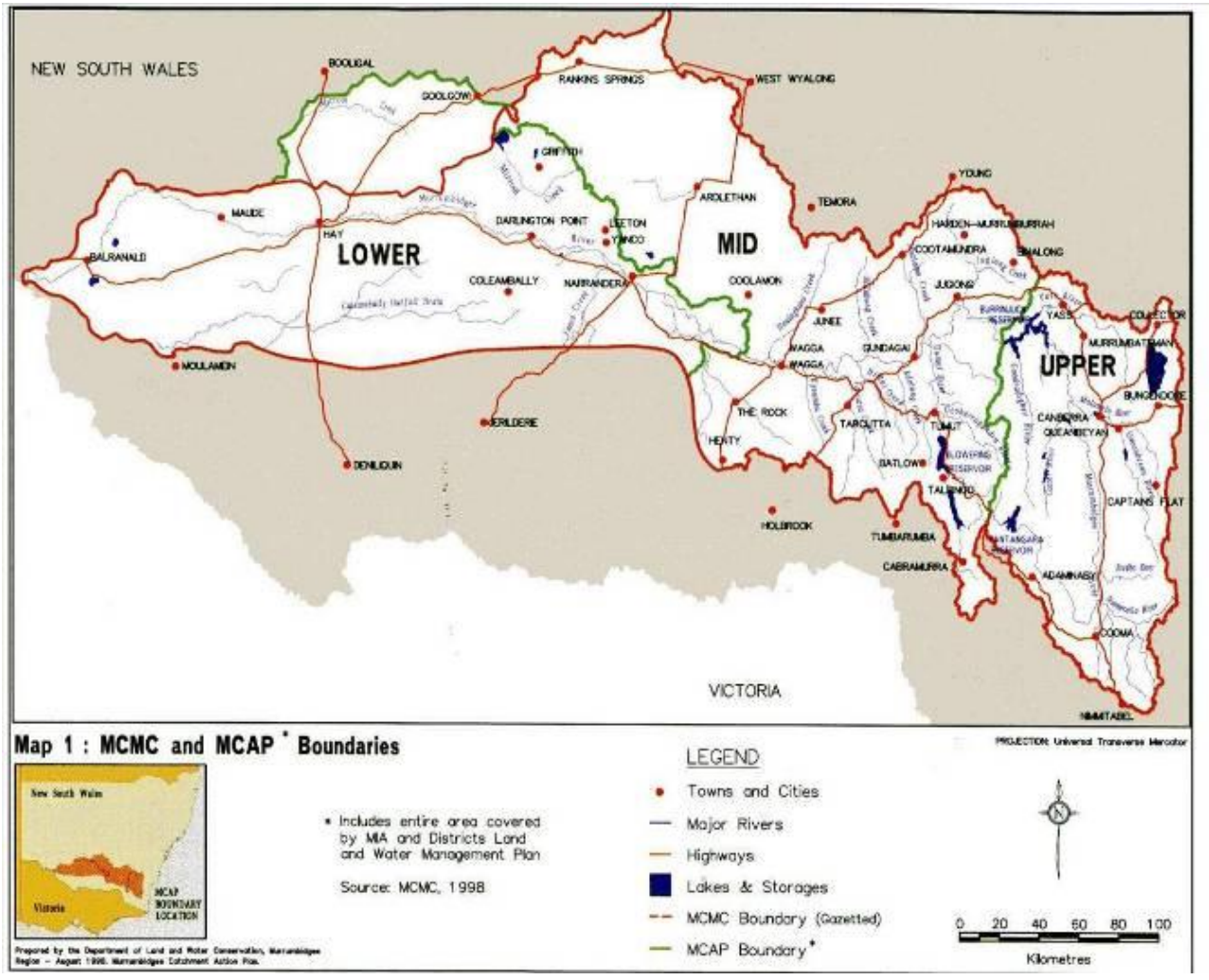

Figure A3: Murrumbidgee Catchment

(Source: Murrumbidgee Catchment Action Plan)

The western part of this basin is known as the Mallee region and the eastern part is commonly referred to as the Riverine Plain.

The Riverine Plain accounts for the majority of the Lower Murrumbidgee and the sediments that form the underlying soil structure have 3 distinct layers, based on their physical composition and the time of deposition. These layers are referred to as: the Renmark, the Calivil and the Shepparton formations.

All three comprise sand, silt and clay and they each contain a number of groundwater aquifers.

The deeper Renmark and Calivil formations are recharged from the basin margins and from the Murrumbidgee River and flow westerly. The Shepparton formation is significantly recharged from rainwater and irrigation leakage from the entire Riverine Plain. It also flows in a westerly direction. The aquifers within the Shepparton formation are particularly important in terms of rising water tables and salinity (including urban salinity) throughout the Lower Murrumbidgee.

Griffith is on the boundary between the Palaeozoic massif of eastern Australia and the Cainozoic deposits of the Murray Basin. The City is underlain by bedrock which is defined as Devonian conglomerates, quartzites and sandstone. The surrounding plain consists of Pleistocene fluvial and Aeolian sediments.
(The geology of the Lower Murrumbidgee is shown in Figure A4)

Soils

Soil materials and properties reflect the geology, climate and topography of the catchment. Soil types vary significantly across the lower Murrumbidgee.

Solonised brown soils extend west and south east of Balranald and are characterised by large amounts of calcareous material. These soils are particularly vulnerable to wind sheeting and wind drift and may form limestone scalds if erosion is severe.

Ancestral streams and floodplain complexes occur within the Lowbidgee district and along the full length of the Lower Murrumbidgee section of the River. The typical soil formation is usually entrenched one to three metres below the Plain and comprises grey/silty/clay loams.

Grey brown and red clays occur, particularly on the beds and floodplains of the Murrumbidgee River and associated creek systems. Irrigation areas of the Lower Murrumbidgee are often founded on these clay complexes. The fine texture and strong structure of these soils present a low erosion risk. Surface sealing is a problem, particularly on irrigated lands (with gypsum used to improve soil structures)

Red brown earths occur over extensive areas of the eastern Riverine Plain and cover approximately 50% of the Lower Murrumbidgee. Wind erosion and scalds are common with this soil type. They are moderately fertile with hard setting topsoils that are prone to structural breakdown. Infiltration rates and water holding capacities are typically high – they are often used for irrigation.

Red earths occur in a small area in the north east of the Lower Murrumbidgee. They generally have low organic content, low nutrient status and are susceptible to wind sheeting and gully erosion. These soils are not well suited to agriculture.

The urban area of Griffith is underlain by duplex, clay loams. Subsoils are typically medium clays, whilst topsoils usually vary from sandy loams to red – brown clay loams.

Water Storages

Major water storages that directly affect the Lower Murrumbidgee include Burrinjuck Dam (on the Murrumbidgee) and Blowering Dam (on the Tumut River).

Burrinjuck Dam was built in 1913 to supply the MIA and completion of Blowering in 1968 was intended to meet the increasing water demands in the Coleambally Irrigation Area (CIA).

The operation of the Murrumbidgee as a regulated river (to supply water for irrigation) has resulted in the flow regimes of the river being altered – with winter flows captured in storages for subsequent irrigation releases in the summer months and increased high flows in the summer months.

Regulatory structures in the Lower Murrumbidgee further influence downstream flows.

Important weirs in the system include: Berembed, Yanco, Gogeldrie, Hay, Maude, Redbank and Balranald.

Also, Barren Box Swamp, Tombullen Storage and Lake Wyangan are important storages in the system and are relied on by surrounding irrigation districts during low river flow periods.

Griffith's raw water supply is delivered from the Murrumbidgee River at Berembed Weir to Murrumbidgee Irrigation's Main Northern Canal. The upstream storages (Burrinjuck and Blowering Dams) provide a high level of security for the City's water supply.

Areas of Significance and Conservation Value

There are no National Parks in the Lower Murrumbidgee, but there are a number of State Forests, Nature Reserves, Wildlife Refuges and Experimental Regeneration Areas.

- Nature Reserves

In the eastern part of the catchment, Narrandera Nature Reserve is located along the Murrumbidgee River approximately 3 kilometres from the town. The Reserve is 71 hectares in area and comprises river red gum and yellow box forests. There is a significant koala population within the Reserve. Narrandera is approximately 30 kms to the south east of Griffith.

Except for the wetlands discussed below, there are no other Reserves near Griffith.

- State Forests

There are 35 individual State Forests in the Lower Murrumbidgee, covering approximately 43,000 km^2 and ranging in individual size from 33 hectares to 4246 hectares. They are predominantly cypress pine forests, with some river red gum forest areas.

They are managed primarily for timber production and for providing relatively undisturbed vegetation communities and habitat for fauna. Systematic grazing is practised to reduce fuel for fires.

There are problems with flooding of the forests and the introduction of a variety of weeds.
There are no State forests near Griffith.

- Wetlands

The Lower Murrumbidgee contains some of the most widely recognised and important wetlands for wildlife habitat and breeding areas. Many areas have been recognised as significant and important regionally, nationally and, even, internationally. (Fivebough Swamp and Tuckerbill Swamp, for example, are significant wetlands of importance and are both Ramsar listed)

The most widely recognised wetlands include the Lachlan/Murrumbidgee Confluence Wetlands, Tuckerbil Swamp, **Barren Box Swamp** and Fivebough Swamp (which is located just east of Griffith)

There are also wetlands along the riverine corridor which, although not as well recognised, are very significant in terms of their biological importance.
Important water bird species in the Lower Murrumbidgee include the blue-billed duck, freckled duck, magpie goose and the Australasian bittern.

- Aboriginal Heritage

Aboriginal sites and artifacts are important in that they record the culture, events and way of life of the Aboriginal people who occupied the catchment area for 40,000 years before white settlement.
Common relics found in the Lower Murrumbidgee include campsites, canoe trees and shield trees.
Shell middens have also been found along the edge of ancient and present day streams and water bodies.
Sandhills within the Lower Murrumbidgee were often used for burials. These areas are extremely important to indigenous communities and are often very fragile. They are a significant part of the natural and historical heritage of the catchment and need to be protected.

There are no known sites of significance within the Griffith LGA.

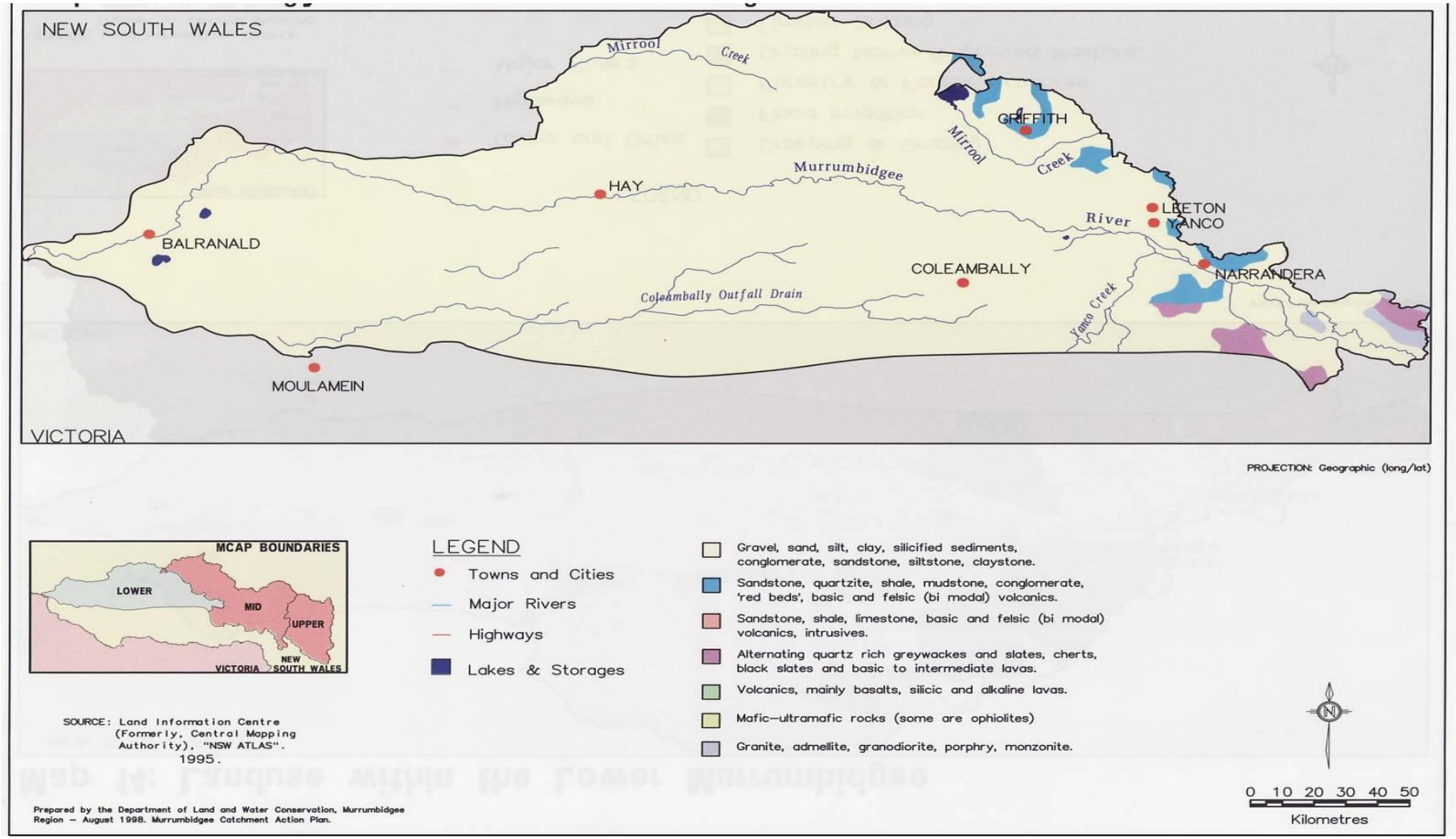

Figure A4: Geology of the Lower Murrumbidgee

(Source: Murrumbidgee Catchment Action Plan)

f. Land Use

Regional

The Lower Murrumbidgee is an area of agricultural diversity and economic prosperity. Both irrigated and dryland farming are important to the on-going viability of the region.

The main areas of irrigated agriculture in the catchment are the Murrumbidgee Irrigation Area (MIA) and the Coleambally Irrigation Area (CIA). The area also includes the Lowbidgee Flood Control and Irrigation District.

Of particular interest to this study is the MIA .A significant proportion of the entire Lower Murrumbidgee area (36,000 people) lives in the MIA and Districts. The MIA and Districts currently comprise around 3,000 agricultural holdings covering an area of 480,000 hectares.

The major irrigated activities are rice, wheat, citrus, wine grapes, peaches, vegetables, prime lambs, wool and beef cattle.

The irrigated broadacre farms comprise cropping specialists, mixed enterprise farms and a small number of livestock specialists. The majority of cropping enterprises are rice growers; although a number combine rice and wheat farming.

Dryland cropping occurs mainly on the coarser textured red earths and the solonised brown soils. Grazing is prominent in the dryland areas and often incorporates some cropping. There are some 500,000 cattle on non-irrigated properties throughout the Lower Murrumbidgee.

Grazing of sheep for wool and to a lesser extent for meat is a major agricultural activity in the Lower Murrumbidgee. The dry climate is suited to the production of fine wool; but the lack of reliable rain is a drawback for these enterprises.

Typically in the Griffith area, the principal land uses are:

- Agricultural production (grapes, vegetables, fruit, rice, wheat, chickens)
- Agricultural produce processing
- Light engineering
- Small business enterprises
- Support industries and commercial enterprises

g. Flooding

Before the construction of Burrinjuck and Blowering Dams, small or moderate floods occurred in the Murrumbidgee Catchment almost every year, following winter/spring rains. These floods would typically spill over the top of the river banks and affect the lower parts of the floodplain. Once every 10 or 12 years a major flood would cover the entire floodplain.

Building of both Dams has allowed these floods to be largely managed; thus reducing the damage to properties and agriculture. The Dams also allowed management of flows for irrigation.

Most small and moderate floods are contained in the storages. Burrinjuck Dam's capacity in proportion to its catchment area is relatively low, so it has limited capacity to contain large floods.

Blowering Dam has a greater capacity to mitigate large floods.

The impact of management for irrigation has altered the flow regimes in the catchments with resulting impacts on floodplain ecosystems.

The Murrumbidgee Valley Floodplain Management Study (Sinclair Knight Mertz, 1987) categorised flooding in the valley into 2 principal regions – the basin upstream of Burrinjuck Dam and the Murrumbidgee River downstream of Burrinjuck Dam.

At this point the River leaves the foothills and enters the broad Riverine Plain which stretches westward for 300 kilometres to the Murrumbidgee – Murray junction.

Damage caused by flooding includes loss of crops, pastures, fencing and damage to structures (channels, levee banks, roads, etc)

The regional Floodplain Management Study recommended that no floodplain management works were warranted or required for this reach.

Griffith and several of its surrounding villages are subject to flooding, mainly from the Main Drain J system. Griffith is reliant upon the irrigation drainage system, under the control of Murrumbidgee Irrigation for its drainage. Some rural areas experience flooding from the Mirrool Creek and the Little Mirrool Creek systems.

h. Murrumbidgee Catchment Action Plan

The Murrumbidgee Catchment Management Authority published its "Action Plan" in 2006, addressing four (4) Principal "Assets" (Community, Biodiversity, Water and Land) and determining the following Catchment and Management Targets:

Table A5: Murrumbidgee Resource Condition Targets to Address Specific National Targets

National Matters for Target	Murrumbidgee Resource Condition Targets
Land salinity	• By 2016 reduce the extent of dryland salinity outbreaks to 75% of 2001 levels • By 2016 lift the percentages of perennials in the pasture phase of farming systems from 10 -50%; and non-arable land from 40 – 80% • By 2016 reduce the water table level to at least 2 metres below the ground surface within 10 urban landscape
Soil condition	• By 2016 there is an improvement in the key indicators of soil health that support sustainable farming enterprises
Native vegetation	• By 2016 there is an increase in the area of terrestrial native vegetation classes of the Murrumbidgee Catchment managed for biodiversity conservation
Inland aquatic ecosystems	• By 2016 the extent (hectares), diversity, condition and connectivity of inland aquatic ecosystems are increased
Nutrients in aquatic environments	• By 2016 there is an improvement in the key indicators of soil health that support sustainable farming enterprises • By 2016 predicted annual average suspended sediment levels in the Murrumbidgee River are reduced by 15%
Turbidity/suspended particulate matter in aquatic environments Surface water salinity	• By 2016 there is an improvement in the key indicators of soil health that supports sustainable farming enterprises • By 2016 predicted annual average suspended sediment levels are reduced by 15% • By 2016 river salinity at Balranald is less than 245 EC for 50% of the time and less than 320 EC for 80% of the time
Ecologically significant invasive species	• By 2016, by using a coordinated approach, the distribution of priority environmental pest animals within the Murrumbidgee Catchment will be restricted • By 2016, by using a coordinated approach, high priority areas affected by priority environmental weeds, including feral native plant species, will be treated within the Murrumbidgee Catchment

All of the key issues in the CMA's Action Plan (particularly those relating to storm water drainage systems, erosion, management of the floodplain, management of wetlands,

revegetation, sediment transportation reductions and salinity reductions (particularly in relation to urban salinity) and water use efficiency gains will all need to be considered in future infrastructure development within Griffith LGA.

Potential Issue: Compliance with CMA Targets

i. 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 around Griffith is shown below.

The areas of significance to the operations of Griffith City Council include Mirrool Creek, Lake Wyangan, the main MI Canals and drains and Barren Box Swamp.

Potential Issue: Pollution of these environmentally sensitive areas.

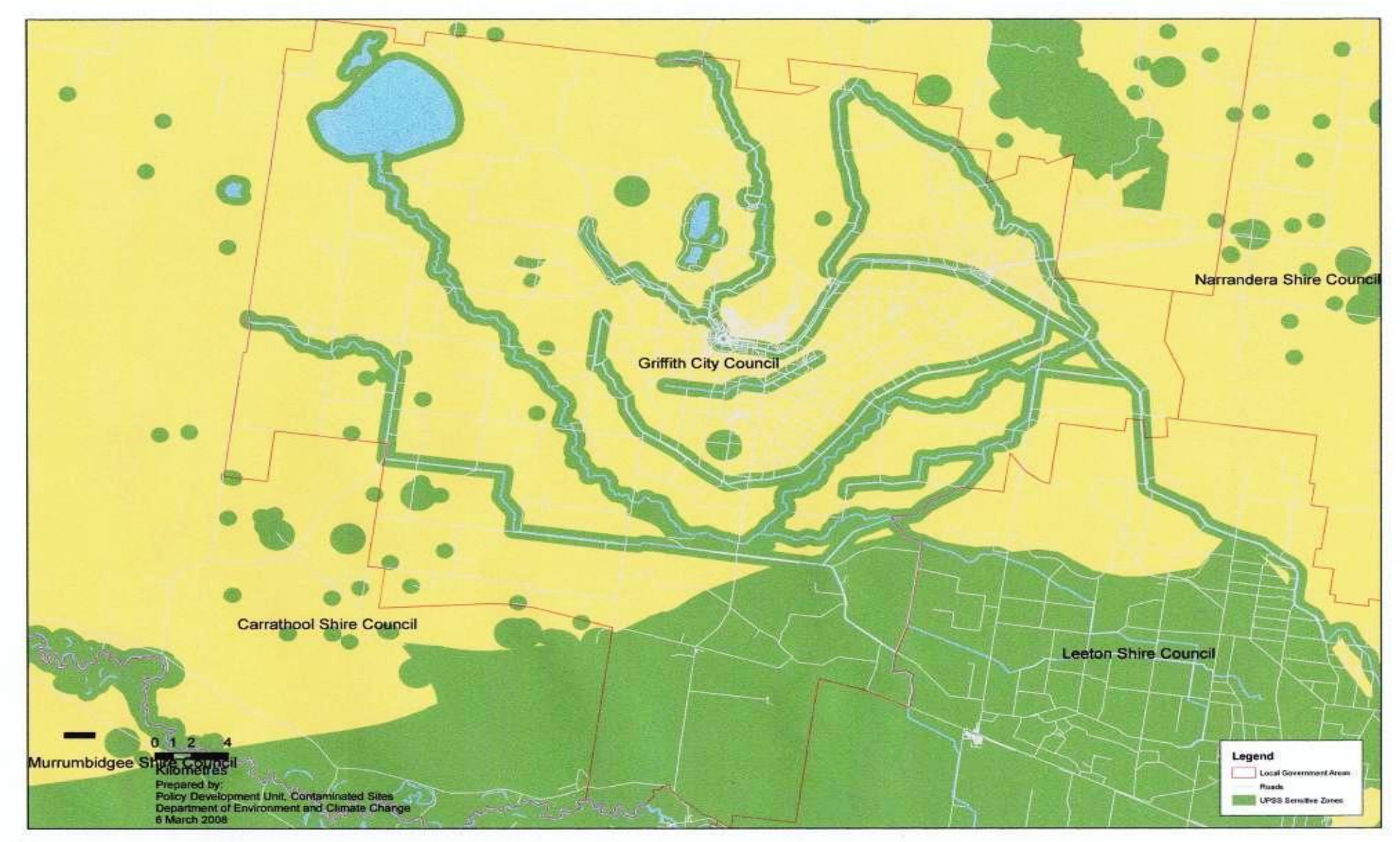

Figure A5: Environmentally Sensitive Areas - Griffith

3. WATER RESOURCES CONTEXT

a. Murrumbidgee Regulated River Context – Water Sharing Plan

General

About 1,200 kilometres of the 1,600 kilometre length of the Murrumbidgee River is regulated. The Water Sharing Plan applies to the regulated stretches of the River.The regulated sections include the Murrumbidgee River from Taemas Bridge within Burrinjuck Dam to its junction with the Murray, the Tumut River from the upper reaches of Blowering Dam to its junction with the Murrumbidgee, and the Yanco/Billabong Creek system from the offtake of Yanco Creek from the Murrumbidgee to the junction of the Billabong Creek with the Edward River.
Whilst the Lowbidgee Flood Control and irrigation district does not form part of the Plan's area, there are rules regarding when flows may be diverted from the Murrumbidgee into the District and the volume of diversions.

TableA6, below, lists the categories of access licences in the Murrumbidgee River and the total shares or volumes applying at the start of the Water Sharing Plan (2004).

Table A6: Water Access Licence Categories and Allocations

Access Licence Category	Total Share Component
General Security	2,043,432 unit shares
High Security	298,021 unit shares
Domestic & Stock	35,572 ML per year
Local water utilities	23,402 ML per year
Murrumbidgee Irrigation conveyance	243,000 unit shares
Coleambally Irrigation conveyance	130,000 unit shares
Supplementary water	220,000 unit shares

(Note: Griffith Council has a Town entitlement of 14,407 ML in the Local Water Utilities category. Council also holds other High Security entitlements and some General Security entitlements.)

Available Water Determinations

Available water determinations are the means by which water is shared between access licences. In the Murrumbidgee, available water determinations are made for each access licence category at the start of each water year by the NSW Office of Water and, if required, during the course of the year.

The original rules allowed for 100% of share component for local water utilities and domestic and stock allocations **in all years.** The current drought has caused a readjustment of this rule and in fact, in 2007/08, 2008/09 and early 2009/10, town allocations have been set at 50% of entitlement for short periods of time.

b. Surface Water

- Sources and Entitlements

Griffith obtains its bulk water supplies from the Murrumbidgee River via Murrumbidgee Irrigation's Main Northern Canal.

The current water entitlements from the Murrumbidgee River system are linked to MI's entitlements and allocations. These entitlements are summarised in Appendix E.

It should be noted that Griffith's total water supply entitlements amount to 0.5% of Murrumbidgee Irrigation's total entitlements (allocations) from the Murrumbidgee River (and 5% of MI's High Security entitlements)

- 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).

The management of the Murrumbidgee River and its anabranches and other streams within its floodplain is affected by Murray-Darling Basin Agreements to meet water needs in Victoria, South Australia and NSW. In 2004, the NSW, Victorian, South Australian, Queensland and Commonwealth Governments agreed to address flows in the Basin's Rivers as part of the National Water Initiative, by signing the Intergovernmental Agreement on Addressing Water Over Allocation and Achieving Environmental Objectives in the Murray-Darling Basin.

The Water Quality Objectives for the reach of the Murrumbidgee River appropriate to Griffith are presented in Table A7 below.

Key indicators and numerical criteria for the Water Quality Objectives listed are shown in Table A8.

Potential Issue: Achievement of water quality objectives applicable within the NWI Intergovernmental Agreement on Over Allocation – to be referred to Murrumbidgee CMA.

Table A7: Water Quality Objectives

Criteria	Objective
 **Protection of Aquatic Ecosystems**	Maintaining or improving the ecological condition of water bodies and riparian zones over the long term
 **Secondary Contact Recreation**	Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed
 **Primary Contact Recreation**	Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed
 **Livestock Water Supply**	Protecting water quality to maximise the production of healthy livestock
 **Irrigation Water Supplies**	Protecting the quality of waters applied to crops and pasture
 **Drinking Water**	Refers to the quality of drinking water drawn from the raw water source before any treatment
 **Homestead Water**	Protecting water quality for domestic use in homesteads including drinking, cooking and bathing

Key indicators and numerical criteria for the Water Quality Objectives listed are shown in Table A8

Table A8: Water Quality Objectives: Indicators & Criteria

INDICATOR	NUMERICAL CRITERIA (Trigger Values)
Aquatic Ecosystems	
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 µS/cm
Dissolved Oxygen	85 – 100%
pH	6.5 – 8.5

Secondary Contact Recreation	
Faecal Coliforms	1000 cfu/100 mL
Enterococci	230 per 100 mL
Algae & BGA	15,000 cells/mL

Primary Contact Recreation	
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

Livestock	
Faecal Coliforms	100 cfu/100 mL
Algae & BGA	11,500 cells/mL
Salinity	3000 – 10,000 µS/cm

Irrigation Water Supplies	
Algae & Blue Green Alagae	Not visible
Salinity	280 µS/cm
Thermotolerant Coliform	Varies – depending on whether food or non-food crops (Refer ANZECC Guidelines)

Drinking Water	All drinking water to comply with Australian Drinking Water Guidelines
Faecal coliforms	0
Salinity	800 - < 1500 µS/cm
pH	6.5 – 8.5
Dissolved Oxygen	6.5 mg/L

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

- Water Quality

Water quality data for the Murrumbidgee River at the Yanco Creek Offtake is presented in Table A9 below. This is not the offtake for supply to Griffith, but it is the nearest monitoring station to the offtake for the Main Northern Canal, which supplies Griffith. There is an Office of Water monitoring site on the Murrumbidgee River at Narrandera, but the advice from the Office is that there is no acceptable water quality data for this site.

Table A9: Summary of Water Quality at Yanco Creek Offtake from Murrumbidgee River

Parameters	No. of Samples	Average	Range	Comments
Electrical Conductivity (µS/cm)	353	100.9	28 - 307	Low salinity -suitable for all purposes
Dissolved Oxygen (mg/L)	291	9.1	5.7 – 13.3	-
Saturated D.O (%)	333	94.5%	62 – 136%	-
Temperature (^{0}C)	355	17.6	6.8 – 27.4	-
Turbidity (NTU units)	297	27	6 – 189	Typically clear water – low turbidity levels
pH (units)	347	7.5	6.2 – 8.8	OK
Total Suspended Solids (mg/L)	60	23.7	5 – 62	Low TSS – reflected in turbidity results above
Total Phosphorus (mg/L)	61	0.037	0.005 – 0.128	Low levels of phosphate
Total Alkalinity (mg/L)	1	35	-	-
Calcium as Ca (mg/L)	1	7.99	-	-
Chlorine as Cl (mg/L)	1	8.14	-	-
Magnesium as Mg (mg/L)	1	3.29	-	-
Potassium as K (mg/L)	1	1.61	-	-
Sodium as Na (mg/L)	1	7.59	-	-
Sulphate as SO_4 (mg/L)	1	3.02	-	-

Source: DWE Waterinfo Data Base, 2003 -2007: Monitoring Site 410007

The water quality in the Murrumbidgee River and Yanco Creek at this point is good quality, compared to other regulated rivers in the Murray-Darling Basin. There are no major water quality issues in this stretch of the river system.

The potential for algal blooms is an ever present risk, but the phosphorus levels have been consistently low for the last 5 years, thereby reducing this risk.

Griffith City Council has a very active blue-green algal monitoring program for Lake Wyangan and the town water supplies. Each of the water treatment plants has off-stream storages, Griffith WTP has activated carbon dosing facilities and Yenda is a microfiltration plant. MI has the capability of mixing and aerating water at weirs (if required) and, therefore, the impact of BGA is less in the Canal than the Murrumbidgee River itself.

Murrumbidgee Irrigation, under its EPA Licence, undertakes environmental monitoring at a number of sites (for EC, nutrients and pesticides). There are no monitoring sites on the main Northern Channel. The site most relevant to Griffith is on Little Mirrool Creek. Analysis results for pesticides over the past five years are summarised in Table A10 below:

Potential Issue: (for MI): Levels of pesticides in Little Mirrool Creek

Table A10: Murrumbidgee Irrigation Water Quality Monitoring (2003-2007)

Chemical	Detection Range µg/L	Comments
Atrazine	BDL – 0.25	Monthly monitoring. No notification or action levels recorded.
Chlorpyrifos	BDL – 0.1	Monthly monitoring. No notification or action levels recorded
Diuron	BDL – 4.50	Monthly monitoring. There were 2 notification levels in 2006. DECC notified – no follow up action.
Alpha Endosulfan	All BDL	Monthly monitoring
Beta Endosulfan	All BDL	Monthly monitoring
Simazine	BDL – 3.80	Monthly monitoring. One notification level in 2006. No follow up action
Diazinon	All BDL	Monitored November each year
Malathion	All BDL	Monitored Oct. and Nov. each year
Metolachlor	BDL – 0.31	Monitored Oct., Nov., Dec. One notification level detected (2005)
Thiobencarb	BDL – 0.13	Monitored Nov.
Trifluralin	All BDL	Monitored Mar., Apr., May., Sept., Oct., Nov., Dec.,
Molinate	BDL -3.20	Monitored Feb. to Sept

(Note: BDL = below detection limit)

(Source: Murrumbidgee Irrigation: Annual Licence Compliance Reports. http://www.mirrigation.com.au/ReportsAR/EnvironmentalReports.htm

c. Groundwater

The Lower Murrumbidgee is a designated Groundwater Management Area; a distinct hydrogeological region with its own hydrogeology and groundwater usage characteristics.

There are three (3) groundwater systems in the Griffith area, namely:

i) the shallow Shepparton Formation Aquifers, which can be as high as 2m from the surface (although these levels have been dropping since this drought commenced in 1997/09). This water is very saline.

ii) the deep Shepparton Formation, starting at about 20 metre below surface level. Good quality water; high yields

iii) the Calivil Formation Aquifer, which is high quality water at 70+ metres depth below surface level

Griffith is located within this Groundwater Management Area. Although the City does not utilise groundwater as an urban water source, this is a potential source if supply becomes unavailable from the Canal or is reduced during drought.

No studies have been carried out by Council to date on groundwater reserves for location, quality, yields etc.

Data Gap: Availability and suitability of groundwater as an alternative or additional water supply service.

4. CURRENT URBAN WATER SYSTEMS

a. Impact of Drought

At 15 October '09, storage levels in the Murrumbidgee Valley were:

Table A11: Water Storage Levels: Murrumbidgee Valley (October 2009)

Storage	Volume (GL) At 15/10/09	% of Capacity	Volume at this time last year (GL)
Burrinjuck Dam	424	41	502
Blowering Dam	658	40	779
Total	1082		1281

There was significantly less water in storage than at the same time in 2008.

As a result, Griffith City Council applied restrictions throughout 2007 – 08 and, (as of August 2009) imposed Level 3 Restrictions, which require:

Domestic

- Lawns & Gardens

Watering for 2 hours maximum per day on Odds and Evens Basis between the hours of 7-10am, 4-7pm (non daylight saving) and 6-9am, 6-9pm during Daylight Saving period.

This is for fixed Sprinklers and Fixed Hoses

No watering on 31st Day of month

Council approved subsurface watering permitted for 2 hours during hours stated below.

- **Paved Areas**

Not Permitted unless approved for accident, fire, health and safety

- Swimming Pools

Pools not to be filled except with Council approval.

Top ups permitted. Pool covers encouraged.

- Washing Vehicles

Bucket use with hand held trigger nozzle to rinse and pre-rinse only.

- **Fountains & Water Features**

Top-up by hand held hose only to existing.

No filling of new facilities.

- **Water Toys**
not permitted

- **Water Tanks**
top up from Council reticulated system not permitted for garden watering.

Public, Commercial and Industrial

- **Gardens, Parks, Open Space and Businesses including the grassed verges abutting property**
2 Hours maximum per day on Monday, Wednesday and Fridays only. Manual water systems permitted between 5am - 10am. Automatic timed systems between 12am - 6am. Bucket watering permitted at any time.

- **Nurseries and Commercial Growers**
Maximum 5 Hours/day for fixed spray systems

Hand watering is allowed at all times

b. Water Availability

A recent (June 2008) Report by the CSIRO ("Water Availability in the Murrumbidgee") has found that:

- Average surface water availability for the region under **historical climate** is 4270 GL/year. The use of water under **current development** is 2257 GL/year (or 53%). Currently in NSW, 60% of allocated **general security** water is used

- Groundwater use is about 407 GL/year (or 17% of total water use). Extraction of groundwater from the Lower Murrumbidgee Alluvium GMU in 2004/05 was 324 GL (or 67% of average recharge. Entitlements are being reduced to the long term extraction limit of 280 GL/year.

- If the recent climate (1997 to 2006) was to persist, average surface water availability would reduce by 30%, diversions by 18% and end-of-system flow by 46%. The relative level of surface water use would be 62%

- The best estimate of climate change by 2030 is less severe than the recent past, resulting in availability reducing by 9%, diversions by 2% and end-of-system flows by 17%.

c. Levels of Service

The water supply Levels of Service applying in Griffith are documented in Tables A11 (Water Supply) & A12 (Sewerage), below.
(**Note**: These Levels of Service for both water supply and sewerage were established in 2005. They have since been redeveloped as part of the 2009/10 Strategic Business Planning process. The modified Levels of Service are included in Appendix E: IWCM Related Obligations, Responsibilities & requirements)

Table A12: Water Supply: Levels of Service

Description	***Unit***	***Level of Service***	***Achievement***
AVAILABILITY OF SERVICE			
Normal Quantity Available:			
Domestic Peak day	L/tenement/day	1500	Yes
Domestic Annual	kL/tenement/yr	480	Yes
Total Annual Average Consumption	ML/yr	8000	Yes
Total Peak Daily Consumption (Potable)	ML/day	60	Yes
Peak/Average consumption (Potable)	%	200	Yes
Fire Fighting:			Yes
Compliance with the Water Supply Investigation Manual* (AS 2419.1 classifications 2, 3, 4 & 9 with floor area less than 1000m^2)	% area served	100 (Urban) 70 (Rural)	Yes Yes
Pressure:			
- Min pressure when delivering 6 L/min	Metres head	30 (Griffith) 12 (Yenda)	Yes
- Max static pressure	Metres head	60 (Griffith) 30 (Yenda)	Yes
Consumption Restrictions in Droughts:			
- Average duration of restrictions	% normal usage	0	Yes
- Average frequency of restrictions	No./10 yr period	Nil	Yes
Supply Interruptions to Consumers:			
Temporary supply arrangements during interruptions		Where possible	
Planned *(95% of time):*			
- Notice given to domestic customers	Hours	48	Yes
Notice given to commercial customers	Hours	48	Yes
- Notice given to major industrial customers	Days	7	Yes
Unplanned:			
- Maximum duration	Hours	8	Yes
- Frequency	No./yr	80	Yes
RESPONSE TIMES			
Description	***Unit***	***Level of Service***	***Achievement***

Supply Failure			
All Customers:			
- During working hours	Hours	1	Yes
- Out of working hours	Hours	2	Yes
Customer Complaints:			
Personal/Oral	Working Days	1	Yes
Written	Working Days	10	Yes
Note: Times apply for 95% of occasions			
Service Provision:			
Time to provide a domestic individual connection to water supply in serviced area (95% of times)	Working days	20	Yes
WATER QUALITY			
(Should meet Drinking Water Quality Guidelines of Australia, NHMRC & AWRCM 2004)			
Total coliforms	CFU/100ml	0	Yes
Themotolerant coliforms	CFU/100ml	0	Yes
Sampling frequency	Samples/month	10	Yes
Physico-chemical Parameters:			
pH	Unit	6.5 – 8.0	Yes
Turbidity	NTU	0.5	Yes
Fluoride	mg/L	1	Yes
Free available chlorine (WTP)	mg/L	<5	Yes
Free available chlorine (Reticulation)	mg/L	1	Yes
Sampling frequency	Samples/year	129	Yes
Percentage Compliance with 2004 NHMRC/AWRCM Australian Drinking Water Quality Guidelines:			
Physical parameters	%	100	Yes
Chemical parameters	%	100	Yes
Total coliforms	%	100	Yes
Thermotolerant coliforms	%	100	Yes

Table A13: Sewerage: Levels of Service

Description	***Unit***	***Level of Service***	***Achievement***
RESPONSE TIMES (Defined as time to have staff on-site to commence rectification after notification of problem)			
Supply Failure All Customers: - During working hours - Out of working hours	 Hours Hours	 1 2	 Yes Yes
Customer Complaints: Personal/Oral Written Note: Times apply for 95% of occasions	 Working Days Working Days	 1 10	 Yes Yes
Service Provision: Time to provide a domestic individual connection to water supply in serviced area (95% of times)	Working days	20	Majority
WATER QUALITY (Should meet Drinking Water Quality Guidelines of Australia, NHMRC & AWRCM 2004)			
Microbiological Parameters: Total coliforms Themotolerant coliforms Sampling frequency	 CFU/100ml CFU/100ml Samples/month	 0 0 10	 Yes Yes Yes
Physico-chemical Parameters: pH Turbidity Fluoride Free available chlorine (WTP) Free available chlorine (Reticulation) Sampling frequency	 Unit NTU mg/L mg/L mg/L Samples/year	 6.5 – 8.0 0.5 1 <5 1 24	 Yes Yes Yes Yes Yes Yes
Percentage Compliance with 2004 NHMRC/AWRCM Australian Drinking Water Quality Guidelines: Physical parameters Chemical parameters Total coliforms Thermotolerant coliforms	 % % % %	 100 100 100 100	 Yes Yes Yes Yes
Availability of Service:			
- extent of area serviced	Service area	100% within the defined service area	Yes
- Category C (industrial connections)	% licensed	100	Yes
- Commercial connections (Cat. A&B)	% licensed	99	Yes

Description	*Unit*	*Level of Service*	*Achievement*
Sewer System Failures:			
Category One:			
- Failure due to rainfall and deficient capacity (overflows)	No./5 year	0	Yes
Category Two:			
- Failures due to pump or other breakdown including power failure	No./year	1	Yes
Category Three:			
- Failures due to main blockages and collapses (fat and tree roots)	No./year	10	No
Response Times for System Failures: (Defined as the maximum time to have staff on-site to commence rectification)			
Priority One: (Major spill, significant environmental or health impact, or affecting large number of consumers ie a major main)			
- Response time during working hours	Minutes	30	Yes
- Response time after hours	Minutes	60	Yes
Priority Two: (Moderate spill, some environmental or health impact, affecting small number of consumers ie other mains)			
- Response time during working hours	Minutes	30	Yes
- Response time after hours	Minutes	60	Yes
Priority Three: (Minor spill, little environmental or health impact, or affecting a couple of consumers)			
- Response time during working hours	Hours	1	Yes
- Response time after hours	Hours	2	Yes
Response Times for Complaints:			
General Complaints and Inquiries:			
Written complaints	Working days	5	Yes
Oral complaints	Working days	1	Yes
Note: times for 95% of complaints			
Odour Complaints:			
Treatment works	No./year	<2	Yes
Pumping Stations	No./year	<4	Yes
Effluent Discharge and Sludge Management			
Failure to meet licence limits and statutory requirements (100 percentile)	No. of samples/year	0	No

d. Relevant Land Use in Griffith

The principal sources of economic growth and development in the urban areas of Griffith include:-

- Agricultural production - grapes, vegetables, fruit, rice, wheat, chickens
- Agricultural produce processing
- Light engineering
- Small business enterprises
- Support industries and commercial enterprises

A list of the Licences issued by DECCW, under the Protection of the Environment Operations Act, 1997 (POEO) relevant to the water supply and sewer services is presented in Table 14 below.

Table A14: Activities in Griffith Licensed under POEO Act (relevant to LWU)

	Name	Address	Status
1829	AUSTRALIAN GRAIN STORAGE PTY LTD licence summary	Doug McWilliam Road YENDA 2681	Issued
1868	BARTTER ENTERPRISES PTY. LIMITED licence summary	MCWILLIAM'S ROAD HANWOOD 2680	Issued
2486	BARTTER ENTERPRISES PTY. LIMITED licence summary	FARM 124 MURPHY ROAD HANWOOD 2680	Issued
11733	CASELLA WINES PTY. LIMITED licence summary	FARM 1471 & 816 WAKELY ROAD YENDA 2681	Issued
11733	CASELLA WINES PTY. LIMITED licence summary	WHITTON STOCK ROUTE YENDA 2681	Issued
934	CEMEX AUSTRALIA PTY LIMITED licence summary	FARM NO.2363 THARBOGANG 2680	Issued
10801	DE BORTOLI WINES PTY LIMITED licence summary	153 DE BORTOLI ROAD BILBUL 2680	Issued
10801	DE BORTOLI WINES PTY LIMITED	LOWE ROAD BILBUL 2680	Issued

	licence summary		
11915	GRIFFITH CITY COUNCIL licence summary	HILLSTON ROAD GRIFFITH 2680	Issued
1402	GRIFFITH CITY COUNCIL licence summary	WHITTON STOCK ROUTE YENDA 2681	Issued
1604	GRIFFITH CITY COUNCIL licence summary	DUCHATEL ROAD GRIFFITH 2680	Issued
5875	GRIFFITH CITY COUNCIL licence summary	HILLSIDE DRIVE THARBOGANG 2680	Issued

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

All the above licensed activities are subject to a Trade Waste Agreement with Griffith City Council.

The only business which is connected to Council's sewerage system is the domestic component of Casella Wines at Wakely Road, Yenda (Licence 11733).

All of the above businesses are connected to either the Griffith or Yenda water supply systems.

e: Current Water Supply Services

The Water Supply, Treatment and Distribution systems for Griffith are discussed in detail in **Appendix B: System Boundaries**.
The Levels of Service are presented here as well as a summary of the actual service provided.

Water Supply Service Summary

Key aspects of the water supply service to the towns in Griffith are summarised in the Table A14 below:-

Table A15: Summary of Water Supply Services

Water Source:	Supply from Ml's Main Canal Ex Murrumbidgee River		
Entitlements:	• Town Entitlement		14,407 ML/yr
	• High Security (for general purposes)		1,377 ML/yr
	• General Security (Parks, Golf Courses, Picnic Areas & Lookouts.)		455 ML/yr
	• Joint Accounts (High Security)		306 ML
		Total	**16,545ML**

Populations:	LGA (2006) Census		23,799
	Griffith		15,826
Metered Customers: (2007/08)	Residential		7,706
	Non-Residential		1,478
		Total	9,184
Total Water Extracted: (2007/08)			6,821 ML
Annual Consumption: (2007/08) (Refer Table A13 below)			5,516 ML
Unaccounted for Water: (2007/08)			1,305 ML (20.6%)
Treated (Potable) Water: Quality Compliance	Total System : Compliance E.coli		100%

Water Consumption

Details of water consumption in Griffith are summarised in Table A16 below:-

Table A16: Actual Water Consumption

Annual Consumption

Potable Supply

Peak Annual Demand Recorded		6844 ML (2006/07)
Peak Day Demands	2009	49 ML (Feb.)
	2008	38 ML (Jan.)
	2007	41 ML (Jan.)
	2006	**54.7 ML** (Jan.)
	2005	47.8 ML (Dec.)
	2004	44.1 ML (Feb.)

Consumptions by User Category **(2007/08)** (Potable) [based on water extracted from all sources]

Residential		3,655 ML (57.8%)
Commercial		539 ML (8.5%)
Industrial		170 ML (2.7%)
Rural		422 ML (6.7%)
Public Parks & Open Space		226 ML (3.6%)
Bulk Sales		0 ML
Unbilled authorised		298 ML (4.7%)
Unaccounted for Water		1,305 ML (20.6%)
System Losses		-498 ML (-7.8%)
	Total	**6,322 ML**

The level of "unaccounted for water" is very high. Council conducted a Water Loss Survey in 2005 (Wide Bay Water), which determined an ILI of 3.3

Similarly, water losses at 7.8% are high, but are being addressed in a water loss rectification program, which has involved a leak detection survey of 3000 houses and 121 km of mains and the construction of a pressure management zone.

Data Gap: Verification of Water Losses and UFW

The main, individual, water users in Griffith are listed in Table A17 below:

Table A17: Major Water Users

i) Potable Water Users

#	Water Use	Ave/Day	No.	Road	Description	Category
1	138,686	380	1471	Wakley RD	Casella Winery	Industrial
2	73,836	202		Kidman WY	Warburn Estate Winery	Industrial
3	59,076	162	1	Benerembah ST	GCC Combined Meters	Institutional
4	58,868	161		De Bortoli RD	De Bortoli Winery	Industrial
5	58,626	161		De Bortoli RD	De Bortoli Winery	Industrial
6	28,349	78	5	Animoo AV	Griffith Base Hospital & Nurses Home	Institutional
7	26,806	73	55	Jondaryan AV	Casella Winery (Old Dal Broi)	Industrial
8	26,119	72		Wincey RD	Atkinson Hydroponics	Commercial
9	25,504	70	55	Mirrool AV	Berton Vineyards Winery	Industrial
10	24,157	66	22	Jensen RD	Orlando Winery	Industrial
11	23,050	63		Slopes RD	Pace Farm Pty	Industrial
12	19,739	54		Kidman WY	Saleyards & Filtration Farm (part)	Institutional
13	18,275	50	82	Coolah ST	Griffith High School	Institutional
14	17,919	49	1311	Snaidero RD	Bartters Hatchery	Industrial
15	17,070	47	1283	Brayne RD Whitton	West End Winery	Industrial
16	16,762	46		Stock Route	Terrel Estate Winery	Industrial
17	16,588	45		Kidman WY	Hometown Shopping Complex	Commercial
18	16,174	44		Walla AV	TWG Winery	Industrial
19	15,757	43		Messner ST	Wood Park	Institutional
20	15,457	42	585	Beelbangera RD	Tarac	Industrial

ii) Raw Water Users

#	Water Use	Ave/Day	No.	Road	Description	Ownership
1	65440	179	1	Doolan CR	Ted Scobie Oval	Crown Land – managed by GCC
2	26553	73	1	Speirs ST	EXIES OVAL	Privately owned
3	22060	60	83	Wakaden ST	Griffith Cemetery	Crown Land – managed by GCC
4	21101	58	565	Remembrance DR	Griffith Golf Club	Private
5	17031	47		Animoo AV	Griffith Bas Hospital	Private
6	14823	41		Remembrance DR	Aerodrome & Cottage	Owned by GCC
7	12117	33		Kookora ST	Willow Park	Crown Land – managed by GCC
8	10551	29	1	Poole ST	Wade High School	Private
9	10091	28		Remembrance DR	Dalton Park Racecourse	Private
10	8504	23	9	Langley CR	Enticknap Park	Private
11	7811	21	5	Animoo AV	Griffith Base Hospital & Nurses Home	Private
12	6227	17		Mirrool AV	Pumpwell Y3	Owned by GCC
13	6063	17		Curran RD	Yenda Public School	Private
14	5679	16	265	Banna AV	CWA Park	Crown Land – managed by GCC
15	5538	15	10	Doug McWilliam RD	Casella Wines (Old McWilliams Winery)	Private
16	5369	15		Kooba ST	Apex Park	Crown Land – managed by GCC
17	5031	14		West AV	Memorial Park	Crown Land – managed by GCC
18	4897	13	82	Leaver ST	Residential Property	Private
19	4619	13	8	Groongal AV	Jubilee Oval	Crown Land – managed by GCC
20	3624	10	24	Davidson PL	Dei Agnoli Park - Open Space	Crown Land – managed by GCC

The biggest user of **potable water** is Casella Wines, which uses 380 kL/day (approximately 140 ML/year). This represents approximately 2% of the total metered consumption for the City. Other major consumers are DeBortoli Winery (118 ML/year), Warburn Estate Winery (74 ML/year) and Council itself (162 ML/year). Overall, the 20 biggest users consume around 697 ML/year, or 12.6% of metered consumption.

The biggest **raw water** user is Ted Scobie oval, which consumes 65 ML/year. The 20 biggest raw water users consume a total of around 263 ML/year.

Peak day demands by User Category are not known.

The Demand management modelling carried out as part of this study (Refer **Appendix C**) indicates that at current rates of consumption, the Water Treatment Plants will reach capacity in 2025/6.

Council's 30 Year Forward Capital Works Program allows for augmentation of water treatment facilities to commence in 2023/24, which is a conservative approach.

Water Treatment:-

Griffith operates 2 Water Treatment Plants, namely:-

- Griffith WTP: (60 ML/d capacity)
- Yenda WTP: (2 ML/d capacity)

- Total Capacity: 62 ML/d
- Peak Day Demand: 49 ML/d (2008/09)
  [Note: Peak Day since 1994: 54.7 ML (2005/06)]
- Peak Hourly Demand: 306 ML/d (2008/09)

The current Peak Day Demand for Griffith's Water Treatment Plants is approximately 79% of the total capacity.

Currently, commercial/industrial use accounts for only 16.6% of total consumption, so there is some scope for reasonable industrial growth in Griffith.

Water Quality

Water quality produced by Griffith's Water Treatment Plants is typically of high quality. In the period, 2004/05 to 2007/08, the Treatment Plants met all Australian Drinking Water Quality Guidelines for physical, chemical and microbiological criteria as shown in Table A18 below.

Table A18: Water Quality Compliance Results

Criteria	**2004/05**	**2005/06**	**2006/07**	**2007/08**
Physical	100%	100%	100%	100%
Chemical	100%	100%	100%	100%
Microbiological				
• E.coli	100%	100%	100%	100%
• Total coliforms	100%	100%	100%	100%

(Source: DWE Performance Reports; 2004/05; 2005/06; 2006/07; 2007/08)

Assets & Asset Management

Griffith has a Water Supply Asset Register in place which lists the following information for Griffith and Yenda as appropriate:-

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

Table A19: Condition of Water & Sewerage Assets

Asset	Gross Current Replacement Value	Fair Value	Accumulated Depreciation	Annual Depreciation	Residual Value
Water Supply and Sewerage Treatment Active Assets	97,212,325	90,758,019	6,454,306	792,026	58,819,995
Potable Water Supply Mains	61,517,847	49,946,474	11,571,373	609,075	-
Raw Water Supply Mains	4,956,387	3,206,534	1,749,853	87,987	-
Sewer Mains and Reticulation	55,900,501	40,781,126	15,119,375	596,636	-
Sewer Manholes	9,670,455	8,565,397	1,105,057	76,523	4,835,227
Totals	***229,257,514***	***193,257,550***	***35,999,963***	***2,162,246***	***63,655,222***

Table A19 indicates that Water Supply Assets are aging and that a program of asset replacement/renewal is necessary.

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.

Potential Issue: Commitment to a program of water supply asset renewal/replacement.

f. Current Sewerage Services

Griffith City Council provides sewerage services to Griffith, Yenda, Yoogali, Hanwood and Bilbul.

On-site septic tank systems (located primarily on the urban fringes of Griffith and the three smaller villages) are administered in accordance with the provisions of the Local Government Act.

Sewerage Services Summary

Key aspects of the sewerage services in Griffith LGA are summarised in Table A20 below:-

Table A20: Summary of Sewerage Services

		2007/08	2008/09
Population Serviced:	Permanent	21,000	21,500
	Peak	23,000	23,500
Connected Properties:	Residential	7,006	7,226
	Non- Residential	787	698
Unsewered Urban Premises (%)		2.6	-
No. of on-site systems		1,388	1400(1)
Volume of Sewage treated (kL/property)		308	256
Volume Recycled (2)		18%	11%
Biosolids Re-used (On site uses)		0%	0%
Infiltration (assessed)		Not measured	
EPA Licences:	Griffith	Licence No.1604 Licence to discharge to MI drainage channel	
	Yenda	Licence No.1402 Licence to discharge from Pond3	
	Bilbul	Not licensed	
Public Health Incidents		0	0
Environmental Incidents (Cat. 1)		15	0
(Cat. 2/3)		0	0
Odour Complaints		15	3
Service Complaints		7	0

Source: DWE Performance Report 2007/08

Note:

(1): The Villages of Lake Wyangan and Nericon will be connected to sewerage in 2013/14 and Tharbogong in 2018/19.

(2)The volume recycled in 2007/08 included trials on a "Filter" Reuse project (specifically aimed at reducing nutrients to satisfy DECCW requirements) which were subsequently abandoned.

Sewerage Systems

Principal aspects of Council's sewerage infrastructure include:-

- Treatment Works: 3 No.(Griffith, Yenda & Bilbul)
- Pumping Stations: 29 No.
- Pumping Capacity: 13 ML/d
- Length of Main: Gravity Reticulation: 169 kms
  Pumping (Rising)Mains: 54 kms
- Total Length of Mains 223 kms

Sewage Treatment:-

Treatment Plants: Griffith: Trickling Filter (currently being updated to MBR technology plant)
Built: 1992
Yenda: Oxidation Ponds
Built 1981
Bilbul: Oxidation Pond
Built 1990

Capacities of the plants are: Griffith: 65,000EP
Yenda: 34,000 EP
Bilbul: 310 EP
Total: 99,310 EP

Current Plant Inflows (2007/08) are:

Griffith:	1,486 ML/yr
Yenda	113 ML/yr
Bilbul	0.09 ML/yr

The Griffith Plant, which discharges from Pond 5 into the MI drainage channel, labelled as EPA ID 1 is licensed by DECCW (EPA) under Licence No 1604.

Yenda STP (Licence No. 1402) discharges from Pond 3 to MI Drainage Channel at Licence Point ADP 001.

There is no discharge from the Bilbul Plant – all effluent is evaporated

Flow data from the Treatment Plants is summarised in Table A21 below:

Table A21: Annual Flows at Sewage Treatment Plants

	Griffith	**Yenda**
Flow Categorisation		
-Annual Residential Inflow	1583 ML	108 ML
-Annual Non-Residential Inflow	146 ML	5 ML
-Trade Waste	200 ML	0
-Infiltration	na	na
Average Dry Weather Flow		
-Permanent population	46 L/s	3.6 L/s
-Peak population	46 L/s	3.6 L/s
Peak Dry Weather Flow		
-Permanent population	78 L/s	5 L/s
-Peak population	78 L/s	5 L/s
Peak Wet Weather Flow		
- Peak Day	8.6 ML/d	1.8 Ml/d
- Peak Hour	200 L/s	17 L/s

Essentially, the Plants currently have ample capacity to treat the flows generated. Council has resolved to upgrade the Griffith Plant to MBR technology, to comply with more stringent discharge conditions imposed by the EPA (DECCW), as discussed below.

Griffith Sewage Treatment Plant operates under a Pollution Reduction Program (PRP) as discussed in **Appendix E: IWCM Related Obligations, Responsibilities & Requirements**

The Licence requirements imposed by DECCW under the Pollution Reduction Program are:

Parameter	Current (kg/year)	Future (kg/year)
BOD	36,000	18,000
N	26,648	18,000
O&G	4,336	3,600
P	2,900	540
TSS	60,000	27,200

Council's concept design process fully reviewed the future capacity of the plant and reviewed population growth, trade waste issues and the potential for effluent reuse.

The plant capacity has been designed with allowance for an upgrade in 10-12 years, subject to review of growth and load predictions.

Potential Issue: Compliance with more stringent conditions applied by DECCW to the Griffith STP

The Licence conditions applying to the **Yenda** Sewage Treatment Plant are discussed in Appendix E

Effluent Quality:

Effluent analysis results (mean values) for both the Griffith and Yenda Plants are shown in Table A22 below.

Table A22: Analysis Results for Griffith & Yenda STP's (2008 EPA Licence Periods)

Parameter	Griffith STP		Yenda STP	
	90%ile limit	% Compliant	90%ile limit	% Compliant
pH (units)	-	-	5.5 – 9.5	83
BOD (mg/L)	30	100	50	100
TSS (mg/L)	30	58	50	83
Total N (mg/L)	10	67	-	-
Faecal coliforms (per 100 ml)	200	100	600	100
Oil & Grease (mg/L)	10	100	-	-
Total P (mg/L)	-	-	-	-

These are generally good treatment results.

The only parameter of concern in these results is the Total Suspended Solids results for both Plants, particularly the Griffith Plant. It would seem that there is substantial carry over of algae, at times, from the Maturation Lagoons. The new MBR Plant will address this issue.

Council has entered into a Contract to upgrade the STP to a Membrane Bioreactor. This is a funded project, fully committed to by Council and hence is Business as Usual.

Trade Waste Management

Council has recently updated its Trade Waste Policy (August 2009) and is continuing to implement and monitor it.

Trade Waste information is summarised in Table A23 below:

Table A23: Griffith Trade Waste Discharges

Large Trade Waste Dischargers:	4
No. of Trade Waste Discharges:	225
Volume of Dischargers:	
- Total (from Council records)	200 ML/yr
- Large dischargers (daily max.)	614 kL/d
- Equiv. BOD of large dischargers	6131EP
- Equiv. TSS of large dischargers	5009EP
Industry Categories:	All

Assets and Asset Management

Council maintains an excellent Sewerage 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 A19 above.

Table A19 (above) indicates that Sewerage Assets are aging, but sufficient annual expenditure is currently being directed to maintenance.

Potential Issue: Commitment to a program of sewerage asset renewal/replacement.

g. Current Stormwater Services

All the urban centres of Griffith (including Griffith, Tharbogang, Yenda, Yoogali, Hanwood, Bilbul and Beelbangera) have stormwater drainage systems. The drainage systems of the Villages are typical of rural villages with table drains predominant.

Griffith and the surrounding villages lie within the catchment of the major main drain "J", drainage channel.

Stormwater Management

Council has completed a Flood Study (August 2006) and is working towards completion of a Floodplain Risk Management Study and Plan.

The Patterson Britton & Partners P/L Flood Study indicates that Griffith, Yenda, Bilbul and the Villages are all subject to flooding in the 100 year event.

All of Griffith's stormwater discharges to a sophisticated network of drainage canals which are owned and operated by Murrumbidgee Irrigation. (Refer to layout in Figure B12 in **Appendix B: Griffith System Boundaries**).

In effect all stormwater in the City is collected and returned to the Mirrool Creek system, for reuse.

Barren Box Swamp is a terminal depression for drainage water from Mirrool Creek and it is used for storage and for improving water quality.

Griffith is somewhat unique in that Murrumbidgee Irrigation (MI) operates both the irrigation water supply and the drainage system in and around the City. Both the water supply and drainage management are covered by a Contract between MI and Council. MI is responsible for water quality in its drains, but has no direct control over the quality of drainage water it receives. The provisions to drain into MI's drainage system are covered in the "MI Members Contract" – Section 9. This essentially requires Council to meet water quality standards (as specified by DECCW). A copy of the Contract with MI is appended to Volume 1: Evaluation Study Report.

Expansion of the urban area and rural residential development has meant that portions of the irrigation system have been converted from farm to urban use. In many cases, the original drainage channels have been filled in and replaced with alternative stormwater drainage systems.

During some seasons (especially in autumn), the combination of urban runoff and farm releases creates a backwater problem on the floodplain. This is most apparent when heavy rainfall coincides with rice field discharge just before harvest. Water is held in a largely static condition until the discharges dissipate.

The low grades of the system mean that the drainage system is relatively wide and deep. This has created some problems, particularly with erosion, public safety, mosquito breeding and carp damage.

Stormwater Levels of Service

The current and targeted Levels of Service are shown in Table A24 below:

Table A24: Stormwater Drainage – Current & Target Levels of Service

Description	Unit	Existing Level of Service	Long Term Target
Existing Drainage System			
Main Drain J	ARI (years)	5-20	>20
Secondary and Tertiary Channels	ARI (years)	5-20	>20
Culvert crossings	ARI (Years)	5-20	>20
Siphons	ARI (Years)	5-20	>20
Existing Developed Areas			
CBD (Floor Levels)	ARI (Years)	100	>100
Other		20	20
New Development and Drainage Systems			
Peak discharges	m^3/s	<=Existing	<=Existing
Floor levels	ARI (years)	>100	>100
Single urban residential minor drainage system	ARI (years)	20	20
Medium – high density urban residential minor drainage system	ARI (years)	5	5
Commercial minor drainage system	ARI (years)	20	20
Rural minor drainage system	ARI (years)	10	10
Overland flow paths – trunk drainage	ARI (years)	100	100
Water Quality			
Urban Drainage System		GPTs in several detention basins. No other controls	Removal of sediment and gross pollutants prior to discharge to trunk drainage system
Main Drain J		No controls	Removal of sediment and gross pollutants
Lake Wyangan		No controls	Removal of salt, nutrients, sediment and gross pollutants
Maintenance			

Main Drain J and subsidiary channels	Ownership	MI	MI
Cleaning of piped drainage system within urban areas	Frequency (years)	As needed	1
State Emergency Services			
Response time during major floods	hours	2	2

Stormwater quality data are limited, largely because there is little community perception that stormwater quality impacts on community values. However, water quality is an important issue for the agricultural industry (on which Griffith depends) which relies on the quality of water; and receives and uses the stormwater discharged to the channel system. Water quality monitoring has been undertaken by MI and the (limited) available results are presented in Table A25 below.

Table A25: Stormwater Drainage Water Quality Monitoring Results

Parameter	**Unit**	**Tuckerbil (Mar – May 2000**	**Mirrool Creek (Mar.2000)**	**Murrumbidgee River (Mar. 2000) Monitoring results from DWE)**
Elect. conduct.	µS/cm	467 - 642	201	106
Total P	mg/L	0.148 – 0.306	0.062	0.04
NOx	mg/L	0.52 – 1.09	0.016	
Kjeldahl N	mg/L	1.0 – 1.39		0.4
TSS	mg/L	78 - 101		
Turbidity	NTU	117 -146	3	34
pH	units	7.4 – 7.8		
Ca	mg/L	17 -23		
Cl	mg/L	61 - 103		
K	mg/L	7 - 11		
Mg	mg/L	11 - 14		
Na	mg/L	54 - 82		
SO_4	mg/L	37 - 56		

Source: DWR Technical Report 93/10, 1993

Assets & Asset Management

The City has not fully developed its Asset Register for stormwater pits and pipelines. This is being worked on over a period of time, as resources permit.

The stormwater system appears to be in good condition.

h. 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,* (DWE, 2008) provides 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.

The NSW Office of Water (formerly DWE) has provided a list of possible climate change impacts relating to water service planning. For Griffith, the potential impacts of climate change include:

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

Impacts on the Water Utility may include:

- Changes to water access licence conditions
- Greater uncertainty about yield from the existing raw water source
- Possible increases in damage to underground infrastructure, particularly pipelines
- Reduction in sewage volumes

- Increased retention time of sewage in mains, particularly rising mains
- Increased concentration of nutrients and chemicals in raw sewage
- Changing technology and legislation
- 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 Griffith:

The Key findings of the CSIRO Report to the Australian Government regarding Murray – Darling Basin Sustainable Yields (Water Availability in the Murrumbidgee, June 2008) were:

- Average water availability for the region, under historical climate, is 4,270 GL/year of which 53% (2,257 GL/year) is currently used. Groundwater use is about 407 GL/year or 17% of total water use.
- If the recent climate (1997 to 2008) were to persist, average surface water availability would reduce by 30%. The relative level of surface water would be 62%.
- The best estimate of climate change by 2030 is less severe than the recent past. Average surface water availability would reduce by 9% and surface water diversion by 2%.
- Rainfall could vary from -17% in dry years to +8% in wet years, with a “best estimate” change from historical of -4%.
- Likely future development of farm dams would reduce total runoff by 1%. Although likely commercial plantation forestry expansion would have significant local effects on runoff, the impact on average annual runoff for the entire region would be negligible.
- Groundwater extraction is expected to increase by around 22% to become 21% of total average annual water use by 2030.

Griffith’s water supply entitlement is “Town Supply” which has a very high level of security. The supply is administered by Murrumbidgee Irrigation (under Agreement) because MI is the carrier of the water (via the canal system).

However, cuts to this Town Entitlement have been imposed in recent years by the Office of Water (as high as 50% cut) because of the water shortages in storage (as a result of the drought).

Given the availability of groundwater reserves, it might be prudent for Council to investigate the viability of sinking bores to augment supply into the future.

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

It is understood that Council may be required to assess the “secure yield” of its water source in the next year or two.

Potential Issue: Determination of “secure yield” in planning the future provision of future water supply services.

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APPENDIX B

APPENDIX B: GRIFFITH SYSTEM BOUNDARIES

Contents – Appendix B

Figures

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

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

Potable Water Supply:
- Griffith
- Yenda

and the Villages of:
- Beelbangera
- Bilbul
- Hanwood
- Lake Wyangan
- Nericon
- Yoogali
- Tharbogang

Raw Water Supply: Irrigation of:
- Council Parks & Gardens
- Schools
- Golf Course
- Airport

And supply to Yenda residential & business area

Sewerage:
- Griffith
- Yenda
- Bilbul
- Yoogali
- Hanwood
- Beelbangera

Stormwater:
- Griffith
- Beelbangera
- Bilbul
- Hanwood

- Lake Wyangan
- Nericon
- Tharbogang
- Yoogali

Maps and details of the water supply, sewerage and stormwater systems are included in Attachment B.

Figure B1: City of Griffith and Surrounding Villages

b). Administrative Boundaries

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

* NSW Office of Water, (formerly Department of Water & Energy (DWE))
* NSW Health, with regional representation in Griffith and Albury.
* Department of Environment, Climate Change and Water (DECCW), with regional representation in Griffith.

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

* Murray Darling Basin Commission, Canberra in relation to the Murrumbidgee River and Wetland Management.

* State Water, Dubbo; in relation to water allocations from the Murrumbidgee River.
* NSW Department of Primary Industries, with regional representation in Albury.
* NSW Department of Lands.
* NSW Roads and Traffic Authority, located in Wagga Wagga.
* Murrumbidgee Catchment Management Authority, with Head Office located in Wagga Wagga .
* Murrumbidgee Irrigation, centred in Griffith.

c). Physical Boundaries

Griffith is located in the Murrumbidgee Local Government region of New South Wales, is within the Murrumbidgee catchment and is surrounded by Leeton, Murrumbidgee, Narrandera and Carrathool Shires.

The City is located in the Riverine Plain of the Murrumbidgee River valley, on the boundary of the Mid-Murrumbidgee and the Lower Murrumbidgee sections of the Murrumbidgee catchment.

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

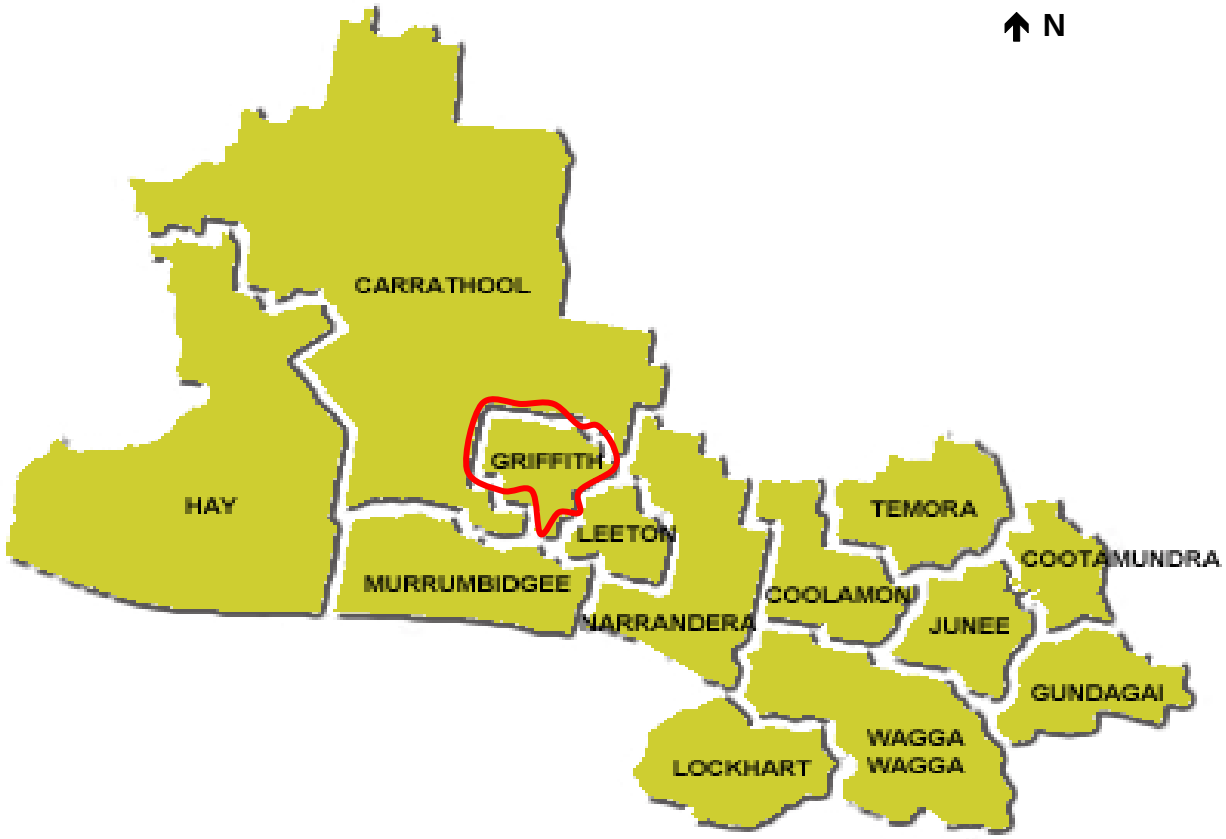

Figure B2: Murrumbidgee Local Government Boundaries

(Source: NSW Department of Local Government - Local Council Boundaries

ATTACHMENT B: SCHEMATICS

B - 1
BULK WATER SUPPLY SCHEMATICS

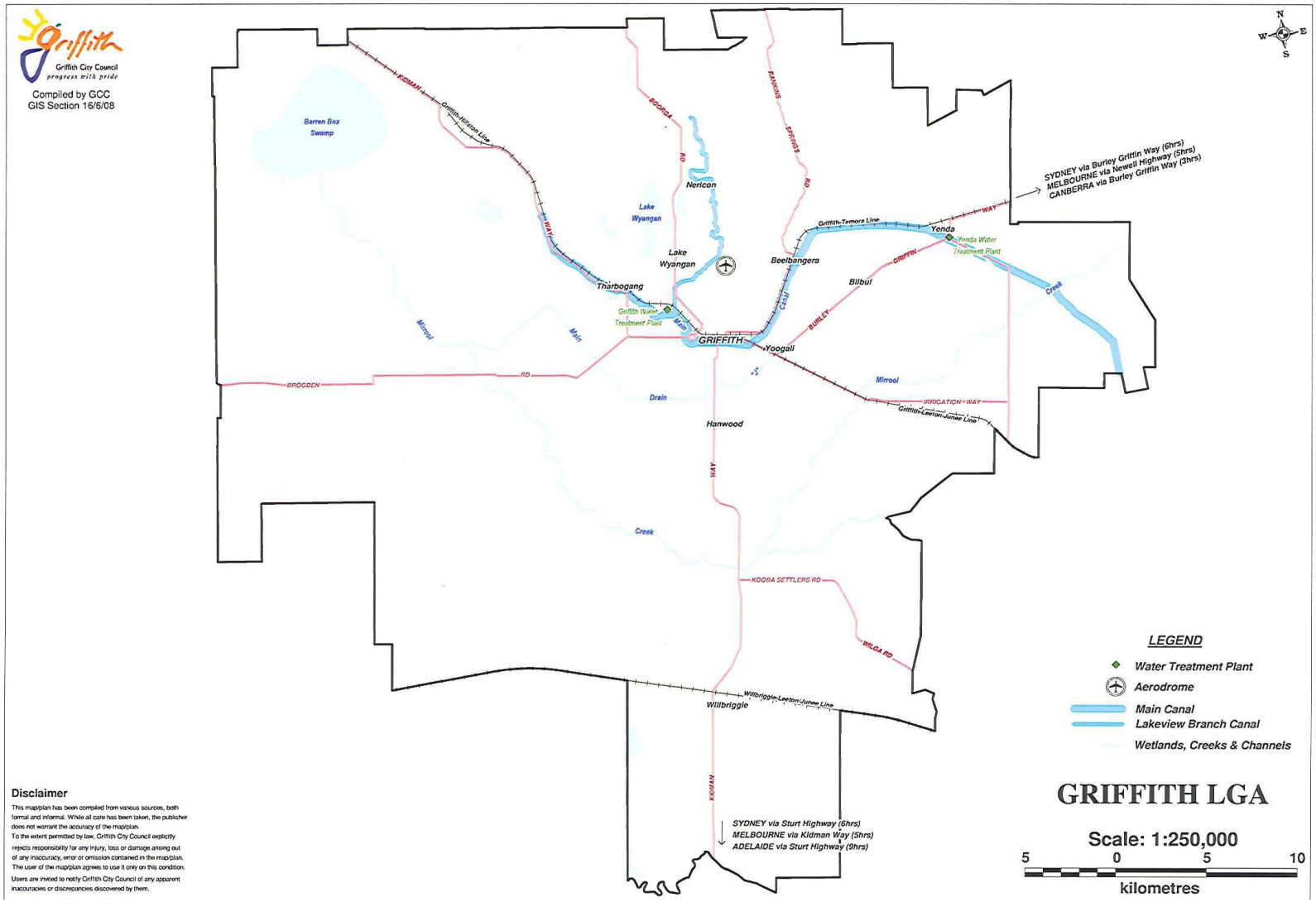

Figure B3: Griffith LGA and Water Supply Features

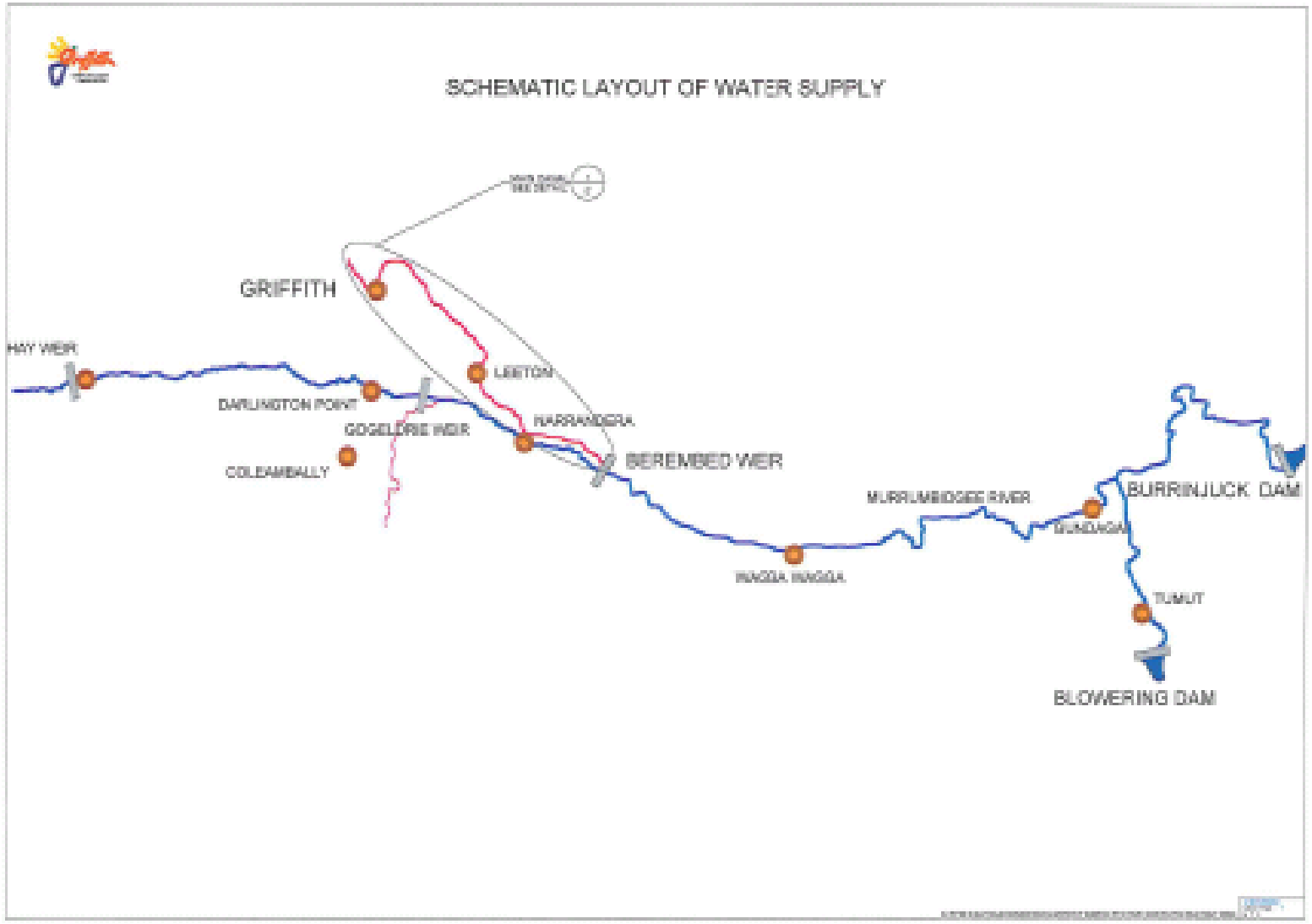

Figure B4: Murrumbidgee Supply System

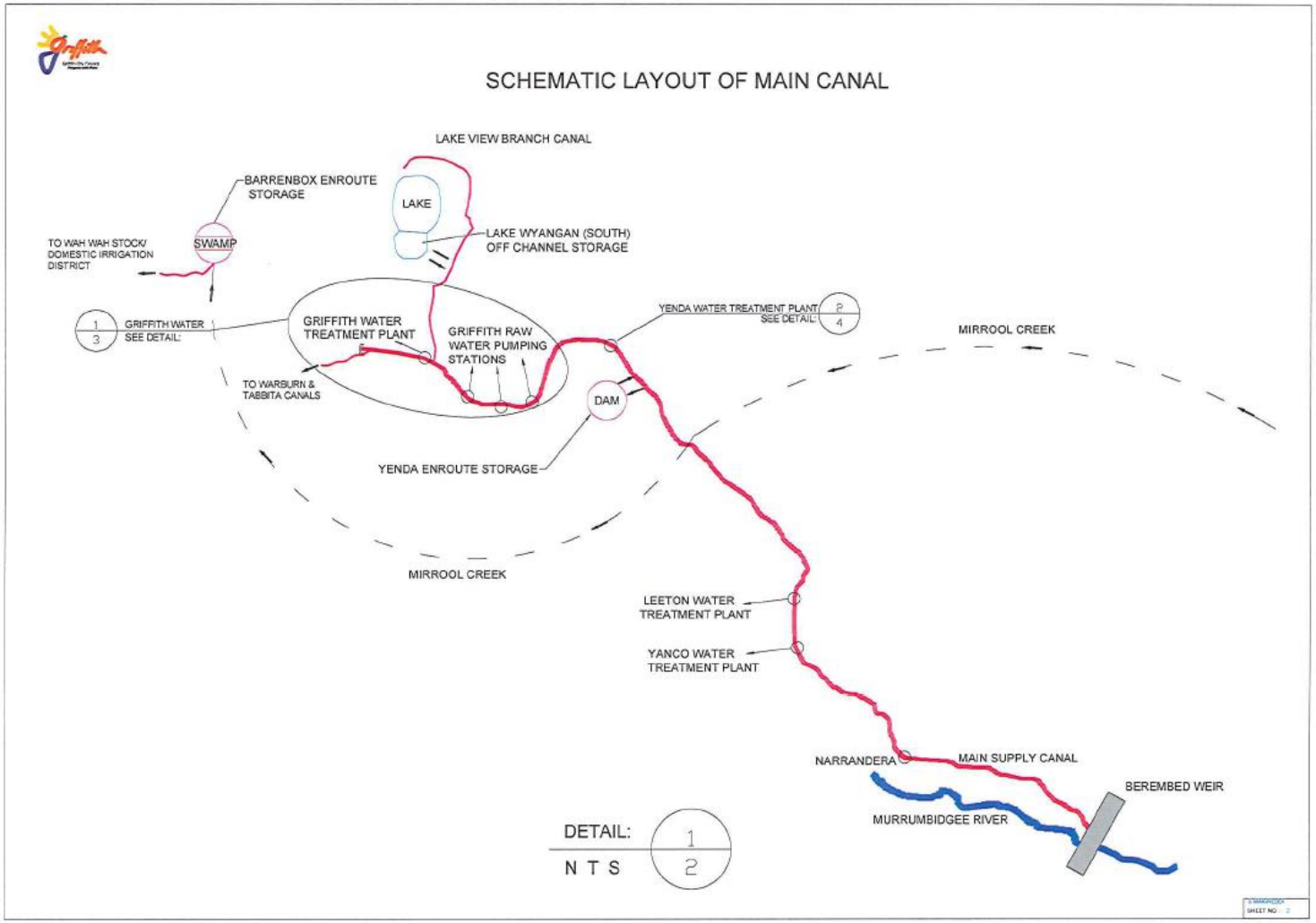

Figure B5: Griffith Water Supply System

B - 2
WATER SUPPLY SYSTEMS

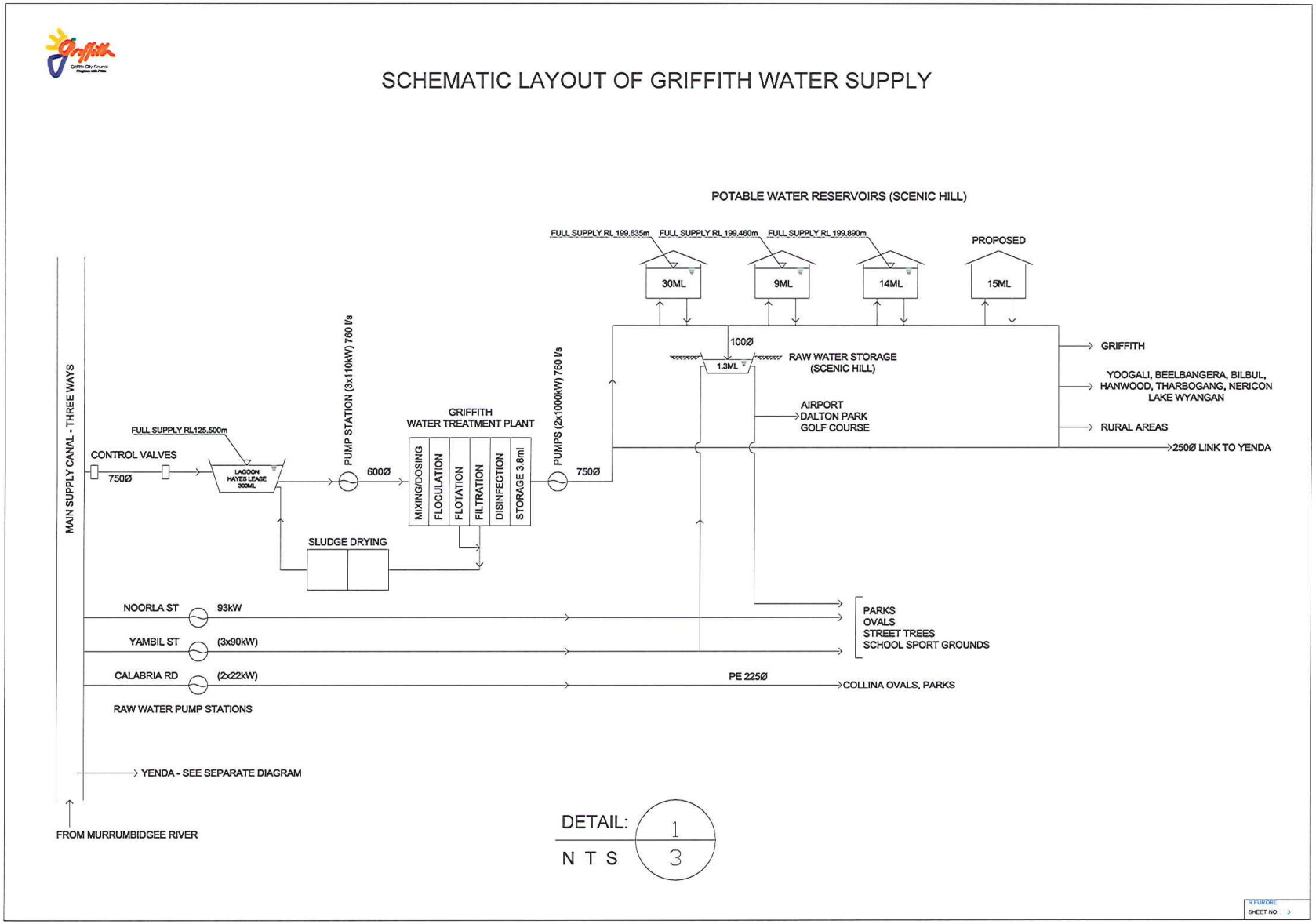

Figure B6: Griffith Water Supply System Schematic

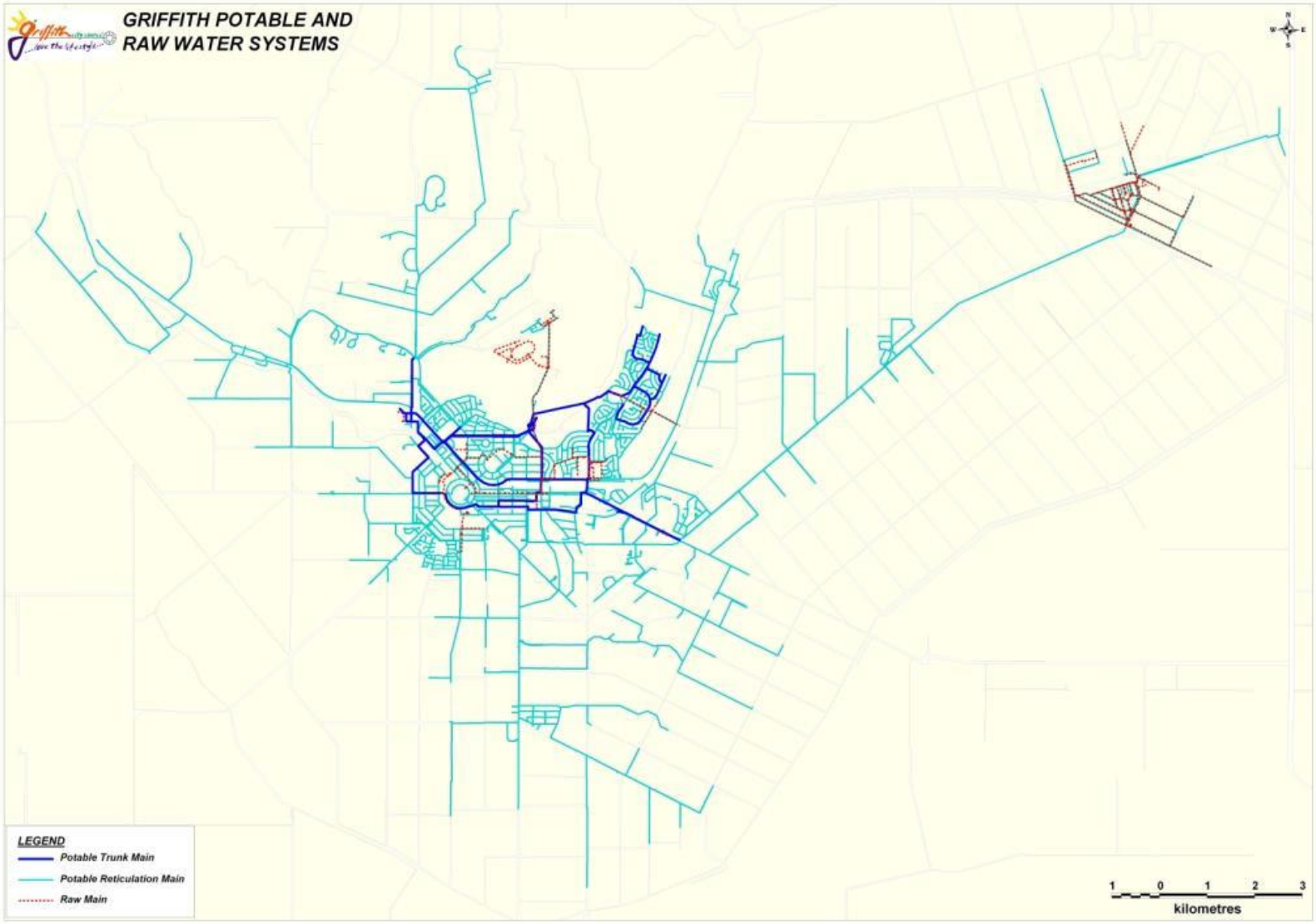

Figure B7: Griffith Reticulation System

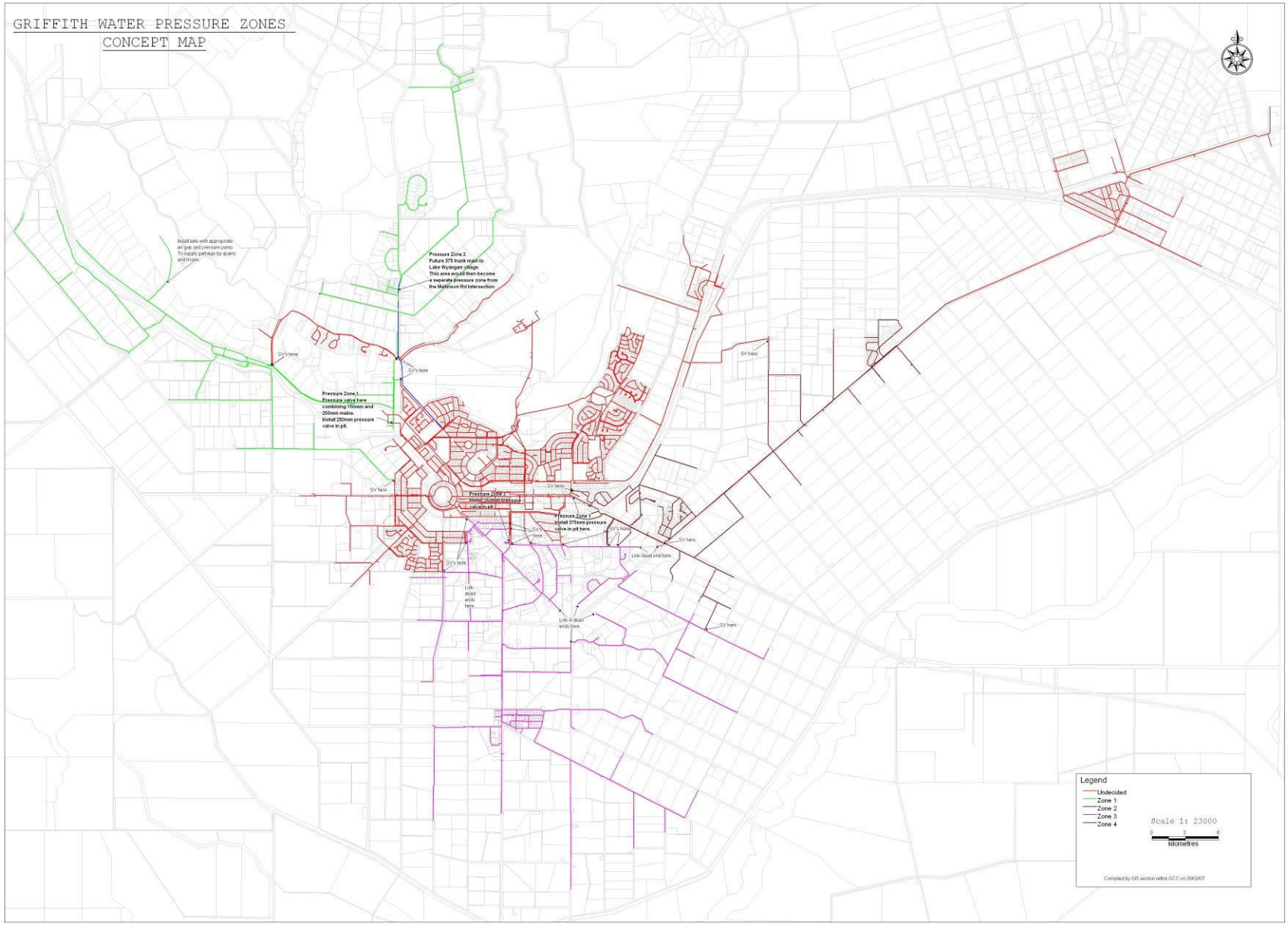

Figure B8: Griffith Water Supply Pressure Zones

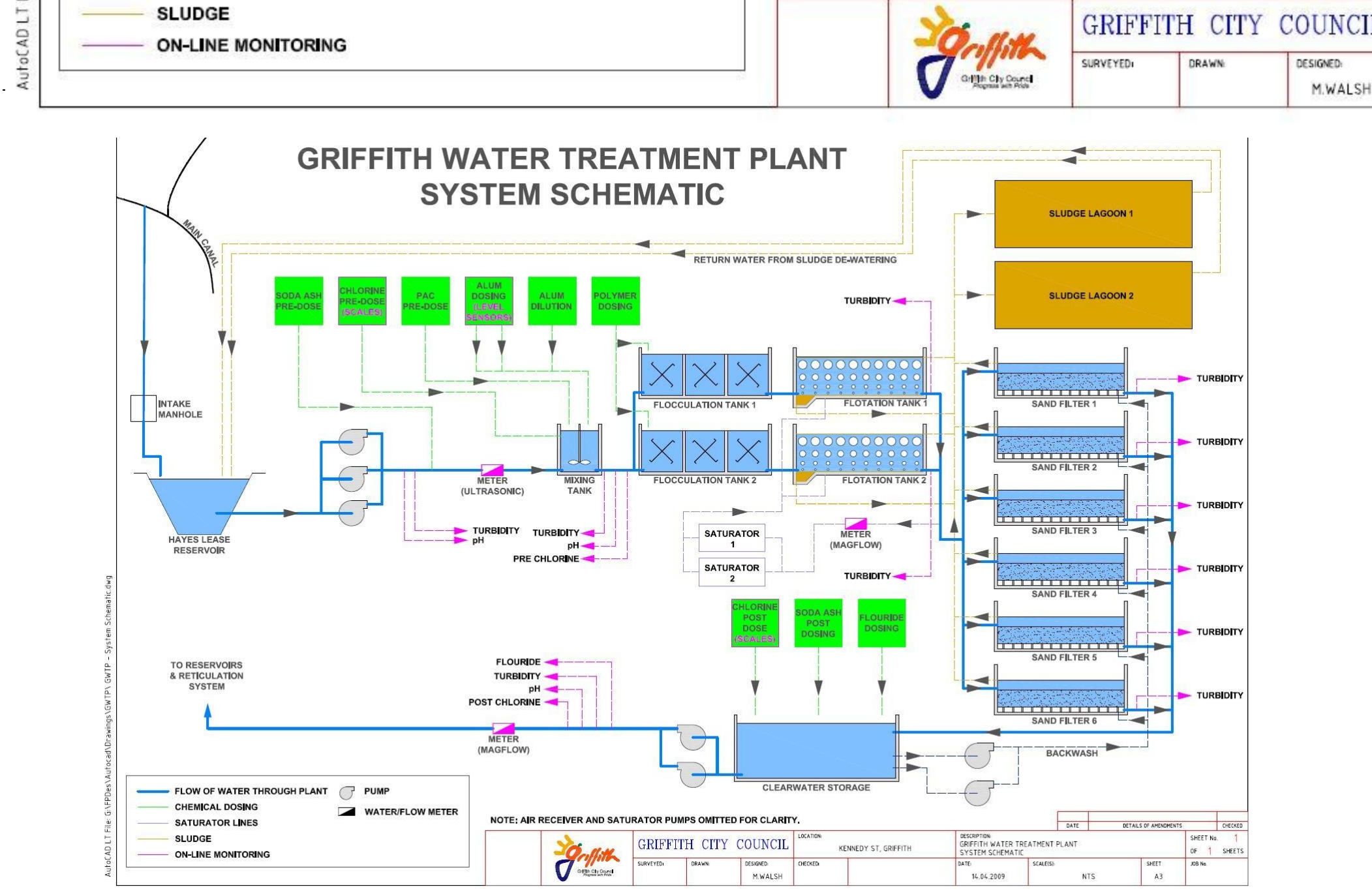

Figure B9: Griffith Water Treatment Plant Schematic

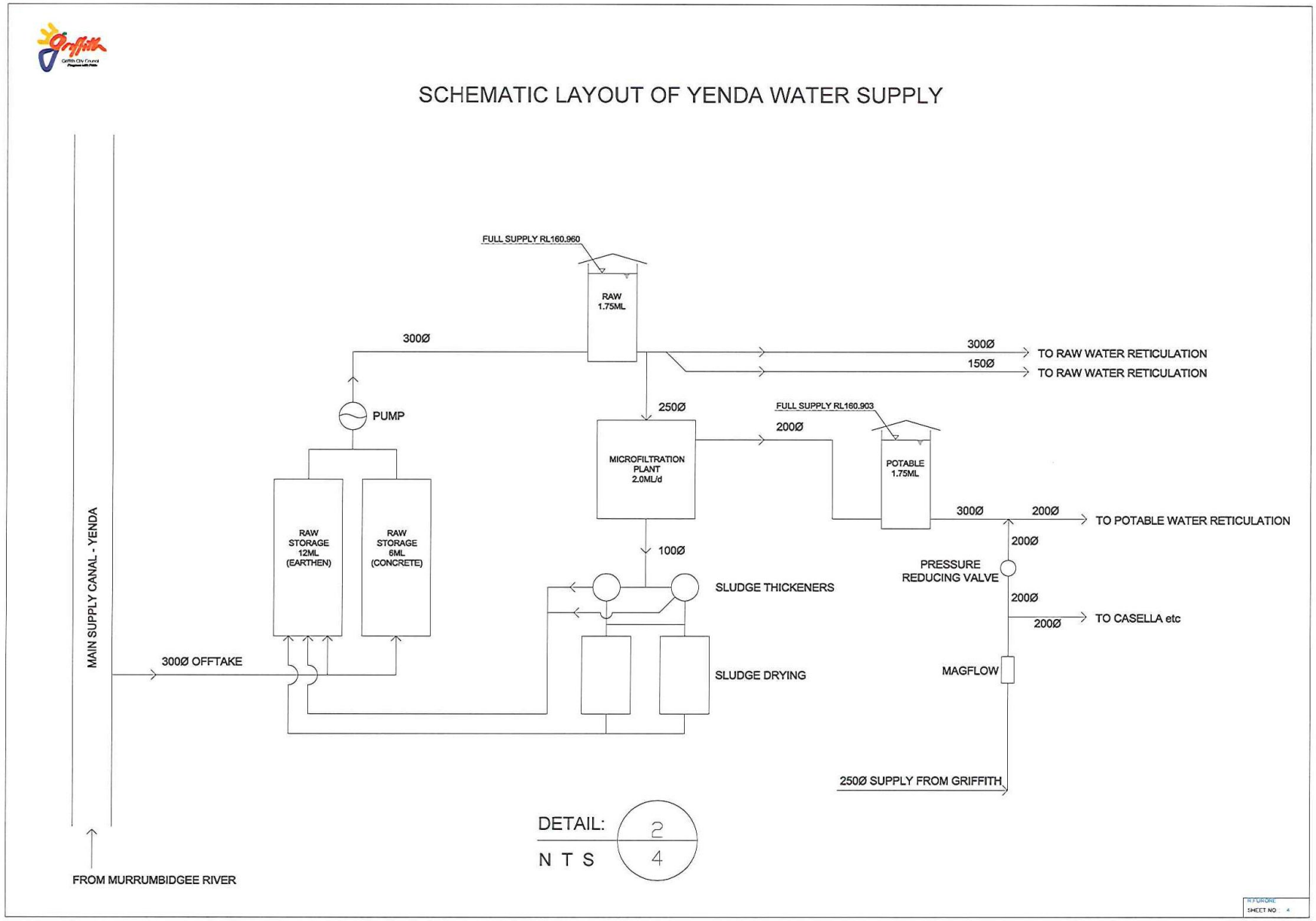

Figure B10: Yenda Water Supply System Schematic

B - 3
SEWERAGE SYSTEMS

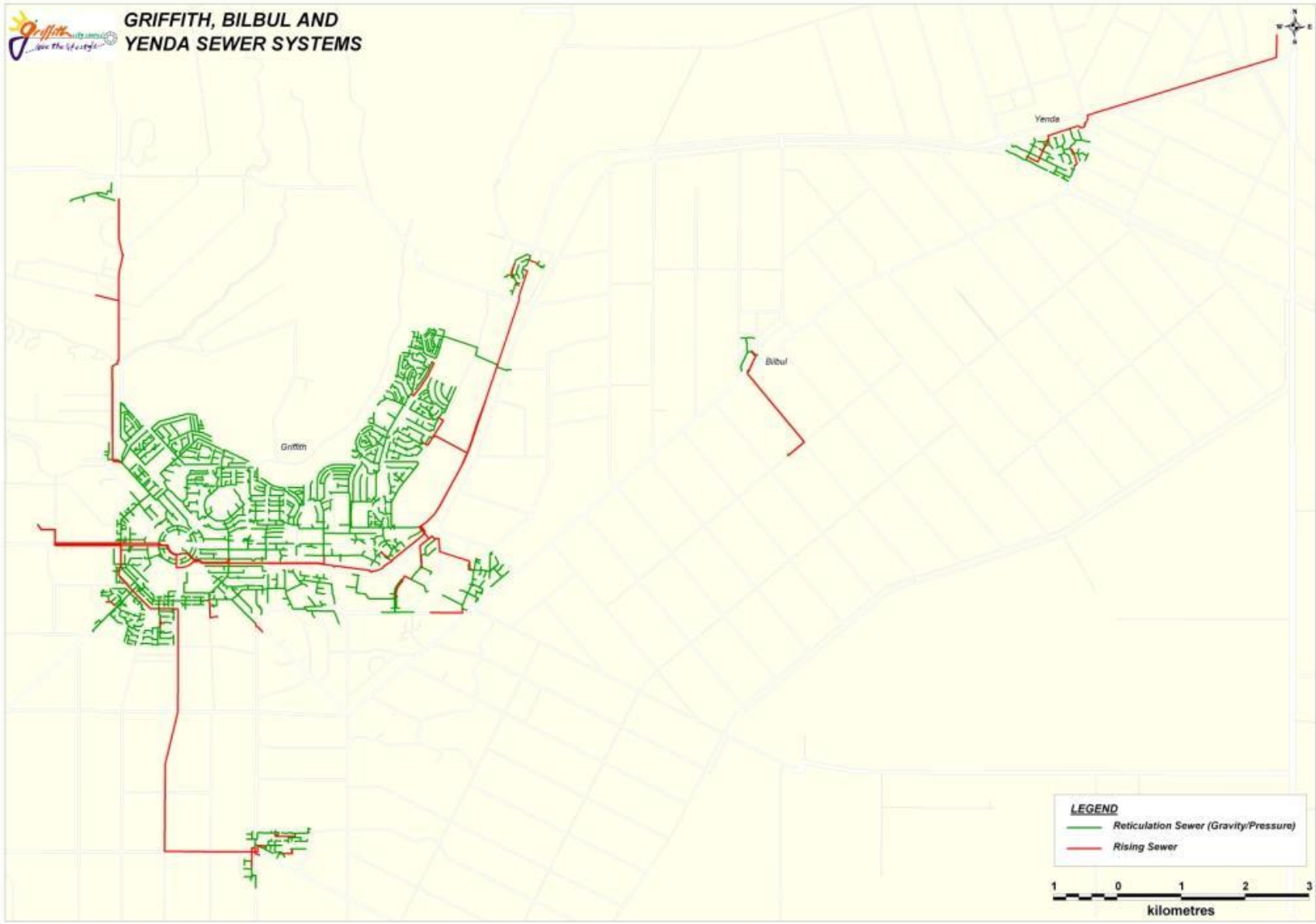

Figure B11: Griffith, Yenda & Bilbul Sewerage Systems

B-4
STORMWATER SYSTEMS

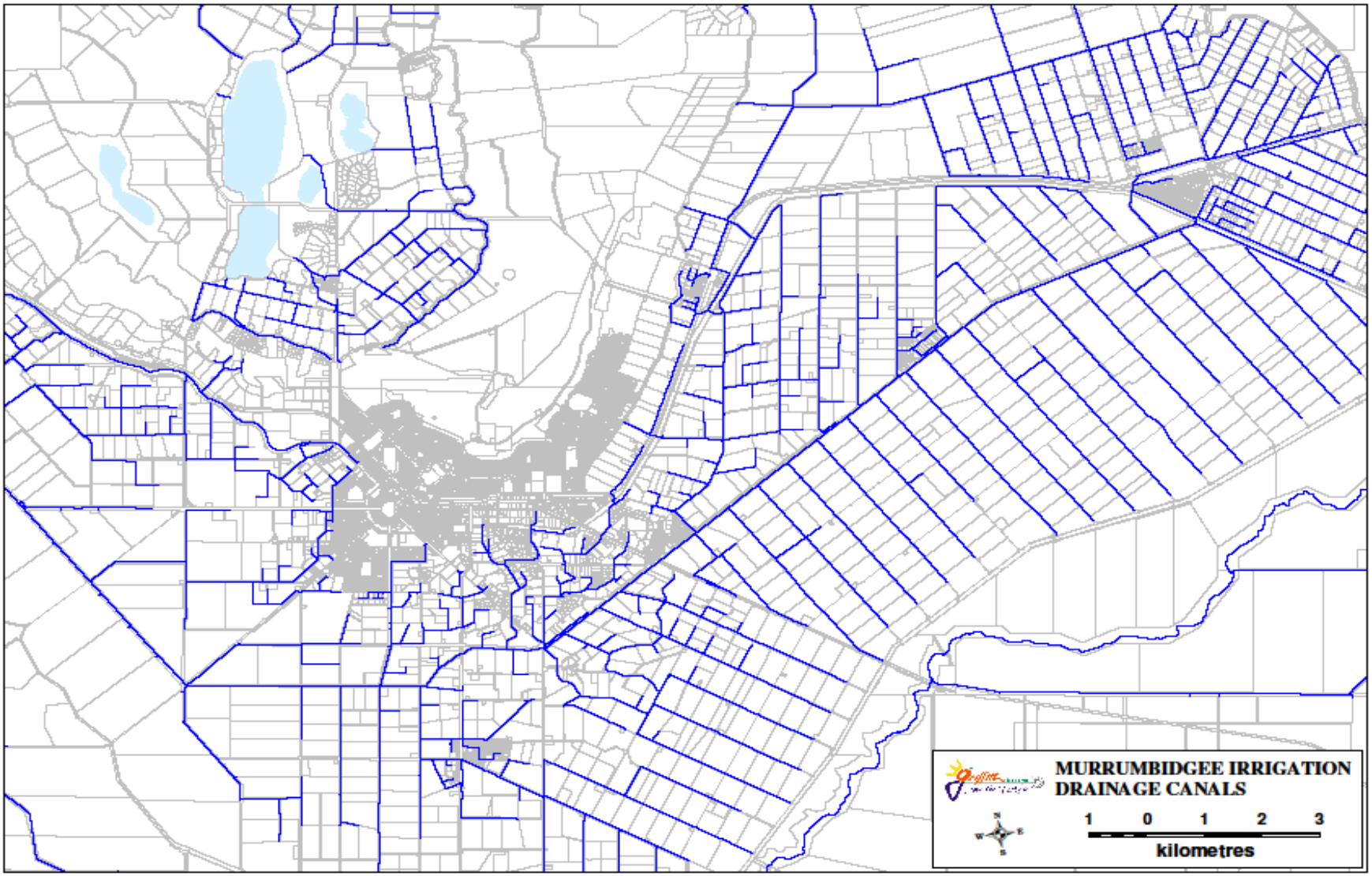

Figure B12: Griffith Drainage System

Figure B12(a): Location of Barren Box Swamp in relation to Griffith

(Source: Google Maps)

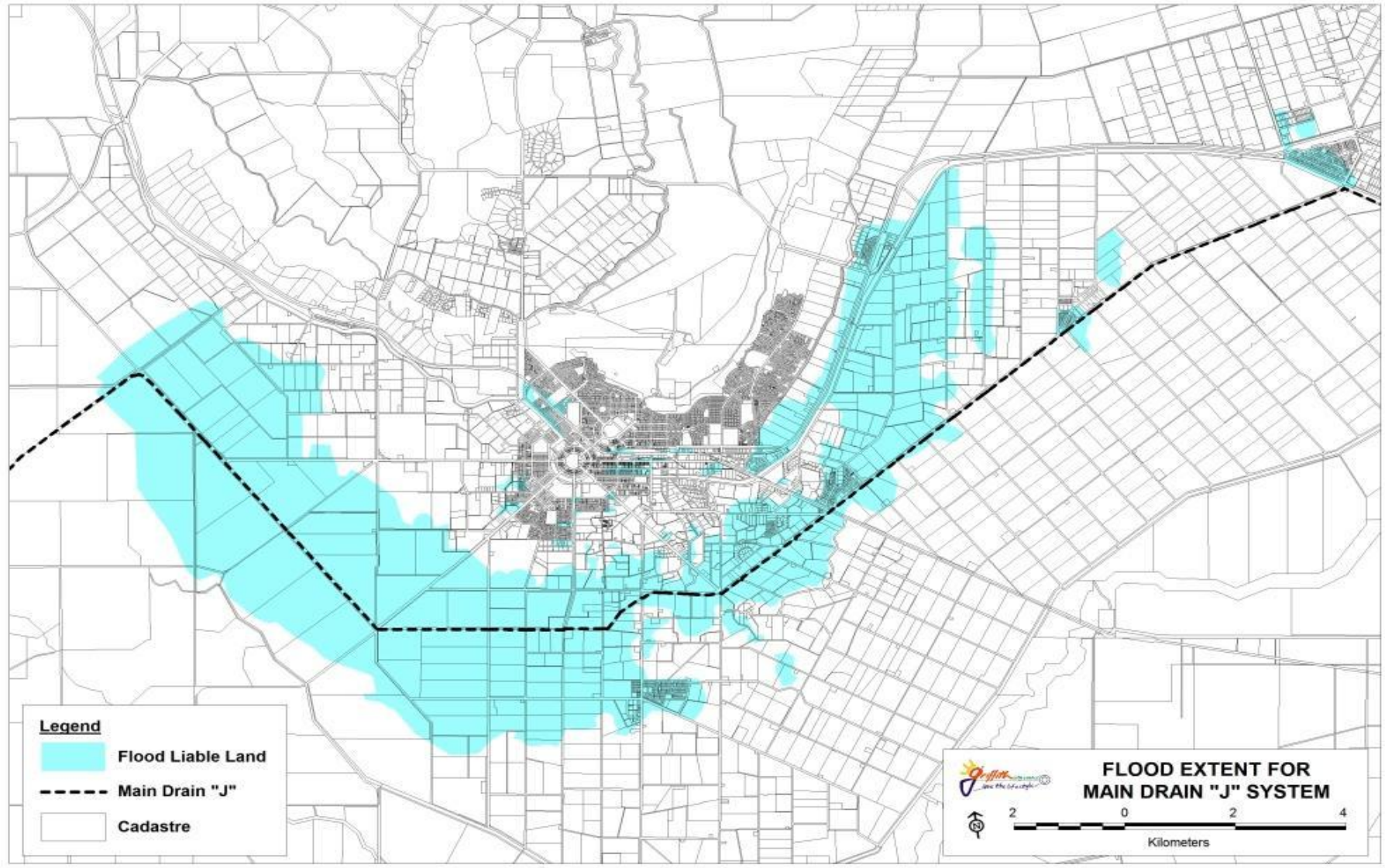

Figure B13: Flood Extent for Main Drain "J" System

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APPENDIX C

APPENDIX C: DEMAND MANAGEMENT & PROJECTIONS

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DEMAND MANAGEMENT MODELLING

1. INTRODUCTION

1.1 BACKGROUND

Griffith City Council (GCC) is responsible for the management and operation of water supply and sewerage in the Griffith Local Government Area.

This demand management analysis identifies potential water savings associated with the introduction of demand management measures in the GCC 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 options, each containing different water demand management measures. The Traditional Option, which provides baseline data against which the impacts of different water demand management measures can be compared, was also assessed.
- Analysis of the modelled water management measures. 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 options; and
    - water demand and effluent generation forecasts for the next 30 years for each of the options.

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 1.

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 options.

Item	Source	Comments
Climate	Climate data (daily rainfall, evaporation & maximum daily temperature) from the Griffith Airport Weather Station was used. Monthly Evaporation data from the Griffith Agricultural station (No. 063005)Weather Station was reviewed	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 Griffith was accessed from the 2006 Bureau of Statistics Census Tables.	The total population of Griffith was reported as 22,000
Demographic Data	From Council's customer data base.	A population growth rate of 0.7% pa was used.
Daily Water Production ML/d	Daily meter readings of water treated at the Water Treatment Plants.	Daily data is available from 1995/96.
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.	• Pumping & treatment costs for both water supply and sewerage. • Augmentation costs for planned 30 Year Capital Works. • Water Prices (volumetric charge per kilolitre).

Table C1: Data Used in Modelling

2. CURRENT WATER PRODUCTION AND CONSUMPTION

2.1 WATER CONSUMPTION PROFILE

Council's bulk supply is drawn from the canal system owned and operated by Murrumbidgee Irrigation (MI).

Council's Town Entitlement is the same as any other Town Entitlement in NSW, except that it is administered under MI's suite of entitlements (as administered by State Water). The Contract with MI is discussed in Appendix E: IWCM Related Targets, Obligations, Responsibilities and Requirements.

The total usage within the City in 2007/08 was 7,010 ML (including losses)

Details of customers supplied are shown in Table 2.

Population (Served with Water)	22,000
Assessments	
- Total	9,184
- Residential	7,706
- Non Residential	1,478

Table C2: Population Supplied with Filtered Water (2007/08)

(Source: GCC)

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 **2007/08** billing period, are shown in Table 3 below:

Category	*No. of Accounts*	*Consumption (ML)*	*%*
Residential Single	7706	3635	57.8
Commercial	514	539	8.5
Industrial	225	170	2.7
Public	74	205	3.2
Parks & Open Space	41	226	3.6
Rural	504	422	6.7
Other – non rateable	120	298	4.7
Metered/Billed Consumption		**5,515 ML**	**87.2%**
Unaccounted for Water (Losses)	-	1305	**20.6**
System Losses (7.8%)	-	-498	**-7.8**
Totals		6322	100.0

Table C3: Potable Water Consumption by Customer Category (2007/08)

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 2002/03 to 2007/08 indicates a range of UFW results – from 11.7% to 24.1%. The average UFW over the period was 18.5%; as shown in Table 4.
The actual, recorded system losses for 2007/08 are 7.8%. This water loss has been used in the modelling.
In order to quantify and monitor the level of Unaccounted for Water (UFW) and system losses in Griffith, Council is implementing a water loss detection and rectification program. To date, the following work has been undertaken:

- Wide Bay Water conducted an overall water loss audit in 2005, determining an Infrastructure Leakage Index (IFI) of 3.3
- a water loss audit and detection program has been carried out (Reference: Detection Services Pty. Ltd, February 2009)), involving 3000+ tenements and 121 km of mains
- a Pressure Reduction Zone (PRZ) was commissioned in December 2009 covering 3000+ tenements

- District Metering Zones will be constructed in 2010 to establish five (5) new metered zones (DMZs)

Council is proceeding to implement all the recommendations of the Wide Bay Water study, including replacement of customer meters throughout the City, on a priority basis.

Council's targets are to reduce losses to 10% by 2015 and to 5% by 2025 by eliminating system leaks, pressure reduction in selected areas and by capturing more, accurate records of consumption in the CBD (currently estimated where customers are not metered).

Year	Griffith Treated Water Production (ML/annum)	Yenda Treated Water Production (ML/annum)	Combined WTP Production (ML/annum)	Metered/Billed Consumption ML/annum)	Losses (1) %
1994/95	8343.4				
1995/96	7388.2	209.4	7597.6		
1996/97	8479.7	236.8	8716.5		
1997/98	9025.1	255.4	9280.5		
1998/99	7952.8	253.7	8206.5		
1999/00	6970.9	233.4	7204.3		
2000/01	8318.3	253.2	8571.4		
2001/02	8131.8	232.8	8364.6		
2002/03	8084.4	250.8	8335.2	6324	24.1%
2003/04	7246.5	331.3	7577.8	6692	11.7%
2004/05	7461.6	399.8	7861.4	6015	23.5%
2005/06	7539.5	504.5	8044.0	6551	18.56%
2006/07	7579.2	369.2	7948.4	6844	13.9%
2007/08	6399.2	421.7	6820.9	5516	19.13%
Annual Average	**7780.0**	**304.0**	**8040.7**	**6323.7**	**18.5%**

Table C4: Water Production, Consumption & Losses (Combined Griffith and Yenda WTPs)

Note (1): The 750 mm meter recording all potable water flows from the WTP was replaced in October 2007, due to inaccurate readings. The individual loss figures are, therefore, in question.
[The calculated total of unbilled water in 2008/09 was 17% (much of which probably relates to the number of properties in the CBD which are not metered)].

Data Gap: Verification of Water losses

3. ANALYSIS OF HISTORICAL WATER PRODUCTION

3.1 INTRODUCTION

Analysis of historical water production for Griffith was based on actual, observed production data.

Due to the limited daily production and annual consumption data available, it is considered that there is not likely to be a significant difference between the observed and climate corrected data.

It should be noted that the period covered by the modelling (1995/96 to 2007/08) represents a period of extreme drought conditions.

This may tend to skew the results towards a lower than "normal" consumption trend.

3.2 CLIMATE DATA

Key climate characteristics are summarised in Table 5.

Rainfall is relatively low; at an average of 406 mm; although rainfall is quite uniform throughout the year (on a month-by-month basis)

Average annual evaporation exceeds annual rainfall by nearly 1350 mm annually.

The data presented is long term (1909 to 2009) except for evaporation, which is recorded from 1966.

Table C5: Climate Data

(Source: Bureau of Meteorology)

Month	Mean Daily Maximum Temp. ^{o}C	Mean Daily Minimum Temp. ^{o}C	Mean Monthly Rainfall mm	Daily Evaporation mm
	(1909 to 2009)	(1909 to 2009)	(1908 to 2009)	(1966 to 2009)
January	31.6	16.3	29.2	8.7
February	31.3	16.4	27.8	8.0
March	28.1	13.6	34.4	6.0
April	22.9	9.4	33.0	3.5
May	18.4	6.4	37.8	2.0
June	14.8	4.0	37.2	1.4
July	14.3	2.9	33.2	1.6
August	16.2	4.0	40.9	2.3
September	19.6	6.0	32.5	3.4
October	23.2	9.1	41.3	4.9
November	27.0	11.9	28.5	7.1
December	30.1	14.7	30.7	8.1
Annual	23.1	9.6	406.0	4.8

2008 DATA				
January	34.1	18.3	51.6	10.2
February	29.7	14.2	18.2	7.9
March	30.8	12.8	8.4	7.2
April	23.3	6.5	24.2	7.5
May	19.8	4.5	9.0	2.3
June	17.4	4.8	34.0	1.8
July	14.8	2.7	29.8	1.9
August	15.4	1.7	20.8	2.9
September	22.1	4.0	22.0	5.5
October	26.6	8.8	20.2	7.8
November	26.8	11.5	67.0	7.5
December	28.8	12.5	45.8	8.9
Annual	24.1	8.5	351	6.0
Variation to Long Term Average.	+4.3%	-11.5%	-13.5%	+25%

It is interesting to note the impacts of the recent drought on the climate data. The data for 2008 shows that:

- The mean daily maximum temperature was 4.3% above the long term average
- The mean daily minimum temperature was 11.5% below the long term average
- Average rainfall was down 13.5%
- Average evaporation was up 25%

3.3 MODEL RESULTS

Figures 1(a) and 1(b) below show the observed potable water production for Griffith and Yenda from 1994 to 30 June 2008.
Figure 1(c) shows the combined results for both the Griffith and Yenda Plants.

Figure C1(a): Total Annual Treated Water Production - Griffith

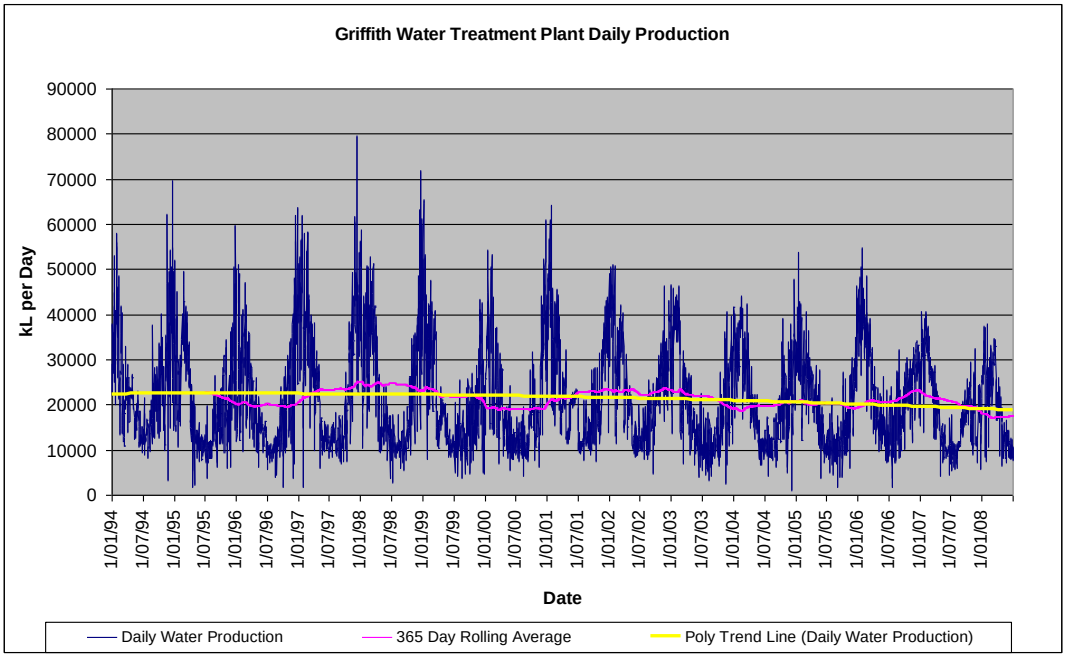


Figure C1(b): Total Annual Treated Water Production - Yenda

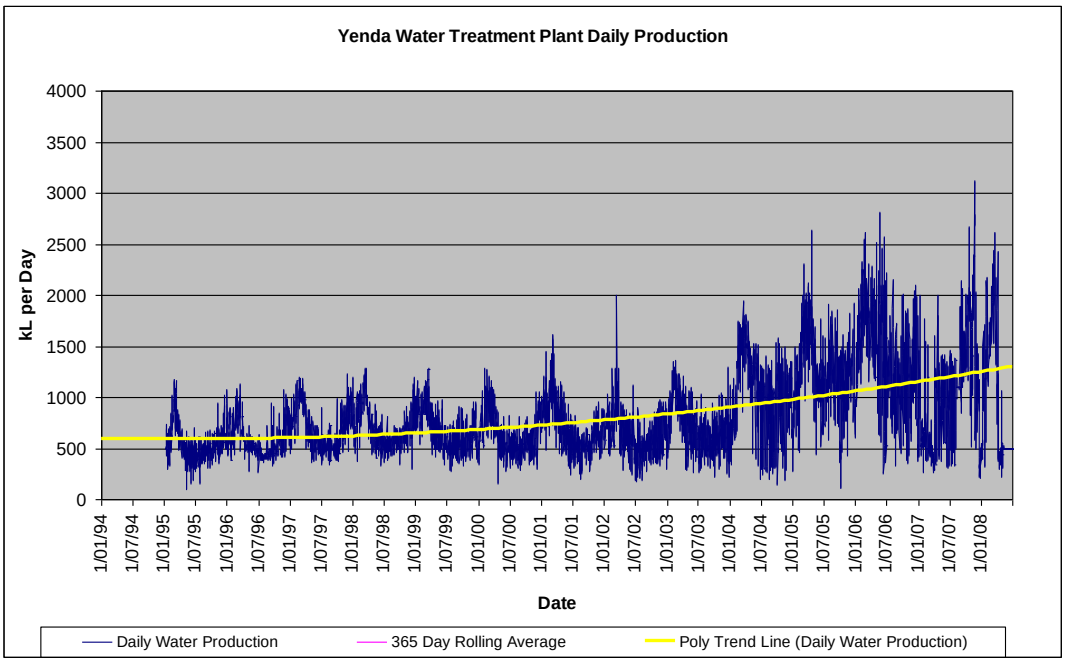
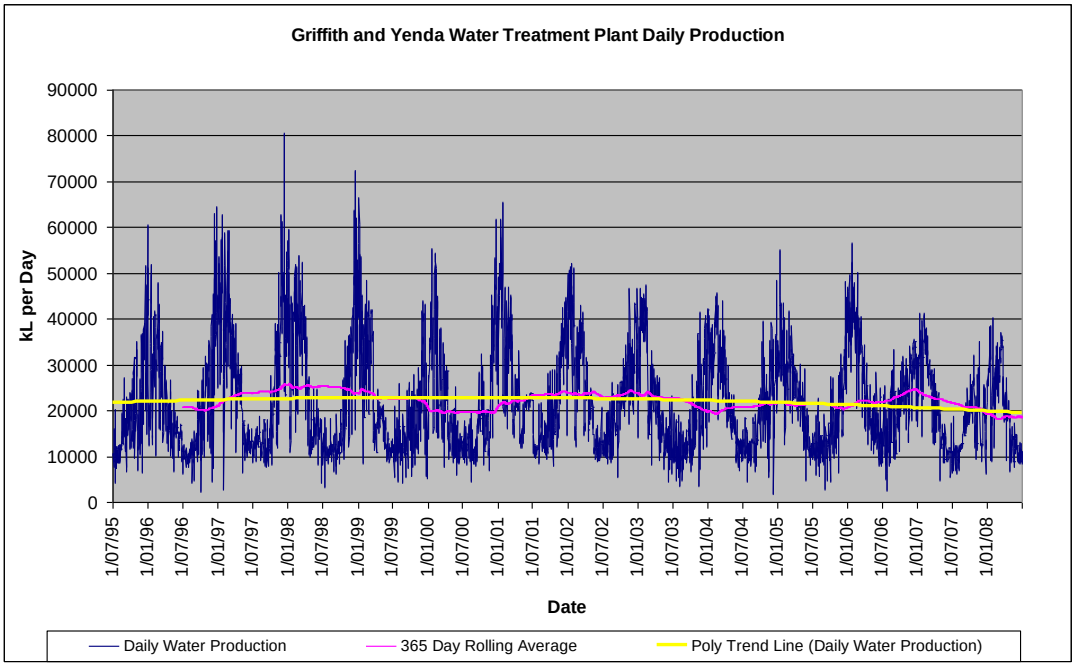


Figure C1(c): Total Annual Treated Water Production – Griffith & Yenda Combined

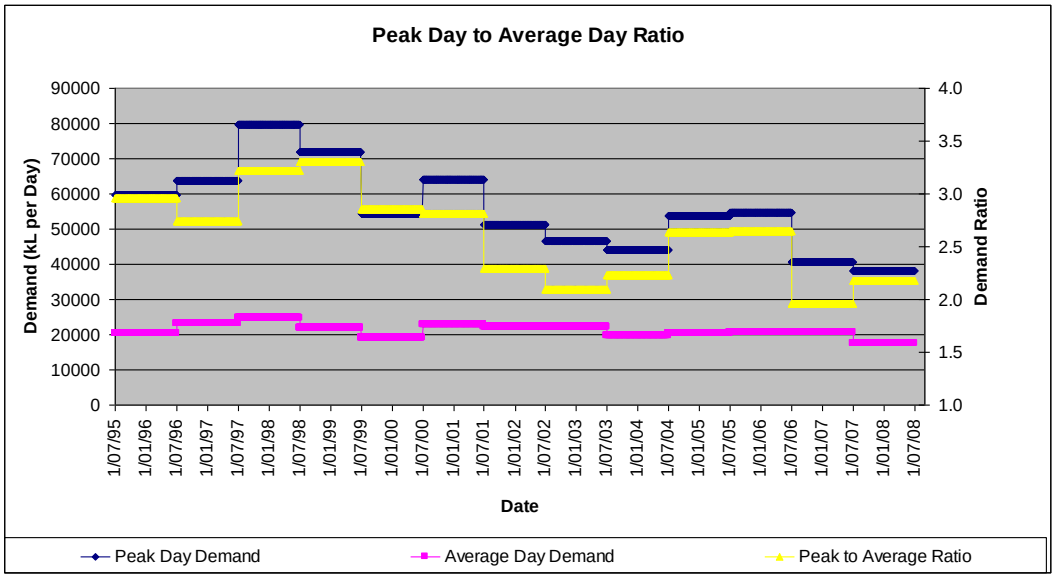


The trend is fairly constant over the period. There is a downward movement in 2001/02 and again in 2007/08, reflecting the impacts of water restrictions, pricing increases and Council's water conservation education and awareness programs.

3.4 PEAK DAY TO AVERAGE DAY DEMAND RATIOS

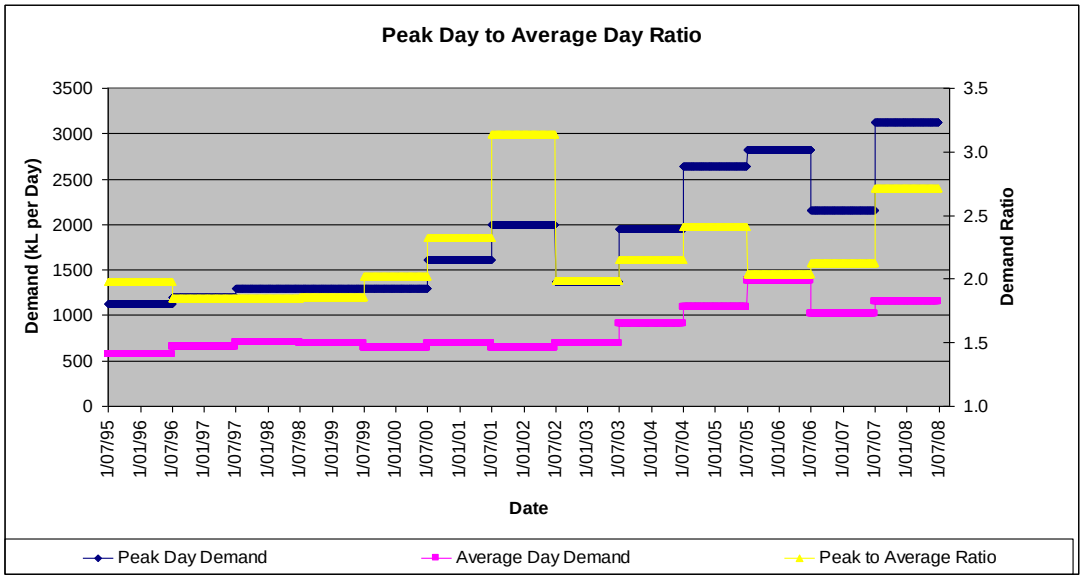
The observed peak to average day demand ratios for Griffith and Yenda are shown in Figures C2(a) and C2(b) below.
Figure C2(c) shows the combined results for both the Griffith and Yenda Plants.

Figure C2(a): Peak Day to Average Day Ratio - Griffith



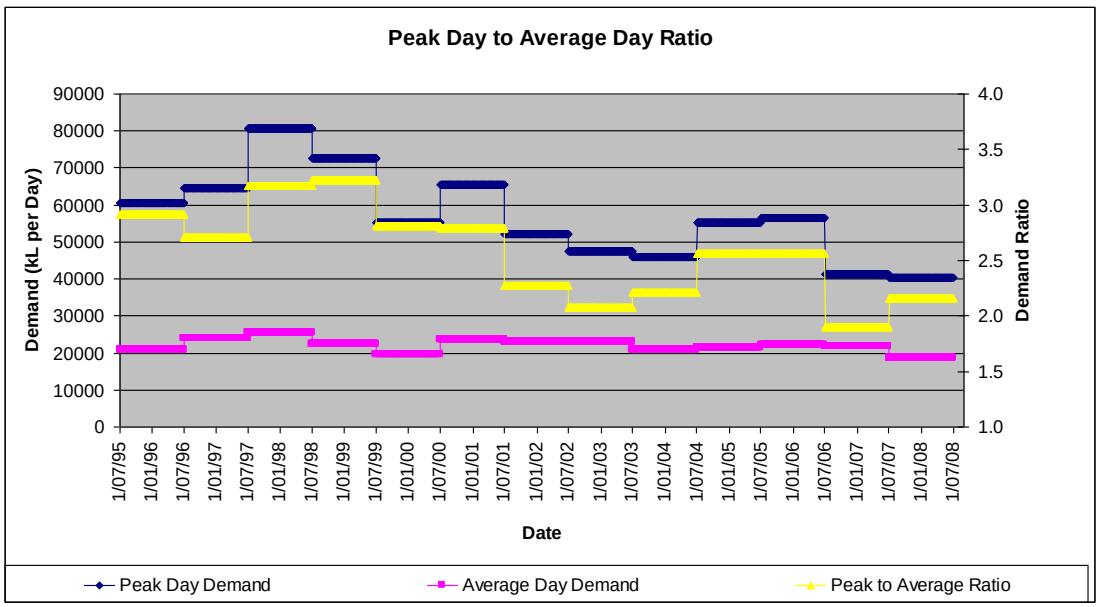
The observed peak day to average day demand ratio for **Griffith** ranged from 2.0 to 3.3 for the period from 1 July 1995 to 30 June 2008, with an average value of 2.6.
The peak to average demand ratio for 2007/08 was 2.2.

Figure C2(b): Peak Day to Average Day Ratio -Yenda



The observed peak day to average day demand ratio for **Yenda** ranged from 1.8 to 3.1 for the period from 1 July 1995 to30 June 2008, with an average value of 2.2.
The peak to average demand ratio for 2007/08 was 2.7.

Figure C2(c): Peak Day to Average Day Ratio –Griffith & Yenda Combined



The observed peak day to average day demand ratio ranged from 1.9 to 3.2 for the period from 1 July 1995 to 30 June 2008, with an average value of 2.6.
The peak to average demand ratio for 2007/08 was 2.2.
It is also important to note that the peak day consumption has fallen significantly since 1997/98. The 2007/08 peak day was approximately half the high of 80 ML/d.

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 Griffith City 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 options. The options included the Traditional Approach, which provides baseline data against which the impacts of different water demand management measures could be compared; and four integrated options. An integrated approach consists of one or more individual water demand management measures, including source substitution measure

The options were assessed to:

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

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

4.2 DATA

The following data were inputted to the DWE model to calculate the Traditional Approaches:

- 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 E6.

Element	
Current Year	2008
Current population served with water	22,000
People per residential assessment	2.9
Assumed change in people per residential assessment	-5.0%
Anticipated population growth	0.7%

Table C6: Demographic Data Used in Model

(Notes: 1. The Model calculated the number of persons per residential assessment
2. The populations were obtained from the 2006 Census.)

4.2.2 WATER USE DATA

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

The data used is summarised below in Tables C7 and C8.

Element	
Current annual water supplied (treated water)	7,764 ML/a
System Losses	7.8%
Peak to average day water demand ratio (2007/08)	2.2
Total length of water mains in system	483km

Table C7: Water Use Data

Customer Category	% of Total Water Consumed	Total number of accounts	Proportion of Customers Connected to Sewerage	Consumption per Account (L/d)
Residential	55.7%	7706	95%	1,424
Commercial	9.5%	514	100%	3,642
Industrial	4.0%	225	100%	3,503
Public	4.6%	74	100%	12,249
Parks and Open Space	3.5%	41	35%	16,821
Rural	5.4%	504	0	2,111
Other	5.2%	120	0	8,539
Unmetered	12.1%	0		
Total	100.0%		100.0%	

Table C8: Water Used By Paying Customers & Other Users (2007/08)

Notes: 1. The number of accounts is based on 2008 data, as supplied by GCC
2. The %age of total water consumed is based on the average metered consumption data and production data from 1 July 2003 to 30 June 2008
3. The model has utilized existing data to assess the demand profiles and determine potential savings for various demand management measures.

4.2.3 EVAPORATIVE COOLING

Council has advised that approximately 70% of residential properties have evaporative coolers.

DATA GAP: Results of efforts to reduce system losses and improve the percentage of metered properties.

4.2.4 RESIDENTIAL INTERNAL WATER USE

For the purpose of the model it has been assumed that 45% of treated water is used internally.

Residential Internal Water Use	
Assumed level of internal residential water use per person [(1)]	221L/d
Calculated percentage of indoor residential use:	45%

Table C9: Residential Internal Water Use

Note [(1)]: Council has not carried out surveys of average indoor/outdoor usage. The assumption of 45% utilised indoors is based on comparisons between summer and winter consumption levels.

Current water supply and sewerage operating and treatment costs were also inputted, as were planned future infrastructure works.

4.2.5 WATER PRICING

The water pricing data used in the Model is shown in Table C10 below:

Element	**2008/09**	**2009/10**
Residential Filtered Water up to 200 kL/a	$0.45/kL	$0.55/kL
> 200 kL/a	$0.70/kL	$0.90/kL
Residential Raw Water	$0.23/kL	$0.26/kL
Access Charge: Varies Base: 20 mm service	$108.00	$120.00

Table C10: Water Charges

It should be noted that these prices for consumption are significantly lower than the State wide median (in 2007/08) of $1.30/kL.

4.3 UNDERLYING ASSUMPTIONS

The simplified version of the Model makes a number of assumptions regarding water use. These are set out in Table C11 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:

Location	**Percentage Use (NSW)**
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.	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)	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: • 50% of the proportion of residential use for commercial and public users. • 90% for parks and open space uses. • 25% of the proportion of residential use for industrial users.

Table C11: Underlying Assumptions (Water Use) used in DEUS End Use Model

4.4 IWCM OPTIONS

4.4.1 OPTIONS CONSIDERED

The management measures used in the modelling are shown in Table C12 below:

Management Measure	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
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 C12: IWCM Options

The year 2009 was adopted as the starting year for estimating future water demands for each of the options.

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

Option 1: Continuing community education, system water loss management and on-going Government initiatives.

Option 2: Additional low cost management measure -conservation pricing.

Option 3: Includes water audits for non residential customers, fixture efficiency with the use of rain water and dual reticulation.

Option 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 C13 below:

Community Education (basic)	Council would provide materials, training and technical assistance to implement a basic ongoing community education program.
Community Education (intensive)	Council would provide materials, training and technical assistance to implement a comprehensive ongoing community education program.
Residential Retrofit Program	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
National Mandatory Water Efficiency Labelling Scheme (Already in place – therefore, not modelled)	A mandatory water efficiency labelling scheme (WELS) for toilets, washing machines, shower roses, taps, urinals and dishwashers was introduced in 2005
BASIX	The NSW Governments program to achieve a 20% reduction in water use in new residences
Rainwater Tanks on all New Residential Development	Council would mandate the need for rainwater tanks on all new development. For supply to toilet flushing, washing machine use and outdoor use
Dual Reticulation for New Subdivisions	Council would require all new subdivisions to be fitted with dual reticulation systems with recycled water to be used for toilet flushing and irrigation
Permanent Restrictions on Water Use	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
Conservation Pricing	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.
Active Leak Detection & Repair	Introduce a more active detection and repair program
Non-residential Water Audits	Allows for water audits for non-residential customers
Grey Water Reuse	Residences would install grey water treatment & recycling facilities for outdoor use

Table C13: Descriptions of Water Demand Management Measures

[Refer also to Part A of this Appendix C]

4.4.2 ASSESSMENT OF MEASURES

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 options are presented below.

Management Measure	B/C Ratio		Average Annual Water Saving (ML/year)
	Utility	Total Community	
Community Education	12.7	18.3	166.4
Permanent (Low Level) Water Saving Measures	59.4	59.4	418.2
Conservation Pricing for Residential Users	481.0	481.4	608.4
Non-Residential Water Audits	11.4	5.8	17.8
System Water Loss Management	0.1	0.1	32.2
Rainwater Tanks for all New Residential Development	17.3	0.2	745.7
Dual Reticulation for all New Residential Development	113.7	1.3	1012.9
BASIX - Fixture Efficiency with Rainwater Use	26.0	0.6	819.1
BASIX - Fixture Efficiency with Dual Reticulation	110.0	1.7	1086.2
Evaporative Cooling Unit and Cooling Tower Audit	0.1	0.1	7.2

Table C14: Water Savings and B/C ratios for Demand Management Measures

The data in the above table indicates that dual reticulation for all new residential development and BASIX, (with both rainwater use and dual reticulation) have the greatest benefits in terms of water savings.

Conservation pricing and permanent (low level) water saving measures also provide significant water savings.

BASIX fixture efficiency with dual reticulation is shown to yield the highest annual water saving, with clearly the highest utility and community B/C ratio.

From a Benefit/Cost perspective, conservation pricing for residential users is clearly the best option, followed by permanent low level water restrictions

4.4.3 FUTURE WATER DEMANDS

- Total Water Demand Forecasts

The average (2008 to 2038) water demands and water savings for each of the IWCM options are summarised in the table below:

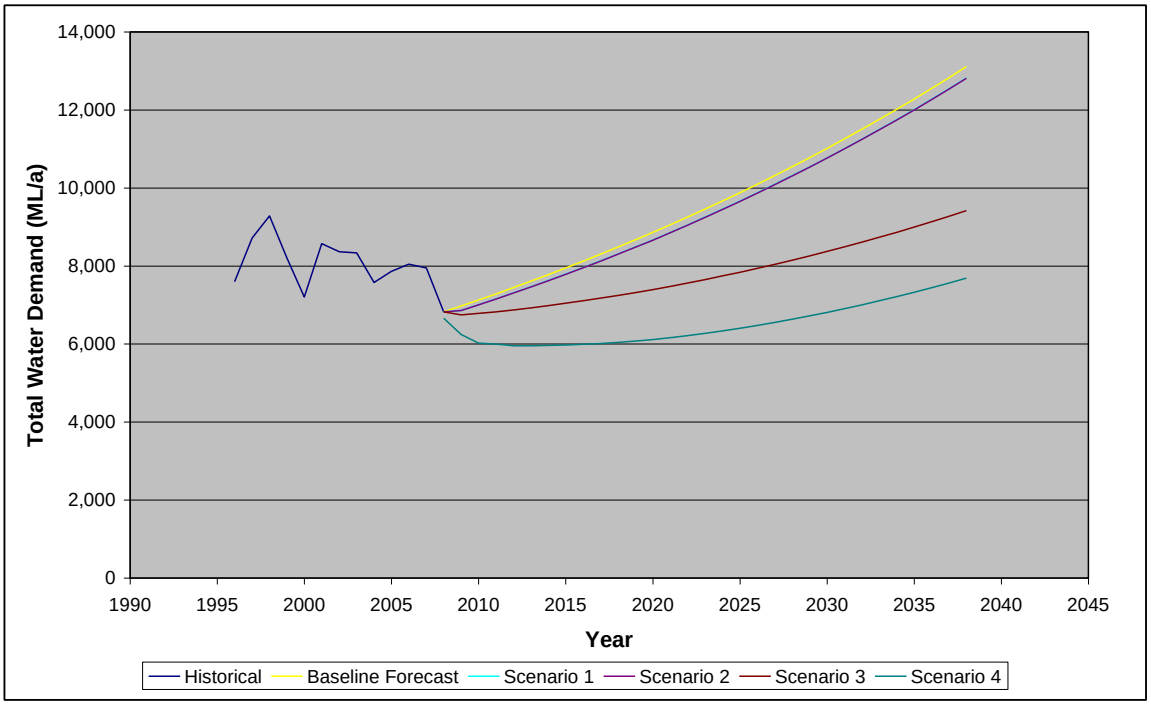
IWCM Option	**Total Water Used ML/year**	**Average Water Saved**	
		(ML/Year)	**%**
Baseline	6,825		
Scenario 1	6,626	199	3
Scenario 2	6,619	206	3
Scenario 3	4,986	1,839	27
Scenario 4	3,697	3,128	46

Table C15: 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 46% are achievable (according to the Model) depending on which of the options is adopted. Clearly, Option 4 is predicted to yield the highest savings.

Figure C3: Total Water Demand Forecasts



- Peak Day Demand Forecasts

  The Peak Daily Demand forecasts for the options considered are shown in Figure 4.

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

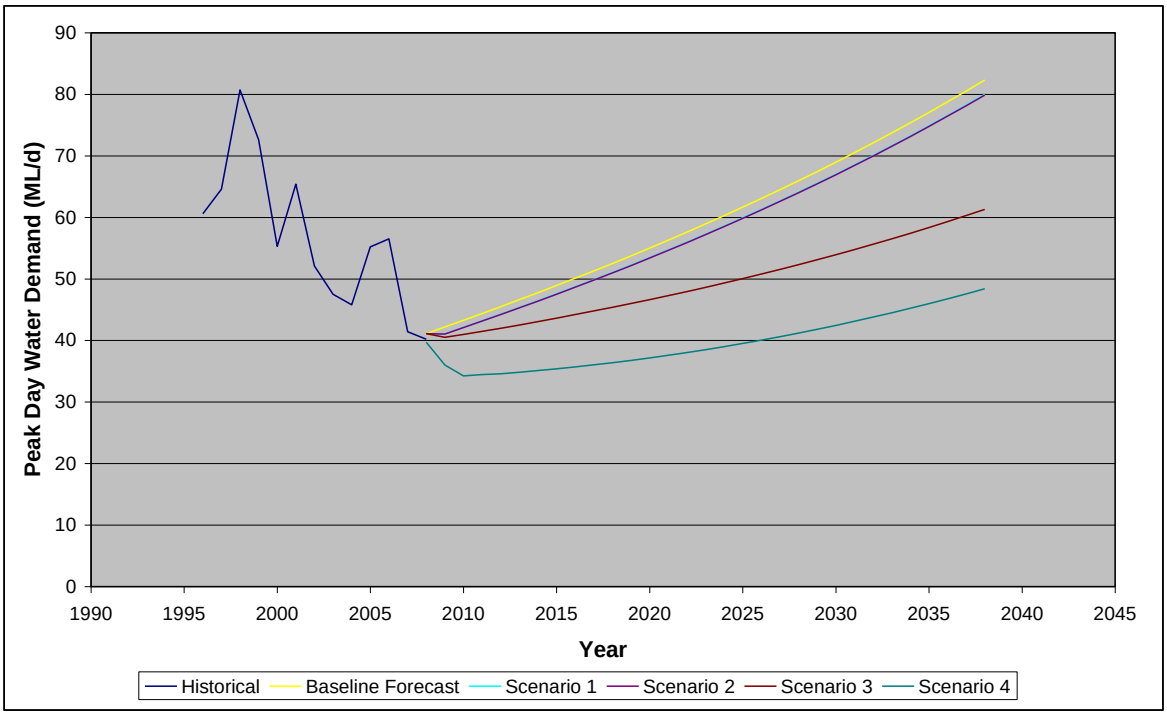
The results indicate that the Griffith Plant (capacity 60 ML/d) will only have sufficient capacity until 2025/26 under the baseline forecast. Implementation of the demand management measures listed in the four options will extend the life of the Plant, - to 2027 under Option 1 and 2; to 2038 under Option 3 and substantially beyond 2038 under Option 4.

It is noted that provision for increasing the capacity of the Griffith WTP has been allowed in the 30 year Forward Capital Works Program for 2023/2024.

Council has advised that future upgrade timelines will be re-evaluated when the proposed demand management initiatives are completed and assessed.

Potential Issues: Reassessment of timing for WTP upgrade.

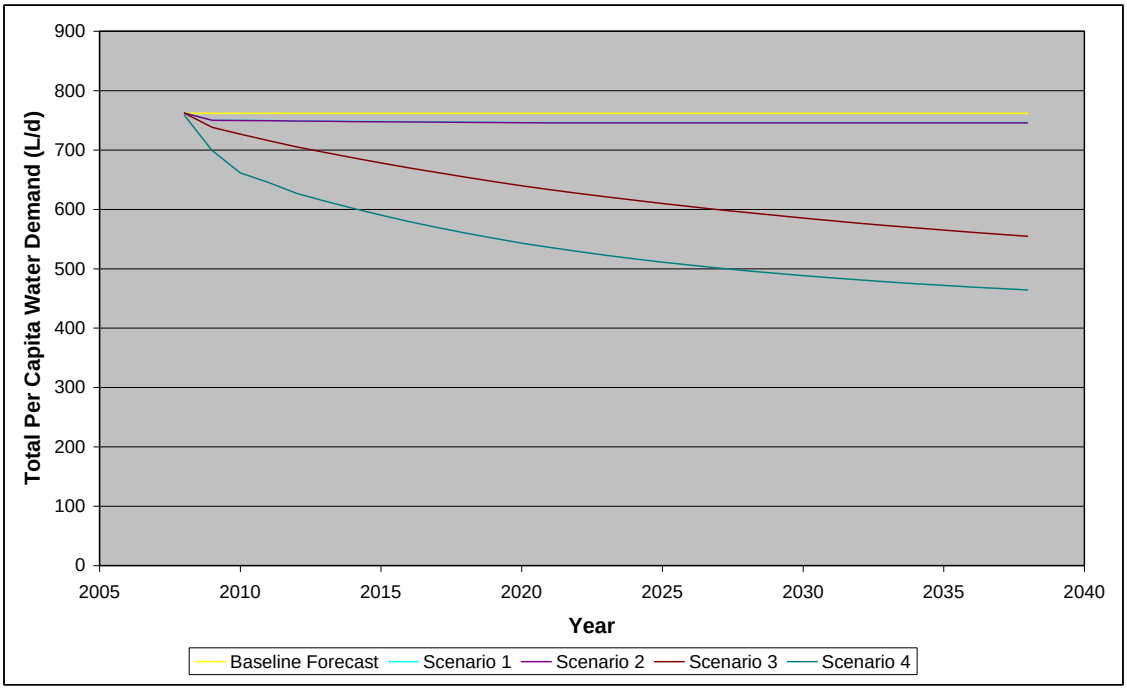
Figure C4: Peak Day Demand Forecasts



- Total Per Capita Water Demand

Figure C5 shows the impact of the various demand management options on per capita water demand to 2038. There is a reduction in demand under all options, relatively minor under Options 1 and 2, but it becomes particularly significant under Options 3 and 4.

Figure C5: Total Per Capita Water Demand Forecast Options



- Future Wastewater Flows

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

  Average daily flows are shown in Figure E6 and peak wet weather flows are shown in Figure E7.

  For an existing Plant capacity of 99,000 EP or 23.25 ML/d, (Griffith STP: 64,000 EP; Yenda STP: 34,000 EP), capacity is predicted to exceed the 30 year planning horizon.

Figure C6: Wastewater Flows Options

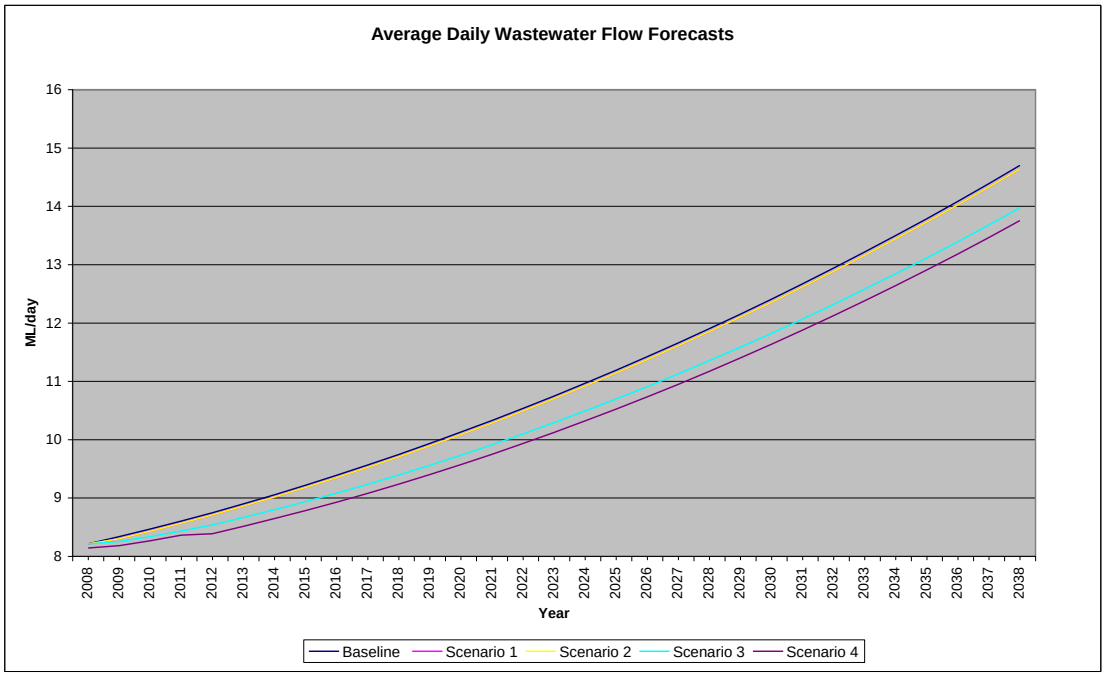
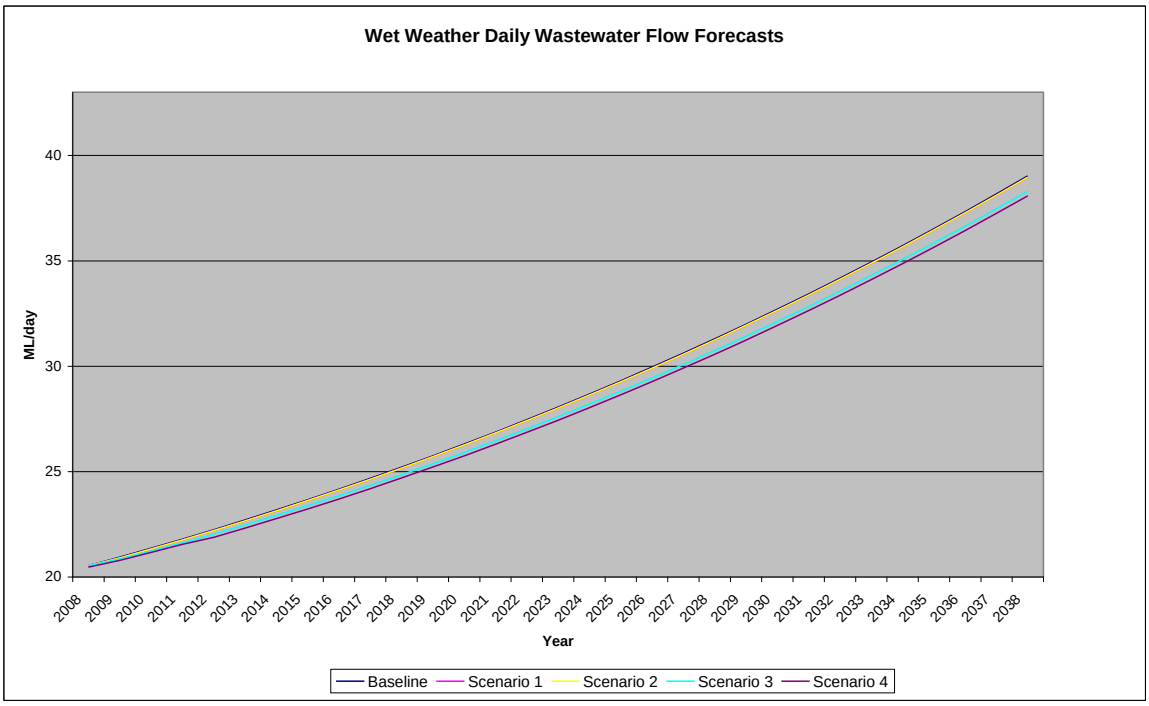


Figure C7: Wastewater Wet Weather Flows Scenario



5. CURRENT WATER CONSERVATION INITIATIVES

Griffith City 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:

(a) Education Programs:

- **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 Griffith City 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.

- **Advertising**

  Council publishes a weekly report in the *Area News* newspaper on the amount of water produced for the past week at the Griffith Water Treatment Plant.

  Council also occasionally publishes water conservation tips in the newspaper and provides relevant information with water accounts.

  Council tends not to use radio or television advertising, except for information about water restrictions.

- **WELS**

  Council provides a link to the WELS (Water Efficiency, Labelling & Standards Scheme) and offers rebates to residents on water efficient shower roses, toilets and washing machines.

- **Brochures**

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

  - Saving water in the garden
  - Hints on bucket watering
  - How to monitor a water meter
  - A guide to grey water diversions

(b) Water Restrictions

During this drought Council has utilised its Drought Management Plan and, in conjunction with the NSW Office of Water, has introduced water restrictions, as required.

Restrictions introduced over the last 2 years have been:

- Level 4 mandatory restrictions introduced in June 2007
- Council adopted its formal restrictions policy in August 2007
- Level 3 implemented in September 2007
- Level 2 implemented in November 2007 and again in May 2908
- Level 1 implemented in April 2009, followed up by Level 3 in August 2009.

(c) Pricing Policy

As outlined in Section B5, demand management is essential for effective and efficient management. Council is increasing the water usage component of the bill and reading meters and billing four (4) 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 currently developing a pricing regime which will generate 75% of revenue via **consumption charges,** which will be a powerful demand management initiative.

Currently (2008/09), consumption charges account for:

- 72% of water charges
- 65% of total revenue.

(d) Others

- **Water Loss Program**

  Water losses have been identified as a major issue for Griffith City Council's water supply system. Overall, nearly 21% of water produced is unaccounted for and 7.8% has been attributed to system losses. This is considered high and, as a result, Council has undertaken a Water Loss Analysis (*Water Loss Audit & Leak Detection*, Detection Services Pty. Ltd., February 2009) and has implemented a pressure reduction zone (PRZ) for 3000+ tenements, constructed a further PRZ, constructed 5 new District Metered Zones and is developing a water meter replacement program and developing additional strategies to reduce system wide leakage

- **Rainwater Tanks**

  Council supports the installation of rainwater tanks (for the purposes outlined in Section B6).

  Details of rebates available, under the NSW Government's Rainwater Tank Rebate scheme, are made available to residents and are posted on Council's website.

6. SUMMARY AND CONCLUSIONS

Griffith City Council provides water supply and sewerage services to a population of 32,700. The City is continuing to grow, with an annual increase in population of around 0.7%.pa

The main conclusions of this Report are:

- Water consumption has reduced from a high of 6,844 ML in 2006/07 to 5,516 ML in 2008/09 (primarily as a result of the implementation of Level 3 water restrictions), with an average over the six (6) year period, from 2002/03 to 2007/08, of 6324 ML ;
- The average annual water production (water treated) since 1994/95, has been 7,780 ML;
- Unaccounted for water (UFW) since 2002/03 has averaged 18.5%. This is considered to be quite high and a target of 5 – 6% UFW would be more appropriate. System losses in 2007/08 were approximately 7.8%.

The UFW percentages have been derived as the difference between the volumes of water treated at the Water Filtration Plants and those volumes that have actually been billed for. Since the actual **water losses** are not known, Council is proceeding with a full water loss investigation and rectification program.

- Residential water consumption is relatively high by national standards at 1,414 L/per residential property per day or 491 L/person/d (2007/08). Approximately 55% of this water is used outside the home (lawns, gardens, pools etc)
- The peak to average day usage ratio is 2.2 (2007/08), which is similar to similarly sized cities throughout NSW
- Council's water usage charges are based on an inclining block tariff, with the first 200 kL provided at $0.55/kL. Thereafter, the charge is $0.90/kL (2009/10 charges).
- These charges are low in comparison with other regional cities and towns in NSW. The State wide median consumption charge (first tier charge) in 2007/08 was $1.30/kL. (This is a weighted median and is based as a percentage of connected properties across the State. The median, based on a percentage of LWUs was $1.10/kl).

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

i). Dual reticulation for all new residential development and implementation of BASIX (with both rainwater use and dual reticulation) will deliver the greatest benefits in terms of **water savings**.

Conservation pricing for residential users and permanent (low level) water saving measures will also yield significant water savings.

Conservation pricing is shown to yield the highest annual water savings with clearly the highest utility and community **benefit/cost ratio**, followed by permanent low level water restrictions.

ii). Full uptake of the demand management initiatives modelled may deliver significant water savings – up to 3,128 Ml/year (or 46% reduction) for Scenario 4 initiatives, or 1,839 Ml/year (or 27% reduction) for Scenario 3 initiative.

iii). The results indicate that the capacity of the Water Treatment Plant will be reached by 2025/26. Implementation of Options 1 and/or 2 will extend the life until 2027. Implementation of Option 3 demand management initiatives is expected to extend the life of the plant (in terms of capacity) to 2038.

iv). the capacity of the Sewage Treatment Plant is not expected to be reached within the 30 year planning period.

Council has a commitment to water conservation in the City 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 promotion of rainwater tanks.

The greatest cost benefit options will be derived from full implementation of residential conservation pricing and permanent low level saving measures.

7. REFERENCES

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ATTACHMENT to Appendix C: End Use Model Tables

Demand Management Least Cost Planning - Decision Support System

Baseline Forecasts

Existing Demand Measures:

Community Education

Water Restrictions

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Resident Population Served with water						22,000	22,484	22,979	23,484	24,001	24,529	25,068	25,620	26,184	26,760	27,348	27,950	28,565	29,193	29,836	30,492
Persons per Residential Account						2.85	2.85	2.85	2.85	2.84	2.84	2.84	2.83	2.83	2.83	2.83	2.82	2.82	2.82	2.81	2.81
Annual Average Water Consumption (ML/year)																					
Historical	8,335	7,578	7,861	8,044	7,948	6,821															
Baseline Forecast						6824.6	6974.7	7128.1	7285.0	7445.2	7609.0	7776.4	7947.5	8122.3	8301.0	8483.7	8670.3	8861.0	9056.0	9255.2	9458.8
Peak Day Demand (ML)																					
Historical	47.50	45.80	55.20	56.50	41.40	40.19															
Baseline Forecast						41.11	42.19	43.28	44.38	45.49	46.62	47.76	48.92	50.10	51.30	52.51	53.75	55.01	56.29	57.59	58.92
Per Capita Demand (L/person/day)																					
Baseline Forecast						849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30
Forecast Waste Water Flows (ML/day)																					
Daily Average						8.21	8.34	8.47	8.60	8.75	8.90	9.06	9.22	9.39	9.56	9.75	9.93	10.13	10.33	10.53	10.75
Design Wet Weather						20.53	20.94	21.36	21.79	22.24	22.70	23.17	23.66	24.16	24.67	25.20	25.74	26.30	26.87	27.46	28.06

Demand Management Least Cost Planning - Decision Support System

Baseline Forecasts (cont'd)

Existing Demand Measures:

Community Education

Water Restrictions

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Resident Population Served with water	31,163	31,848	32,549	33,265	33,997	34,745	35,509	36,291	37,089	37,905	38,739	39,591	40,462	41,352	42,262
Persons per Residential Account	2.81	2.81	2.80	2.80	2.80	2.79	2.79	2.79	2.79	2.78	2.78	2.78	2.77	2.77	2.77
Annual Average Water Consumption (ML/year)															
Historical															
Baseline Forecast	9666.9	9879.6	10097.0	10319.1	10546.1	10778.1	11015.2	11257.6	11505.2	11758.4	12017.0	12281.4	12551.6	12827.7	13110.0
Peak Day Demand (ML)															
Historical															
Baseline Forecast	60.27	61.65	63.06	64.49	65.95	67.44	68.97	70.52	72.10	73.72	75.37	77.05	78.77	80.53	82.32
Per Capita Demand (L/person/day)															
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30
Forecast Waste Water Flows (ML/day)															
Daily Average	10.97	11.19	11.42	11.66	11.90	12.15	12.41	12.67	12.94	13.22	13.50	13.79	14.08	14.39	14.70
Design Wet Weather	28.67	29.30	29.95	30.61	31.29	31.99	32.70	33.43	34.17	34.93	35.72	36.52	37.33	38.17	39.03

Demand Management Least Cost Planning - Decision Support System

Scenario 1

New Demand Measures:

Community Education
System Water Loss Management

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Demand Measures Water Savings (ML/year)																						
Community Education	0.00	118.53	121.73	124.96	128.22	131.52	134.86	138.24	141.67	145.16	148.69	152.29	155.94	159.66	163.44	167.28	171.20	175.19	179.26	183.40	187.63	191.93
System Water Loss Management	0.00	0.00	0.00	2.99	6.11	9.37	12.77	16.32	20.01	23.86	27.87	32.04	36.39	37.19	38.00	38.84	39.69	40.57	41.46	42.37	43.30	44.26
Calculated Total Savings	0.00	118.53	121.73	127.95	134.33	140.89	147.63	154.56	161.69	169.02	176.56	184.33	192.33	196.84	201.44	206.13	210.90	215.76	220.72	225.78	230.93	236.19
Total Water Savings Scenario 1 (Modelled)	**0.00**	**118.53**	**121.73**	**127.95**	**134.33**	**140.89**	**147.63**	**154.56**	**161.69**	**169.02**	**176.56**	**184.33**	**192.33**	**196.84**	**201.44**	**206.13**	**210.90**	**215.76**	**220.72**	**225.78**	**230.93**	**236.19**
Annual Average Water Consumption (ML/year)																						
Baseline Forecast	6824.6	6974.7	7128.1	7285.0	7445.2	7609.0	7776.4	7947.5	8122.3	8301.0	8483.7	8670.3	8861.0	9056.0	9255.2	9458.8	9666.9	9879.6	10097.0	10319.1	10546.1	10778.1
Integrated Scenario 1	6824.6	6856.2	7006.4	7157.0	7310.9	7468.1	7628.8	7792.9	7960.7	8132.0	8307.1	8486.0	8668.7	8859.1	9053.8	9252.7	9456.0	9663.8	9876.2	10093.3	10315.2	10541.9
Total Water Savings	0.0	118.5	121.7	127.9	134.3	140.9	147.6	154.6	161.7	169.0	176.6	184.3	192.3	196.8	201.4	206.1	210.9	215.8	220.7	225.8	230.9	236.2
Peak Day Demand (ML)																						
Baseline Forecast	41.11	42.19	43.28	44.38	45.49	46.62	47.76	48.92	50.10	51.30	52.51	53.75	55.01	56.29	57.59	58.92	60.27	61.65	63.06	64.49	65.95	67.44
Integrated Scenario 1	41.11	41.06	42.12	43.18	44.26	45.35	46.46	47.58	48.72	49.88	51.05	52.25	53.47	54.71	55.98	57.26	58.58	59.92	61.28	62.68	64.10	65.54
Per Capita Demand (L/person/day)																						
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30
Integrated Scenario 1	849.88	835.44	835.37	834.96	834.55	834.15	833.75	833.35	832.96	832.58	832.19	831.81	831.44	831.41	831.38	831.36	831.34	831.32	831.30	831.29	831.27	831.26
Waste Water Flows (ML/day)																						
Daily Average Baseline	8.21	8.34	8.47	8.60	8.75	8.90	9.06	9.22	9.39	9.56	9.75	9.93	10.13	10.33	10.53	10.75	10.97	11.19	11.42	11.66	11.90	12.15
Integrated Scenario 1	8.21	8.30	8.43	8.57	8.71	8.86	9.02	9.18	9.35	9.52	9.71	9.89	10.09	10.29	10.49	10.70	10.92	11.14	11.37	11.61	11.85	12.10
Design Wet Weather Baseline	20.53	20.94	21.36	21.79	22.24	22.70	23.17	23.66	24.16	24.67	25.20	25.74	26.30	26.87	27.46	28.06	28.67	29.30	29.95	30.61	31.29	31.99
Integrated Scenario 1	20.53	20.90	21.32	21.75	22.20	22.66	23.13	23.62	24.12	24.63	25.16	25.70	26.26	26.83	27.41	28.01	28.63	29.26	29.90	30.56	31.24	31.94

Demand Management Least Cost Planning - Decision Support System

Scenario 1 cont'd

New Demand Measures:

Community Education

System Water Loss Management

Year	2030	2031	2032	2033	2034	2035	2036	2037	2038	
Demand Measures Water Savings (ML/year)										
Community Education	196.33	200.81	205.38	210.04	214.80	219.66	224.62	229.68	234.85	EDUC
System Water Loss Management	45.23	46.23	47.24	48.28	49.34	50.43	51.54	52.67	53.83	LOSS
Calculated Total Savings	241.56	247.03	252.62	258.33	264.15	270.09	276.16	282.35	288.68	Calc
Total Water Savings Scenario 1 (Modelled)	**241.56**	**247.03**	**252.62**	**258.33**	**264.15**	**270.09**	**276.16**	**282.35**	**288.68**	BCP1
Annual Average Water Consumption (ML/year)										
Baseline Forecast	11015.2	11257.6	11505.2	11758.4	12017.0	12281.4	12551.6	12827.7	13110.0	BAS
Integrated Scenario 1	10773.7	11010.5	11252.6	11500.0	11752.9	12011.3	12275.5	12545.4	12821.3	BCP1
Total Water Savings	241.6	247.0	252.6	258.3	264.1	270.1	276.2	282.4	288.7	BCP1
Peak Day Demand (ML)										
Baseline Forecast	68.97	70.52	72.10	73.72	75.37	77.05	78.77	80.53	82.32	BAS
Integrated Scenario 1	67.02	68.53	70.07	71.64	73.24	74.88	76.55	78.25	79.99	BCP1
Per Capita Demand (L/person/day)										
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	BAS
Integrated Scenario 1	831.24	831.23	831.22	831.21	831.20	831.19	831.18	831.18	831.17	SET
Waste Water Flows (ML/day)										
Daily Average Baseline	12.41	12.67	12.94	13.22	13.50	13.79	14.08	14.39	14.70	BAS
Integrated Scenario 1	12.36	12.62	12.89	13.16	13.44	13.73	14.03	14.33	14.64	BCP1
Design Wet Weather Baseline	32.70	33.43	34.17	34.93	35.72	36.52	37.33	38.17	39.03	BAS
Integrated Scenario 1	32.65	33.37	34.12	34.88	35.66	36.46	37.28	38.11	38.97	BCP1

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	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Demand Measures Water Savings (ML/year)																		
Total Water Savings Scenario 1	0.0	118.5	121.7	127.9	134.3	140.9	147.6	154.6	161.7	169.0	176.6	184.3	192.3	196.8	201.4	206.1	210.9	215.8
Evaporative Cooling Unit and Cooling Tower Audit	0.00	1.13	2.29	3.49	4.73	6.00	6.15	6.31	6.46	6.62	6.78	6.94	7.11	7.28	7.44	7.62	7.79	7.97
Calculated Total Savings	0.00	119.66	124.02	131.44	139.06	146.89	153.78	160.87	168.15	175.64	183.35	191.28	199.44	204.12	208.89	213.74	218.69	223.73
Total Water Savings Scenario 2 (Modelled)	**0.00**	**119.66**	**124.02**	**131.44**	**139.06**	**146.89**	**153.78**	**160.87**	**168.15**	**175.64**	**183.35**	**191.28**	**199.44**	**204.12**	**208.89**	**213.74**	**218.69**	**223.73**
Annual Average Water Consumption (ML/year)																		
Baseline Forecast	6824.6	6974.7	7128.1	7285.0	7445.2	7609.0	7776.4	7947.5	8122.3	8301.0	8483.7	8670.3	8861.0	9056.0	9255.2	9458.8	9666.9	9879.6
Integrated Scenario 2	6824.6	6855.0	7004.1	7153.5	7306.2	7462.1	7622.6	7786.6	7954.2	8125.4	8300.3	8479.0	8661.6	8851.9	9046.3	9245.1	9448.2	9655.9
Total Water Savings	0.0	119.7	124.0	131.4	139.1	146.9	153.8	160.9	168.2	175.6	183.3	191.3	199.4	204.1	208.9	213.7	218.7	223.7
Peak Day Demand (ML)																		
Baseline Forecast	41.11	42.19	43.28	44.38	45.49	46.62	47.76	48.92	50.10	51.30	52.51	53.75	55.01	56.29	57.59	58.92	60.27	61.65
Integrated Scenario 2	41.11	41.05	42.10	43.15	44.21	45.29	46.39	47.51	48.65	49.81	50.98	52.18	53.39	54.63	55.90	57.19	58.50	59.83
Per Capita Demand (L/person/day)																		
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30
Integrated Scenario 2	849.88	835.30	835.10	834.55	834.01	833.48	833.08	832.68	832.29	831.90	831.52	831.13	830.75	830.73	830.70	830.68	830.66	830.64
Waste Water Flows (ML/day)																		
Daily Average Baseline	8.21	8.34	8.47	8.60	8.75	8.90	9.06	9.22	9.39	9.56	9.75	9.93	10.13	10.33	10.53	10.75	10.97	11.19
Integrated Scenario 2	8.21	8.30	8.43	8.57	8.71	8.86	9.02	9.18	9.35	9.52	9.71	9.89	10.09	10.29	10.49	10.70	10.92	11.14
Design Wet Weather Baseline	20.53	20.94	21.36	21.79	22.24	22.70	23.17	23.66	24.16	24.67	25.20	25.74	26.30	26.87	27.46	28.06	28.67	29.30
Integrated Scenario 2	20.53	20.90	21.32	21.75	22.20	22.66	23.13	23.62	24.12	24.63	25.16	25.70	26.26	26.83	27.41	28.01	28.63	29.26

Demand Management Least Cost Planning - Decision Support System

Scenario 2 cont'd

Demand Measures:

Existing: Community Education
System Water Loss Management

New: Evaporative Cooling Unit and Cooling Tower Audit

Year		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	
Demand Measures Water Savings (ML/year)															
Total Water Savings Scenario 1		220.7	225.8	230.9	236.2	241.6	247.0	252.6	258.3	264.1	270.1	276.2	282.4	288.7	BCP1
Evaporative Cooling Unit and Cooling Tower Audit		8.15	8.33	8.52	8.71	8.90	9.10	9.30	9.50	9.71	9.92	10.13	10.35	10.58	COOL
Calculated Total Savings		228.87	234.11	239.45	244.90	250.46	256.13	261.92	267.83	273.85	280.01	286.29	292.71	299.26	Calc
Total Water Savings Scenario 2 (Modelled)		**228.87**	**234.11**	**239.45**	**244.90**	**250.46**	**256.13**	**261.92**	**267.83**	**273.85**	**280.01**	**286.29**	**292.71**	**299.26**	BCP2
Annual Average Water Consumption (ML/year)															
Baseline Forecast		10097.0	10319.1	10546.1	10778.1	11015.2	11257.6	11505.2	11758.4	12017.0	12281.4	12551.6	12827.7	13110.0	BAS
Integrated Scenario 2		9868.1	10085.0	10306.7	10533.2	10764.8	11001.4	11243.3	11490.5	11743.2	12001.4	12265.3	12535.0	12810.7	BCP2
Total Water Savings		228.9	234.1	239.4	244.9	250.5	256.1	261.9	267.8	273.9	280.0	286.3	292.7	299.3	BCP2
Peak Day Demand (ML)															
Baseline Forecast		63.06	64.49	65.95	67.44	68.97	70.52	72.10	73.72	75.37	77.05	78.77	80.53	82.32	BAS
Integrated Scenario 2		61.20	62.59	64.01	65.45	66.93	68.43	69.97	71.54	73.14	74.77	76.44	78.14	79.88	BCP2
Per Capita Demand (L/person/day)															
Baseline Forecast		849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	BAS
Integrated Scenario 2		830.62	830.60	830.59	830.57	830.56	830.55	830.53	830.52	830.51	830.51	830.50	830.49	830.48	SET
Waste Water Flows (ML/day)															
Daily Average Baseline		11.42	11.66	11.90	12.15	12.41	12.67	12.94	13.22	13.50	13.79	14.08	14.39	14.70	BAS
Integrated Scenario 2		11.37	11.61	11.85	12.10	12.36	12.62	12.89	13.16	13.44	13.73	14.03	14.33	14.64	BCP2
Design Wet Weather Baseline		29.95	30.61	31.29	31.99	32.70	33.43	34.17	34.93	35.72	36.52	37.33	38.17	39.03	BAS
Integrated Scenario 2		29.90	30.56	31.24	31.94	32.65	33.37	34.12	34.88	35.66	36.46	37.28	38.11	38.97	BCP2

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	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Demand Measures Water Savings (ML/year)																	
Total Water Savings Scenario 2	0.0	119.7	124.0	131.4	139.1	146.9	153.8	160.9	168.2	175.6	183.3	191.3	199.4	204.1	208.9	213.7	218.7
Non-Residential Water Audits	0.0	6.8	13.7	18.5	23.4	21.1	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.8	18.8	18.8
BASIX - Fixture Efficiency with Rainwater Use	0.00	46.77	94.08	141.97	190.48	239.65	289.53	340.15	391.55	443.76	496.83	550.79	605.67	661.52	718.36	776.24	835.19
BASIX - Fixture Efficiency with Dual Reticulation	0.00	60.60	122.19	184.80	248.44	313.14	378.94	445.87	513.96	583.25	653.78	725.59	798.72	873.20	949.08	1026.41	1105.22
Calculated Total Savings	0.00	233.80	353.99	476.72	601.42	720.77	840.92	965.57	1092.36	1221.37	1352.68	1486.39	1622.56	1757.58	1895.09	2035.15	2177.87
Total Water Savings Scenario 3 (Modelled)	**0.00**	**229.62**	**343.99**	**459.28**	**574.94**	**683.69**	**791.69**	**902.63**	**1014.17**	**1126.40**	**1239.40**	**1353.27**	**1468.08**	**1580.21**	**1693.29**	**1807.39**	**1922.60**
Annual Average Water Consumption (ML/year)																	
Baseline Forecast	6824.6	6974.7	7128.1	7285.0	7445.2	7609.0	7776.4	7947.5	8122.3	8301.0	8483.7	8670.3	8861.0	9056.0	9255.2	9458.8	9666.9
Integrated Scenario 3	6824.6	6745.1	6784.1	6825.7	6870.3	6925.3	6984.7	7044.9	7108.2	7174.6	7244.3	7317.0	7393.0	7475.8	7561.9	7651.4	7744.3
Total Water Savings	0.0	229.6	344.0	459.3	574.9	683.7	791.7	902.6	1014.2	1126.4	1239.4	1353.3	1468.1	1580.2	1693.3	1807.4	1922.6
Peak Day Demand (ML)																	
Baseline Forecast	41.11	42.19	43.28	44.38	45.49	46.62	47.76	48.92	50.10	51.30	52.51	53.75	55.01	56.29	57.59	58.92	60.27
Integrated Scenario 3	41.11	40.50	40.99	41.48	41.98	42.51	43.07	43.63	44.20	44.79	45.38	46.00	46.63	47.27	47.94	48.62	49.32
Per Capita Demand (L/person/day)																	
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30
Integrated Scenario 3	849.88	821.90	808.87	796.30	784.25	773.52	763.36	753.36	743.76	734.56	725.72	717.23	709.08	701.58	694.39	687.49	680.85
Waste Water Flows (ML/day)																	
Daily Average	8.21	8.34	8.47	8.60	8.75	8.90	9.06	9.22	9.39	9.56	9.75	9.93	10.13	10.33	10.53	10.75	10.97
Integrated Scenario 3	8.21	8.25	8.34	8.43	8.54	8.67	8.80	8.94	9.08	9.23	9.39	9.56	9.73	9.91	10.10	10.29	10.49
Design Wet Weather Baseline	20.53	20.94	21.36	21.79	22.24	22.70	23.17	23.66	24.16	24.67	25.20	25.74	26.30	26.87	27.46	28.06	28.67
Integrated Scenario 3	20.53	20.86	21.23	21.62	22.03	22.46	22.91	23.38	23.85	24.34	24.85	25.37	25.91	26.46	27.02	27.60	28.20

Demand Management Least Cost Planning - Decision Support System

Scenario 3 cont'd

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	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	
Demand Measures Water Savings (ML/year)															
Total Water Savings Scenario 2	223.7	228.9	234.1	239.4	244.9	250.5	256.1	261.9	267.8	273.9	280.0	286.3	292.7	299.3	BCP2
Non-Residential Water Audits	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	AUDITp
BASIX - Fixture Efficiency with Rainwater Use	895.25	956.45	1018.83	1082.42	1147.26	1213.39	1280.84	1349.66	1419.87	1491.52	1564.64	1639.27	1715.45	1793.23	BASIX-HR
BASIX - Fixture Efficiency with Dual Reticulation	1185.56	1267.48	1351.02	1436.22	1523.13	1611.81	1702.28	1794.62	1888.85	1985.04	2083.22	2183.46	2285.80	2390.30	BASIX-HD
Calculated Total Savings	2323.31	2471.57	2622.73	2776.87	2934.07	3094.43	3258.04	3424.97	3595.32	3769.18	3946.65	4127.80	4312.74	4501.56	calc
Total Water Savings Scenario 3 (Modelled)	**2038.99**	**2156.64**	**2275.61**	**2395.98**	**2517.83**	**2641.22**	**2766.23**	**2892.93**	**3021.40**	**3151.70**	**3283.91**	**3418.09**	**3554.33**	**3692.70**	BCP3
Annual Average Water Consumption (ML/year)															
Baseline Forecast	9879.6	10097.0	10319.1	10546.1	10778.1	11015.2	11257.6	11505.2	11758.4	12017.0	12281.4	12551.6	12827.7	13110.0	BAS
Integrated Scenario 3	7840.6	7940.3	8043.5	8150.1	8260.3	8374.0	8491.3	8612.3	8737.0	8865.3	8997.5	9133.5	9273.4	9417.3	BCP3
Total Water Savings	2039.0	2156.6	2275.6	2396.0	2517.8	2641.2	2766.2	2892.9	3021.4	3151.7	3283.9	3418.1	3554.3	3692.7	BCP3
Peak Day Demand (ML)															
Baseline Forecast	61.65	63.06	64.49	65.95	67.44	68.97	70.52	72.10	73.72	75.37	77.05	78.77	80.53	82.32	BAS
Integrated Scenario 3	50.04	50.78	51.54	52.31	53.11	53.93	54.77	55.63	56.52	57.42	58.35	59.31	60.29	61.29	BCP3
Per Capita Demand (L/person/day)															
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	BAS
Integrated Scenario 3	674.48	668.35	662.46	656.80	651.35	646.10	641.05	636.18	631.50	626.98	622.63	618.44	614.40	610.49	SET
Waste Water Flows (ML/day)															
Daily Average	11.19	11.42	11.66	11.90	12.15	12.41	12.67	12.94	13.22	13.50	13.79	14.08	14.39	14.70	BAS
Integrated Scenario 3	10.70	10.91	11.13	11.35	11.58	11.82	12.07	12.32	12.58	12.84	13.11	13.39	13.68	13.97	BCP3
Design Wet Weather Baseline	29.30	29.95	30.61	31.29	31.99	32.70	33.43	34.17	34.93	35.72	36.52	37.33	38.17	39.03	BAS
Integrated Scenario 3	28.81	29.44	30.08	30.74	31.42	32.11	32.82	33.55	34.30	35.06	35.84	36.64	37.46	38.30	BCP3

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

BASIX - Fixture Efficiency with Dual Reticulation

New: 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	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Demand Measures Water Savings (ML/year)																
Total Water Savings Scenario 3	0.0	229.6	344.0	459.3	574.9	683.7	791.7	902.6	1014.2	1126.4	1239.4	1353.3	1468.1	1580.2	1693.3	1807.4
Permanent Low Level Restrictions on Water Use	0.0	294.7	303.1	311.6	320.2	328.8	337.5	346.3	355.2	364.2	373.3	382.6	392.0	401.5	411.1	420.9
Conservation Pricing for Residential Users	165.2	169.6	419.4	430.7	475.3	487.2	499.3	511.5	524.0	536.6	549.5	562.6	575.9	589.4	603.2	617.2
Rainwater Tanks for all New Residential Development	0.0	39.8	80.6	122.3	164.9	208.4	252.9	298.4	344.8	392.2	440.7	490.2	540.8	592.5	645.2	699.1
Dual Reticulation for all New Residential Development	0.0	53.7	108.7	165.1	222.8	281.9	342.3	404.1	467.2	531.7	597.7	665.0	733.8	804.1	875.9	949.3
Calculated Total Savings	165.24	787.37	1255.83	1489.00	1758.11	1990.02	2223.72	2462.94	2705.41	2951.25	3200.62	3453.67	3710.54	3967.67	4228.76	4493.96
Total Water Savings Scenario 4 (Modelled)	**165.24**	**732.70**	**1108.11**	**1285.73**	**1489.87**	**1653.75**	**1813.73**	**1973.62**	**2131.35**	**2287.20**	**2441.43**	**2594.31**	**2746.09**	**2893.28**	**3039.66**	**3185.45**

Scenario 4 cont'd	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Annual Average Water Consumption (ML/year)																
Baseline Forecast	6824.6	6974.7	7128.1	7285.0	7445.2	7609.0	7776.4	7947.5	8122.3	8301.0	8483.7	8670.3	8861.0	9056.0	9255.2	9458.8
Integrated Scenario 4	6659.3	6242.0	6020.0	5999.2	5955.4	5955.3	5962.7	5973.9	5991.0	6013.8	6042.2	6076.0	6115.0	6162.7	6215.6	6273.4
Total Water Savings	165.2	732.7	1108.1	1285.7	1489.9	1653.7	1813.7	1973.6	2131.4	2287.2	2441.4	2594.3	2746.1	2893.3	3039.7	3185.4
Peak Day Demand (ML)																
Baseline Forecast	41.11	42.19	43.28	44.38	45.49	46.62	47.76	48.92	50.10	51.30	52.51	53.75	55.01	56.29	57.59	58.92
Integrated Scenario 4	39.70	36.00	34.24	34.44	34.56	34.82	35.10	35.39	35.70	36.03	36.39	36.76	37.16	37.58	38.03	38.50
Per Capita Demand (L/person/day)																
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30
Integrated Scenario 4	829.30	760.60	717.76	699.89	679.81	665.17	651.66	638.83	626.87	615.71	605.30	595.58	586.50	578.36	570.76	563.67
Waste Water Flows (ML/day)																
Daily Average	8.21	8.34	8.47	8.60	8.75	8.90	9.06	9.22	9.39	9.56	9.75	9.93	10.13	10.33	10.53	10.75
Integrated Scenario 4	8.14	8.18	8.27	8.36	8.39	8.51	8.65	8.78	8.93	9.08	9.24	9.40	9.57	9.75	9.93	10.12
Design Wet Weather Baseline	20.53	20.94	21.36	21.79	22.24	22.70	23.17	23.66	24.16	24.67	25.20	25.74	26.30	26.87	27.46	28.06
Integrated Scenario 4	20.46	20.78	21.16	21.55	21.88	22.31	22.76	23.22	23.70	24.19	24.69	25.21	25.74	26.29	26.86	27.43

Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	
Demand Measures Water Savings (ML/year)																
Total Water Savings Scenario 3	1922.6	2039.0	2156.6	2275.6	2396.0	2517.8	2641.2	2766.2	2892.9	3021.4	3151.7	3283.9	3418.1	3554.3	3692.7	BCP4
Permanent Low Level Restrictions on Water Use	430.9	441.1	451.4	461.9	472.6	483.6	494.7	506.0	517.6	529.3	541.4	553.6	566.1	578.9	591.9	PERM
Conservation Pricing for Residential Users	631.5	646.1	661.0	676.1	691.6	707.3	723.4	739.8	756.6	773.7	791.1	808.9	827.1	845.7	864.7	PRI
Rainwater Tanks for all New Residential Development	754.2	810.4	867.9	926.5	986.5	1047.7	1110.2	1174.1	1239.4	1306.0	1374.1	1443.7	1514.8	1587.4	1661.6	RAIN
Dual Reticulation for all New Residential Development	1024.2	1100.7	1178.9	1258.7	1340.3	1423.6	1508.6	1595.5	1684.3	1775.0	1867.7	1962.3	2059.0	2157.8	2258.7	DUAL
Calculated Total Savings	4763.43	5037.30	5315.74	5598.89	5886.91	6179.95	6478.16	6781.71	7090.76	7405.46	7725.98	8052.48	8385.14	8724.11	9069.57	calc
Total Water Savings Scenario 4 (Modelled)	**3330.84**	**3476.03**	**3621.21**	**3766.55**	**3912.21**	**4058.38**	**4205.20**	**4352.84**	**4501.43**	**4651.12**	**4802.05**	**4954.36**	**5108.18**	**5263.65**	**5420.88**	BCP4
Annual Average Water Consumption (ML/year)																
Baseline Forecast	9666.9	9879.6	10097.0	10319.1	10546.1	10778.1	11015.2	11257.6	11505.2	11758.4	12017.0	12281.4	12551.6	12827.7	13110.0	BAS
Integrated Scenario 4	6336.1	6403.6	6475.7	6552.5	6633.9	6719.7	6810.0	6904.7	7003.8	7107.2	7215.0	7327.1	7443.4	7564.1	7689.1	BCP4
Total Water Savings	3330.8	3476.0	3621.2	3766.5	3912.2	4058.4	4205.2	4352.8	4501.4	4651.1	4802.1	4954.4	5108.2	5263.6	5420.9	BCP4
Peak Day Demand (ML)																
Baseline Forecast	60.27	61.65	63.06	64.49	65.95	67.44	68.97	70.52	72.10	73.72	75.37	77.05	78.77	80.53	82.32	BAS
Integrated Scenario 4	39.00	39.51	40.05	40.62	41.21	41.82	42.45	43.11	43.79	44.50	45.22	45.98	46.76	47.56	48.39	BCP4
Per Capita Demand (L/person/day)																
Baseline Forecast	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	849.30	BAS
Integrated Scenario 4	557.05	550.86	545.08	539.67	534.61	529.87	525.43	521.27	517.37	513.70	510.27	507.04	504.00	501.15	498.46	SET
Waste Water Flows (ML/day)																
Daily Average	10.97	11.19	11.42	11.66	11.90	12.15	12.41	12.67	12.94	13.22	13.50	13.79	14.08	14.39	14.70	BAS
Integrated Scenario 4	10.32	10.52	10.73	10.95	11.17	11.40	11.63	11.88	12.12	12.38	12.64	12.91	13.18	13.47	13.75	BCP4
Design Wet Weather Baseline	28.67	29.30	29.95	30.61	31.29	31.99	32.70	33.43	34.17	34.93	35.72	36.52	37.33	38.17	39.03	BAS
Integrated Scenario 4	28.03	28.64	29.26	29.90	30.56	31.23	31.93	32.63	33.36	34.10	34.86	35.64	36.43	37.25	38.08	BCP4

APPENDIX D

APPENDIX D: INFORMATION & DATA ASSESSMENT

Contents

1. INFORMATION & DATA SOURCED

From Griffith City Council

Data/Information	*Detail*	*Assessment*	*Comments/Gaps*
▪ DWE Performance Reports	TBL Water & Sewerage Performance Reports for: ⅄ 2004/05 ⅄ 2005/06 ⅄ 2006/07 ⅄ 2007/08 ⅄ 2008/09 submitted	✓	-
▪ State of the Environment Reports	Reports for 2004 & 2008	✓	-
▪ Asset Valuations	Water & Sewer Valuations List, 2008	✓	-
▪ Draft Revenue Policy	Policy for 2009/10	✓	-
▪ Sewer Loan Repayment Schedule	Schedule current at end 2007/08	✓	-
▪ Special Schedules	Schedules 3,4,5 & 6 & associated Notes - financial year ends 30 June ’07, 30 June ’08 & 30 June ‘09	✓	-
▪ Valuation Report	Water Supply & Sewerage Assets Revaluation, Australia Pacific Valuers, June 2008	✓	-
▪ Budget	Water & Sewerage Budgets for 2008/09	✓	-
▪ Forward Works Program	Water Capex 30 Year Program Sewer Capex 30 Year Program	✓	-
▪ Population & Growth	- NSW State and Regional Population Projections, 2006-2036: Department of Planning, 2010 - NSW Statewide Local Area Population Projections, 2008: NSW Department Planning - Griffith Land Use Strategy: Demographic Analysis of Griffiths LGA, 2008; McCrindle Research		

Data/Information	***Detail***	***Assessment***	***Comments/Gaps***
▪ Water Production Data	Griffith Daily Potable Water Production - 1994 to 2008 Yenda Daily Potable Water Production - 1995 to 2008	✓	-
▪ Water Consumption	Water Consumption Spreadsheets 2003 to 2008	✓	-
▪ Weather Data	Griffith Weather Data Griffith Laboratory, CSIRO	✓	-
▪ EPA Licence Data	Analysis results for STP's - 2004 to March 2009	✓	-
▪ Water Supply Contract	Contract with Murrumbidgee Irrigation – Contract to supply raw water, dated 20 October 2006	✓	-
▪ Trade Waste	Non-residential Trade Waste Data base of May 2009	✓	-
▪ Asset Register	- Manhole Register at May '09 - Sewer Reticulation Asset Register at May 2009 - Water Supply Asset Register at May 2009	✓	-
▪ Water Treatment Plant Data	Spreadsheets (2002 to 2008) of Potable water output from Yenda WTP & Griffith WTP	✓	Earlier data (pre-drought) not available
▪ Griffith Land Use Strategy	Demographic analysis of Griffith LGA, McCrindle Research, October 2008	✓	Valuable report
▪ Drought Management Plan	Plan prepared by Hydroscience Pty Ltd, February 2009	✓	-
▪ OH&S	Emergency Response Procedures Manual, June 2001	✓	Requires updating
▪ Griffith Water Reclamation Plant (GWRP) Upgrade	- REF, Hydroscience, 2007 - REF Appendices - Concept Design Report, Hydroscience, July 2008	✓	-

Data/Information	***Detail***	***Assessment***	***Comments/Gaps***
	- Detail Design Plans (in progress)		
▪ GWRP – Automation & Control Upgrade	Preliminary Functional Specification, Serck Controls Pty Ltd, 2006	✓	Relevance?
▪ Griffith Water Treatment Plant	- Process & Operational Review, Hunter Water, February 2006 - Griffith Partnership in Water Quality Improvement, Yenda & Griffith WTPs Hunter Water, April 2008	✓	-
▪ Capital Works Planning	- Long Term Capital Works Plans, Report on Water Supply, GHD 2003	✓	Background information
▪ Strategic Business Plan	- SBPs for Water Supply & Sewerage, 2005	✓	Being upgraded in 2009
▪ Water Loss	- Water Loss Audit & Leak Detection, Detection Services Pty Ltd, February 2009	✓	IWCM Issue
▪ Yenda WTP	- Griffith Partnership in Water Quality Improvement, Yenda WFP, Site Visit, May 2006, Hunter Water	✓	-
▪ System Schematics	- GCC Sewer Reticulation - GCC Water Reticulation - GWTP Schematic - MI Water Quality Sites - Potential DRV Zones - Schematic of Griffith Water Supply - Layout of Main Canal - Layout of Water Supply - Schematic of Yenda Water Supply	✓	-
▪ Management Plan	- 2008/09 Management Plant	✓	-

Data/Information	***Detail***	***Assessment***	***Comments/Gaps***
	- 2009/10 Management Plan		
▪ Annual Report	Annual Report to 30 June 2008	✓	-
▪ DWE Annual Returns	Spreadsheet data returns to DWE for Water Supply & Sewerage, 2007/08, 2008/09	✓	-
▪ Backflow Prevention	Backflow Prevention Policy, 2003	✓	Requires updating
▪ DWE Report 2007/08	Griffith's submitted Performance Report spreadsheets	✓	-
▪ Septic Tanks	Register of on-site septic tanks in Griffith	✓	-
▪ Water Quality Results	Water Analysis results from Greater Southern PHU for - Griffith - Yenda 2006 to 2009	✓	-
▪ Water Licenses	Details of Griffith's Water Entitlements from MI Licence Holder: 2111101	✓	- Town Water Supply: 14407 ML - General Security: 455 ML (Golf Clubs, Picnic areas & Lookout use) - High Security Irrigation: 1300 ML (Parks/Ovals watering) - High Security Domestic: 77 ML - Joint Water Supply Accounts (Booga Road, McCarthy Road & Todd Road

From Other Sources

Data/Information	*Detail*	*Source*	*Assessment*	*Comments*
▪ Environmentally Sensitive Zones – Griffith	UPSS Environmentally Sensitive 20m Map for Griffith	www.environment.nsw.gov.au/clm/upssenvsensitivezones	✓	No issues for Griffith
▪ POEO Register	Activities in Griffith licensed under the POEO Act	DECCW, Griffith	✓	-
▪ Population Data	Demographic data Census Tables & Quick Stats 2001, 2006	Australian Bureau of Statistics	✓	-
▪ Natural Resources Atlas	Australian Natural Resources	www.anra.gov.au/topics/water/overview/nsw/swma-murrumbidgee-river	✓	-
▪ Water availability in the Murrumbidgee	CSIRO Report, June, 2008	CSIRO	✓	-
▪ Groundwater Data	The NSW Groundwater Quality Protection Policy, 1998	DLWC (NSW Office of Water)	✓	-
▪ Population projections	NSW State & Regional Population Projections, 2001 – 2051	NSW Department of Planning	✓	A bit dated – needs updating in light of 2006 Census. Population growth has slowed.
▪ EPA Licences	Licence No. 1402, Yenda STP Licence No. 1604, Griffith STP Also Licence No. 11915, Griffith Saleyards Licence No. 5875, Tharbogang Recycling &	DECCW NSW	✓	-

Data/Information	*Detail*	*Source*	*Assessment*	*Comments*
	Waste Disposal Facility Licence No. 6263, Yenda Recycling & Waste Disposal Facility			
▪ Land & Water Management Plan	MIA & Districts Land & Water Management Plan	MI	✓	-
▪ Sustainable Rivers Audit	- MDBC Rivers Audit 2008 - Ecosystem Health Check, 2008	MDBC	✓	-
▪ Catchment Plan	Murrumbidgee Catchment Action Plan, 2006	Murrumbidgee CMA	✓	-
▪ Natural Resource Management Strategy	Murrumbidgee Catchment NRM Strategy, 1998	Personal Library	✓	-
▪ Groundwater conditions	Groundwater Conditions & Behaviour in the Murrumbidgee Irrigation Areas, 2008	MI	✓	-
▪ Groundwater quality	NSW SoE, Groundwater Quality, September 2008	DECCW	✓	-
▪ Water Quality & River Flows	-NSW Water Quality & River Flow Objectives -Murrumbidgee River & Lake George	www.environment.nsw.gov.au/ieo/murrumbidgee/report	✓	-
▪ Water Sharing Plan	Murrumbidgee Regulated River Water Sources, 2004	NSW DIPNR (NSW Office of Water)	✓	-
▪ Water Planning	▪ Critical Water Planning for the Murrumbidgee Valley - July 2009 - August 2009 - September 2009 - October 2009 ▪ Water Availability Reports, 2009	NSW Office of Water (formerly DWE)	✓	-
▪ Climate & Runoff	Future projections to 2030 for NSW & ACT,	NSW Office of Water (formerly	✓	-

Data/Information	***Detail***	***Source***	***Assessment***	***Comments***
Projections	2008	DWE)		
▪ Water Quality & Flow Data	Water information Data Base, 2003-2007	NSW Office of Water (formerly DWE)	✓	-
▪ 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	✓	-
▪ Floodplain Studies	NSW Inland Rivers Floodplain Management Studies, Murrumbidgee Valley, 1987, SKM	Personal Library	✓	-
▪ Vegetation	Western Riverina Regional Vegetation Committee, Draft Vegetation Management Plan, 2002	Personal Library	✓	-
▪ Soils	Soils of the Murrumbidgee, Coleambally and Murray Irrigation Areas of Australia	CSIRO; www.csiro.au	✓	-
▪ Bioregions	The Bioregions of NSW – their biodiversity, conservation and history. Chapter 8: The Riverina Bioregion	NSW National Parks & Wildlife Service, 2003	✓	-

2. DATA GAPS

A number of data gaps have been identified as part of this IWCM Evaluation Study.

Data gaps are identified where there is no data; insufficient data; or unreliable data, to the extent that an assessment of Council's compliance with Targets and/or Obligations is not possible.
The assessed data gaps are listed below, along with an assessment of their importance (High (H), Medium (M), Low (L) and recommendations for Council to implement to address the gaps.

	Reference	Data Gap	Ranking (H, M or L)	Recommended Action
1.	App. A Section 3c (Page A25)	Information on availability and sustainability of groundwater as an alternative or additional water supply source	H	Investigate and prepare report.
2.	App. A Section 4e (Page A36) & App. C Section 2.2 (Page C5)	Verification of water losses and unaccounted for water	M	Council has commenced a Water Loss management and rectification process. Verification of losses and UFW to be determined and documented.
3.	App. C Section 4.2.2 (Page C13)	Results of system loss reduction program	M	As per 2. Above.
4.	App. E Section 6 (Page E11)	Is Griffith LWU achieving its Levels of Service (?)	L	Council to provide relevant information.
5.	App. E Section 7 (Page E12)	Items not reported in 2007/08 TBL Performance Report	L/M	Council to address items listed in Appendix E Section 7 for 2009/10 and subsequent reports.
6.	App. E Section 8 (Page E14)	Update of 2001 Emergency Response Procedures Manual	H	Council to update in 2010/11.
7.	App. E Section 8 (Page E14)	Update of 2003 Backflow Prevention Policy	H	Council to update in 2010/11.

APPENDIX E

APPENDIX E: IWCM RELATED OBLIGATIONS, RESPONSIBILITIES & REQUIREMENTS

Contents

Tables

1. 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 Griffith City Council.

2. AUSTRALIAN DRINKING WATER GUIDELINES

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

Griffith City 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 Griffith (270 samples) and Yenda (191 samples) for the period 1 July 2006 to 30 June 2009 are summarised in the Table below:

Table E1: NSW Health Analysis Results

		Compliance (Meeting Guideline Values)	
Period	**Parameter**	**Griffith**	**Yenda**
July 2006 – June 2009	Total Coliforms	97%	98%
	E. coli	100%	100%
	pH	100%	96%
	Turbidity	100%	100%
	TDS	100%	100%
	Others	All	All
	Chemical	100%	100%
	Except		
	Fluoride (daily)	93%	68%
	Fluoride (weekly)	94%	73%

Source: NSW Health Drinking Water Database

These results are very satisfactory, especially for a small, regional water supply authority and indicate the capabilities and competence of operating staff.

Issues:	**Griffith – non-compliance with Fluoride concentrations** **Yenda – non-compliance with pH and Fluoride 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. Griffith City Council is currently developing a Management Plan. A Gap Analysis has been completed.

3. WATER ENTITLEMENTS

Water entitlements for the City (as supplied by Murrumbidgee Irrigation) from the Murrumbidgee River via MI's Main Supply Canal are detailed below:

Type 1		***Type 3***		***Type 6***		***Type 7***	
General Security Licence No. WAL 15364		***High Security (Irrigation) Licence No. WAL 300010***		***High Security (Domestic) Licence No. WAL9446***		***High Security (Town Water Supply) Licence No. WAL 9444***	
Location	***Volume (ML)***	***Location***	***Volume (ML)***	***Location***	***Volume (ML)***	***Location***	***Volume (ML)***
Developer Contributions	40	Developer Contributions	1171	Developer Contributions	77		14407
Griffith Gold Club	300	Hanwood Oval	17				
Yenda Golf Club	78	Cirrilo Purchase 24/03/09	102				
Picnic Area and Lookouts	37	Boys – 30/04/09	10				
TOTAL	**455**		**1300**		**77**		**14407**

Joint Water Supply Accounts:

Ml Licence Number:	***Volume (ML)***	***GCC***	***Farmers Name***	***Type***
2158800	112	90	Bordignon	A3 High Security Water
2187402	131	122	Singh and Kaur	A3 High Security Water
2182600	106	94	G Kirby	A3 High Security Water

Table E2: Griffith City Council – Water Entitlements

In summary, Council holds entitlements of 14407 ML/a as Town Supply Entitlement, 1377 ML/a of High Security Entitlements, 455 ML/a of General Security Entitlements and 304 ML of "Shared" High Security Entitlements. These "accounts" are held with Murrumbidgee Irrigation under account number 2111101. (In this region, MI holds the town water allocations with State Water for those towns drawing water from MI's supply system, such as Griffith).

4. LICENCES

Sewage Treatment Plant Licences

a) Griffith Sewage Treatment Plant

The **Griffith Sewage Treatment Plant** (located at Duchatel Road, Griffith) is required to operate in accordance with DECCW (EPA) Licence No. 1604.

The Licence Discharge Point is at the outlet of Pond 5 into the MI drainage channel, labelled as EPA ID1.

The current licence discharge limits are shown below:

Table E3: Discharge Volumes

Unit of measure	***Volume Limit***
megalitres per year	2800

Table E4: Concentration Limits

Pollutant	***Units of Measure***	***50 percentile concentration limit***	***90 percentile concentration limit***	***3DGM concentration limit***	***100 percentile concentration limit***
Oil & Grease	milligrams per litre	-	-	-	10
Faecal Coliforms	colony forming units per 100 millilitres	-	200	-	600
Total suspended solids	milligrams per litre	-	-	-	30
Biochemical oxygen demand	milligrams per litre	-	-	-	30

Table E5: Load Limits

Assessable Pollutant	***Load Limit (kg)***
BOD (Enclosed Waters)	36000
Nitrogen (total) (Enclosed Waters)	26648
Oil & Grease (Enclosed Waters)	4336
Phosphorus (total) (Enclosed Waters)	2900
Total suspended solids (Enclosed Waters)	60000

The current Licence includes a **Pollution Reduction Program (PRP)** which stipulates that the actual load of assessable pollutants must not exceed a set of annual, permissible load limits as well as concentration limits; (which was defined in the Licence as at 1 March 2008). The PRP also stipulates effluent irrigation limits and odour control measures.
Compliance with the PRP requirements is to be achieved by 1 March 2010.
Details of the PRP requirements are shown below:

Table E6: Load Limits

Assessable Pollutant	***Load Limit (kg)***
Total suspended solids	27,000
BOD	18,000
Oil & Grease	3,600
Total nitrogen	18,000
Total phosphorus	540
Thermotolerant coliforms (cfu/100mL)	200

(To be achieved by 1 March 2010)

Table E7: Land Reuse Requirements

Land Use	***Effluent Thermotolerant Coliform standard (cfu/100mL)***
Urban (Non-Potable)	
Municipal with uncontrolled public access	<10
Municipal with controlled public access	<1,000
Agricultural	
Food production – raw human food crops in direct contact with effluent	<10
Food production – raw human food crops not in direct contact with effluent	<1,000
Food production – pasture and fodder	<1,000
Food production – pasture and fodder for dairy animals (without withholding period), drinking water (all stock except pigs) and washdown water for dairies	<100
Non-food crops	<10,000

Table E8: Effluent Quality

Parameter	***Minimum performance requirement***
Biochemical oxygen demand (mg/L)	10
Total suspended solids (mg/L)	15
Total phosphorus (mg/L)	0.3
Total nitrogen (mg/L)	10
Ammonia nitrogen (mg/L)	2
Oil & grease (mg/L)	2
pH	6.5 – 8.5

Odour Control
Ozonation of trickling filters to be achieved by 31 July 2009

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 and submit annual performance reports and manage biosolids (storage, treatment, transportation and disposal) in accordance with DECCW's Biosolids Guidelines.

(b) Yenda Sewage Treatment Plant

The **Yenda Sewage Treatment Plant** is licensed under EPA Licence No.1402. The Licence Discharge Point is from Pond No. 3 (labelled as ADP001) to MI Drainage Channel, with the Effluent Quality Monitoring Point being discharge from Pond 3.

Licence Limits have been imposed for pH, Total Suspended Solids, BOD and Faecal coliforms as detailed below:

Table E9: Yenda STP Licence Conditions

Parameter	***Units of Measure***	***50 percentile concentration limit***	***80 percentile concentration limit***	***90 percentile concentration limit***	***100 percentile concentration limit***
pH	pH				5.5 - 9.5
Faecal Coliforms	colony forming units per 100 millilitres				600
Total suspended solids	milligrams per litre				50
Biochemical oxygen demand	milligrams per litre				50
Volume Limit	ML/year				150

Reporting conditions also stipulate Nitrate and Nitrite, Ammonia Nitrogen, Total Nitrogen, Oil & Grease, Total Phosphorus and Total Kjeldahl Nitrogen concentrations. There are no PRP requirements for this Plant.

c) Bilbul Sewage Treatment Plant

The **Bilbul Sewage Treatment Plant** is not required to be licensed.

5. CONTRACT OBLIGATIONS

Griffith City Council has entered into two (2) Contracts in relation to the development and procurement of the Water Reclamation Plant Upgrade.

These Contracts are for:

i) Detailed Design: Awarded to Hydroscience Pty Ltd for $1.855m
ii) Supply of Membranes: Awarded to Koch Membrane Systems for $2.505m.

Council also has a Contract with Murrumbidgee Irrigation for supply of water via MI's canal system. The Contract is a typical agreement which MI has with its "customers" and is framed around supply to irrigators. The Town water supply component of supply has the same level of security as Town Supplies elsewhere, except that the carrier is MI, not State Water. Allocations under the Town Water Supply Entitlement are still assessed and managed by the NSW Office of Water.

Council also holds three (3) Joint Water Supply Accounts: These relate to three (3) farms (with water entitlements) which Council has purchased, which are "joined" to Councils overall entitlement under the Contract of supply with MI.

The Contract with MI covers aspects like:

- supply of water
- allocations
- obligations of the parties
- measurement of water usage
- drainage (in relation to any drainage of water to the canal system)
- charges
- conditions relevant to irrigators, like:
    - construction, maintenance and repair of members works
    - land and water management plans
    - access to land holdings
    - stock and other damage to MI's works
    - control of noxious weeds
    - transfer of allocations
    - etc.

A copy of the Contract is appended to the Evaluation Report (Volume 1).

6. LEVELS OF SERVICE

The Griffith Strategic Business Plan for Water and Sewerage (2009) details the agreed Levels of Service for both Water and Sewerage Services as follows:
(**Note:** These Levels of Service have been redefined from the 2005 versions – as part of the 2009/10 Strategic Business Planning process. The 2005 Levels of Service are presented in Appendix A: Urban Water Services in Griffith: Tables A12 & A13)

Table E10: Water Supply Levels of Service

Description	***Unit***	***2009 Level of Service***
Service Provision		
Service area		All residential areas and industrial areas where economically viable
Connection time for a new service in serviced areas (90% of the time)	days	21
Availability of Supply		
Fire Fighting: Compliance with the Building Code of Australia and NSW Fire Brigade requirements (for all residential, commercial and industrial areas)	% area served	100 (urban) 70 (Rural)
Pressure: - Min. pressure when delivering 6 L/min - Max. static pressure	Metres head Metres head	30 (Griffith) 12 (Yenda) 70 (Griffith) 30 (Yenda)
Supply		
Supply in accordance with Council design standards.	L/s (throughout system)	0.15 typically
Consumption Restrictions in Droughts:		
In accordance with restrictions defined in Council's Drought Management Plan & as required by the NSW Office of Water		
Supply Interruptions to Consumers Temporary supply arrangements during interruptions **Planned** *(95% of time):* - Notice given to domestic customers - Notice given to commercial customers - Notice given to major industrial customers **Unplanned:** - Maximum duration - Frequency	 Hours Hours Days Hours No./ year	 Where possible 48 48 7 8 80

Response Times		
(Defined as time to have staff onsite to commence rectification after notification of problem)		
Supply Failure: All Customers: - During working hours - Out of working hours	 Hours Hours	 1 2
Customer Complaints: Personal / Oral Written Note: Times apply for 95% of occasions	 Working Days Working Days	 1 10
Service Provision: Time to provide a domestic individual connection to water supply in serviced area (90% of time)	Working days	21
Water Quality (In accordance with the Drinking Water Quality Guidelines of Australia, NHMRC&AWRCM 2004, or as amended) **Sampling Frequency:** Physical & chemical testing	CFU/100ml CFU/100ml In accordance with NSW Health requirements	0 10 0
Microbiological Results:		
Total coliforms – 95% of samples	CFU/100ml	0
Maximum in any sample	CFU/100ml	10
E.coli (in any sample)	CFU/100ml	0
Physico-chemical Parameters		
Percentage Compliance with 2004 NHMRC/AWRCM Australian Drinking Water Quality Guidelines:	As required by NSW Health and ADWG (Refer Appendix E for monitoring schedule)	

Note: Special Customers: Certain customers may have special needs by virtue of specific health, commercial or industrial circumstances. Specific levels of service will be negotiated with these customers.

Table E11: Sewerage Levels of Service

Description	***Unit***	***2009 Level of Service***
Availability of Service - Extent of areas serviced.	Service area	100% within the defined service area
System Failures *Category One*: - Failure due to rainfall and deficient capacity (overflows). *Category Two:*	 No./ 5 year	 0

- Failures due to pump or other breakdown including power failure.	No /year	2
Category Three:		
- Failures due to main blockages and collapses (fat and tree roots).	No./ year	150
Response Times for System Failures (Defined as the maximum time to have staff on site to commence rectification).		
Priority One: (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
- Response time after hours	Minutes	60
Priority Two: (Moderate spill, some environmental or health impact, or affecting small number of consumers i.e. other mains).		
- Response time during working hours	Minutes	30
- Response time after hours	Minutes	60
Priority Three: (Minor spill, little environmental or health impact, or affecting a couple of consumers).		
- Response time during working hours.	Hours	1
- Response time after hours.	Hours	2
Response Times for Complaints		
General Complaints and Inquiries:		
Written complaints.	Working days	5
Oral complaints.	Working days	1
Note: times for 95% of complaints.		

Description	***Unit***	***2009 Level of Service***
Odour Complaints		
Treatment works	No./ year	<2
Pumping Stations	No./ year	<4
Effluent Discharge and Sludge Management		
Failure to meet licence limits and statutory requirements (100 percentile)	No. of samples/ year	0

Data Gap: Is Griffith City Council achieving its Levels of Service ?

7. TBL DATA PERFORMANCE REPORTING

The NSW Office of Water publishes Triple Bottom Line (TBL) Performance Reports annually for each of the Local Water Utilities in NSW.

These Reports detail the Utilities' performances with respect to a range of Key Performance Indicators and rank the Performance against all LWU's as well as those in the population category for a particular LWU.

In a sense these comparisons are a form of best practice benchmarking and are very useful in determining the LWU's performance against its published Levels of Service.

The 2007/08 TBL reports for Griffith for both Water Supply and Sewerage are presented below:

Griffith City Council — TBL Water Supply Performance — 2007/08

WATER SUPPLY SYSTEM - Griffith City Council serves a population of 22,000 (8,110 connected properties). Water is drawn from Murrumbidgee Irrigation Area Main Canal to supply Griffith. The Griffith City Council system comprises dissolved air flotation and microfiltration treatment works, 4 service reservoirs (55 ML) and 4 pumping stations, 50 km of transfer and trunk mains and 433 km of reticulation. The water supply is fully treated.

PERFORMANCE - Griffith City Council achieved 90% compliance with Best Practice requirements. The typical residential bill was $442 which was above the statewide median of $370 (Indicator 14). The economic real rate of return was 0.4% which was greater than the statewide median (Indicator 43). The operating cost (OMA) per property was $551 which was above the statewide median of $300 (Indicator 40). Water quality complaints were less than the statewide median of 3 (Indicator 25). Compliance with microbiological water quality was 100% with 2 of 2 zones compliant (Indicator 20), physical compliance was 100% (Indicator 19) and chemical compliance was 100% with 2 of 2 zones compliant (Indicator 19b). Current replacement cost of system assets was $113M ($11,900 per assessment), cash and investments were $8M, debt was nil and revenue was $6.1M (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	YES
(2c) Pricing - Complying non-Residential Charges	Yes	(6) Integrated water cycle management strategy commenced	YES
(2d) Pricing - DSP with Commercial Developer Charges	Yes	COMPLIANCE WITH ALL REQUIREMENTS	90%

TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

					LWU RESULT	RANKING 3,001 to 10,000	RANKING All LWUs	STATEWIDE MEDIAN
		NWI	No.			Note 1	Note 2	Note 3
					Col 1	Col 2	Col 3	Col 4
UTILITY	CHARACTERISTICS	C1	1	Population served: 22000				
		C4	2	Number of connected properties: 8110 — Number of assessments: 9540				
		C2	3	Residential connected properties (% of total)	83			91
			4	New residences connected to water supply (%)	3.6	1	1	1.1
		A3	5	Properties served per kilometre of water main	17			33
			6	Rainfall (% of average annual rainfall)	85	2	4	110
		W11	7	Total urban water supplied at master meters (ML)	7,010			6,600
			8	Peak week to average consumption (%)	186	2	4	140
			9	Renewals expenditure (% of current replacement cost of system assets)	0.9	1	3	0.1
			10	Employees per 1000 properties				1.4
SOCIAL	CHARGES & BILLS - 2006/07	P1		Residential tariff structure: — Inclining block; independent of land value				
			12	Residential water usage charge (c/kL) for usage up to 200 kL (Note 6)	45	6	6	130
			13	Residential access charge per assessment ($)	108	1	1	110
		P3	14	Typical residential bill per assessment ($)	442	1	3	370
			15	Typical developer charge per equivalent tenement ($)	3,100	1	3	4,300
	HEALTH		18	Urban population without reticulated water supply (%)	0.0	1	2	0.8
		H6	18a	Risk based drinking water quality plan?	No			
			19	Physical water quality compliance (%)	100	1	1	100
			19a	Chemical water quality compliance (%)	100	1	1	100
		H4	19b	Number of zones with chemical compliance	2 of 2			
			20	Microbiological (E. coli) water quality compliance (%)	100	1	1	100
		H3	20a	% population with microbiological compliance	100	1	1	100
	SERVICE LEVELS	C9	25	Water quality complaints per 1000 properties	1	1	3	3
		C10	26	Water service complaints per 1000 properties	6	1	2	9
		C17	27	Customer interruption frequency per 1000 properties	27	1	3	37
		C15	28	Average duration of interruption (min)	180	6	4	120
		A8	30	Number of water main breaks per 100 km of water main	15	2	4	9
			31	Drought water restrictions (% of time)	100	1	3	75
			32	Total days lost (%)				2.8
ENVIRONMENTAL	NATURAL RESOURCE MANAGEMENT	W12	33	Average annual residential water supplied per property (kL)	548	5	5	173
			33a	Average annual residential water supplied - COASTAL (kL/property)				150
			33b	Average annual residential water supplied - INLAND (kL/property)	548	6	6	230
		A10	34	Real losses (leakage) (L/service connection/day)	110	6	4	80
			35	Energy consumption per Megalitre (kilo/Watt hours)	383	1	2	710
			36	Renewable energy consumption (% of total energy consumption)				0
		E12	36a	Net greenhouse gas emissions - WS & Sge (net tonnes CO2 - equivalents per 1000 properties)	1290	6	6	350
ECONOMIC	FINANCE	F5	40	Revenue per property - water ($)	750	1	1	548
		F4	41	Residential revenue from usage charges (% of residential bills)	69	1	2	71
		F17	43	Economic real rate of return - Water (%)	0.4	1	3	0.2
			44	Return on assets - Water (%)	0.0	1	3	-0.1
		F22	45	Net Debt to equity - Water (%)	-7	1	3	-2.0
		F23	46	Interest cover - Water	1	4	4	>100
			47	Loan payment per property - Water ($)	0	1	3	26
		F24	47a	Net profit after tax - WS & Sge ($'000)	-90	6	6	1
	EFFICIENCY		48	Operating cost (OMA) per 100km of main ($'000)	926	1	3	1,040
		F11	49	Operating cost (OMA) per property ($) (Note 6)	551	6	6	300
			50	Operating cost (OMA) per kilolitre (cents)	64	1	1	100
			51	Management cost per property ($)	228	6	6	118
			52	Treatment cost per property ($)	119	2	4	29
			53	Pumping cost per property ($)	5	1	1	25
			54	Energy cost per property ($)	5	1	1	13
			55	Water main cost per property ($)	74	2	3	49
		F14	56	Capital Expenditure per property ($)	279	1	2	252

NOTES:
1. 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.
2. The ranking compared with all LWUs (Col 3) is on a % of LWUs basis - relevant for comparing performance with all other LWUs - see attachment.
3. 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.
4. 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.
5. Non-residential Tariff: Access Charge based on Meter Size^(40mm:$432), Inclining Block; For usage up to 200 kL = 45 c/kL; for usage >200 kL = 70 c/kL.
   Water supplied to non-residential customers was 37% of potable water supplied excluding non-revenue water.
   Non-residential customers provided 42% of the revenue from annual charges and usage charges. Residential tariff for usage >200 kL = 70 c/kL.
6. The operating cost (OMA)/property was $551. Components were: management ($228), operation ($170), maintenance ($70), energy ($5) & chemical ($26) & bulk purchase ($52).

Griffith City Council — TBL Sewerage Performance — 2007/08

SEWERAGE SYSTEM - Griffith Council has 3 sewage treatment works providing secondary treatment. The system comprises 99,310 EP treatment capacity (Trickling Filter and Aerated Lagoon), 29 pumping stations (13 ML/d), 54 km of rising mains and 169 km of gravity trunk mains and reticulation. Treated effluent is discharged to river.

PERFORMANCE - Residential growth for 2007/08 was 4% which is higher than the statewide median. Griffith City Council achieved 100% compliance with Best Practice requirements. The typical residential bill was $438 which was close to the statewide median of $440 (Indicator 12). The economic real rate of return was 0.2% which was less than the statewide median (Indicator 46). The operating cost per property (OMA) was $442 which was above the statewide median of $320 (Indicator 50). Sewage odour complaints were above the statewide median of 0.4 (Indicator 21). Griffith Council reported 4 Category 2 environmental incidents (limited impact). Council did not comply with the environmental regulator for effluent discharge. The current replacement cost of system assets was $123M ($15,800 per assessment), cash end investments were $4M, debt was $2M and revenue was $4.4M (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	YES
(2c) Pricing - Complying Trade Waste Fees and Charges	Yes	COMPLIANCE WITH ALL REQUIREMENTS	100%

TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

	NWI	No.		LWU RESULT	RANKING 3,001 to 10,000	RANKING All LWUs	STATEWIDE MEDIAN
					Note 1	Note 2	Note 3
				Col 1	Col 2	Col 3	Col 4
UTILITY — CHARACTERISTICS	C5	1	Population served: 21000				
	C8	2	Number of connected properties: 6620 — Number of assessments: 7790				
	C6	3	Number of residential connected properties: 5890				
		4	New residences connected to sewerage (%)	4.0	1	1	1.5
	A6	5	Properties served per kilometre of main	30			40
	W18	6	Volume of sewage collected (kL)	2,050			4,300
		7	Renewals expenditure (% of current replacement cost of system assets)	0.2	2	2	0.0
		8	Employees per 1000 properties				1.6
SOCIAL — CHARGES & BILLS - 2007/08	P4		Description of residential tariff structure: — access charge per property; independent of land value (Note 5)				
	P4.1	11	Residential access charge / assessment ($)	438	3	3	440
	P6	12	Typical residential bill / assessment ($) (2007/08 values in Table 7)	438	3	3	440
		13	Typical developer charge / equivalent tenement ($)	1,800	5	4	3,900
		14	Non-residential sewer usage charge (c/kL)	120	2	2	85
SOCIAL — HEALTH		16	Urban properties without reticulated sewerage service (%)	2.6	2	2	3.9
	E3	17	Percent of sewage treated to a tertiary level (%)				84
	E4	18	Percent of sewage volume treated that was compliant (%)	61	4	5	100
	E5	19	Sewage treatment works compliant at all times	1 of 3			
SOCIAL — SERVICE LEVELS		21	Odour complaints per 1000 properties	2.3	5	5	0.4
	C11	22	Service complaints per 1000 properties	53	5	5	11
	C16	23a	Average sewerage interruption (minutes)	120	2	3	120
		25	Total days lost (%)				3.2
ENVIRONMENTAL — NATURAL RESOURCE MANAGEMENT	W19	26	Volume of sewage collected per property (kL)	308	5	4	240
	W26	26a	Total recycled water supplied (ML)	370	2	2	300
	W27	27	Recycled water (% of effluent recycled)	18	4	3	9
	E8	28	Biosolids reuse (%)				100
		30	Energy consumption per Megalitre (kiloWatt hours)	579	2	3	830
		31	Renewable energy consumption (% of total energy consumption)	0	1	2	0
	E12	32	Net greenhouse gas emissions - WS & Sge (net tonnes CO2 equivalents per 1000 properties)	400	5	4	350
ENVIRONMENTAL — ENVIRONMENTAL PERFORMANCE		33	90 Percentile licence limits for effluent discharge: BOD 30 mg/L; SS 30 mg/L				
		34	Compliance with BOD in licence (%)	100	1	1	100
		35	Compliance with SS in licence (%)	61	5	5	100
	A12	36	Sewer main chokes and collapses per 100 km of main	111	4	5	44
	E13	37	Sewer overflows reported to environmental regulator per 100 km of main	3	2	3	12
	E4	38	Sewage treated that was compliant (%)	61	4	5	100
ECONOMIC — FINANCE	F6	42	Revenue per property - Sge ($)	660			590
		43	Revenue from non-residential plus trade waste charges (% of total revenue)	28	1	1	15
		44	Revenue from trade waste charges (% of total revenue)	4.3	1	1	0.8
	F18	46	Economic real rate of return - Sge (%)	0.2	4	3	1.1
		46a	Return on assets - Sge (%)	-0.1	4	4	1.1
	F22	47	Net Debt to equity - Sge (%)	-2	2	2	-4
	F23	48	Interest cover - Sge	1	4	4	>100
		48a	Loan payment per property - Sge ($)	68	2	2	27
	F24	48b	Net profit after tax - Water Supply & Sewerage ($'000)	-93	5	5	1
ECONOMIC — EFFICIENCY		49	Operating cost (OMA) per 100 km of main ($'000)	1,320	4	4	1,330
	F12	50	Operating cost (OMA) per property ($) Note 8	442	5	5	320
		51	Operating cost (OMA) per kilolitre (cents)	143	3	3	133
		52	Management cost per property ($)	141	4	4	107
		53	Treatment cost per property ($)	118	4	4	101
		54	Pumping cost per property ($)	101	5	5	46
		55	Energy cost per property ($)	21	3	3	19
		56	Sewer main cost per property ($)	61	4	4	40
	F15	57	Capital Expenditure per property ($)	340	2	2	268

NOTES:
1 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.
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.
3 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- see attachment.
4 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.
5 Non-residential: Access Charge based on square of size of service connection, sewer usage charge - 120c/kL.
6 Non-residential & trade waste volume was 17% of total sewage collected; these customers only provided 28% of the revenue from annual charges, usage and trade waste charges.
7 Compliance with Total N in Licence was 100%. Compliance with Total P in Licence was 100%.
8 The operating cost (OMA)/property was $442. Components were: management ($141), operation and maintenance ($45), energy ($21), chemical ($22) and effluent/biosolids ($18).

Data Gaps and Potential IWCM Issues have been identified as follows:

Data Gaps:

1. Water Supply
- TBL Item 10: Employees per 1000 properties
- TBL Item 32: Total days lost (%)
- TBL Item 36: Renewable energy consumption as a %age of total energy consumption

2. Sewerage
- TBL Item 25: Total days lost
- TBL Item 28: Biosolids reuse (%)

Potential issues: Items where ranking was in bottom 20% (for similar sized LWUs):
1. Water Supply:
▪ TBL Item 12: Residential water usage charge
▪ TBL Item 28: Average duration of interruption
▪ TBL Item 33b: Average annual residential water supplied (kL/property) – INLAND
▪ TBL Item 34: Real Losses/Leakage (L/connection/day)
▪ TBL Item 36a: Net greenhouse gas emissions (net tonnes CO_2/1000 properties)
▪ TBL Item 47a: Net profit after tax ($'000)
▪ TBL Item 49: Operating cost per property ($)
▪ TBL Item 51: Management cost per property ($)
2. Sewerage:
▪ TBL Item 13: Typical developer charge/equivalent tenement (%)
▪ TBL Item 21: Odour complaints per 1000 properties
▪ TBL Item 32: Net greenhouse gas emissions (net tonnes CO_2 / 1000 properties)
▪ TBL Item 35: Compliance with SS in licence (%)
▪ TBL Item 48b: Net profit after tax ($'000)
▪ TBL Item 50: Operating cost per property ($)
▪ TBL Item 54: Pumping cost per property

8. LEGISLATIVE REQUIREMENTS

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

These are set out in Table E12 below.

Table E12: Griffith City 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 Council in the approvals required and the responsibilities attached to the fluoridation of Council's water supplies. Fluoridation applies at the Griffith Water Treatment Plant and, under the legislation, Council is responsible for: • Daily and weekly tests at the treatment plant • A monthly test submitted to Health's Analytical Laboratory • Reporting to Health of dosing above 1.5 mg/L and any interruptions to dosing longer than 24 hours
Environmental Planning and Assessment (EP&A) Act, 1979	Requires that all proposals, activities and functions which are investigated, designed, planned, constructed and operated by GCC 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	Relevant & important to all GCC'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. Council's Emergency Response Procedures Manual has not been updated since 2001.
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. Council's Back flow Prevention Policy has not been updated since 2003.

Legislation	Council's Obligations & Requirements
Protection of the Environment Operations Act,1997	Need to exercise due diligence to avoid environmental impact. Need to develop operations emergency management plans. Obligation to notify EPA of pollution "incidents" System licensing for sewerage systems; including Pollution Reduction Programs Treatment works operating licences must comply with the Act. Griffith's Licenses are: • Griffith STP : Licence No. 1604 • Yenda STP : Licence No. 1402
Water Management Act, 2000	Requirement to levy developer charges. Provides the framework for water sharing plans and environmental flows. Defines LWU access licences and bulk water supply regimes
Catchment Management Authorities Act, 2003	Murrumbidgee CMA is the statutory body created by this Act Provides the basis and authority for preparation of a Catchment Action Plan which sets direction for investment in natural resource management.
Local Government Act, 1993 and Local Government (General) Regulation, 2005	Need to comply with Accounting Standard AAS27 (including provisions regarding accounting for depreciation) Requirements to comply with DWE Best Practice Criteria. Statutory requirements in relation to pricing and charges (including Developer Charges). Also stipulates the need for Ministerial approval to undertake water supply or sewerage works (Section 60) Other requirements including State of Environment reporting, triple bottom line reporting, etc

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 E13 below:

Data Gaps:

- Update of Council's Emergency Response Procedures Manual
- Update of Council's Backflow Prevention Policy

Table E13: 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
Development Control Plans (DCP'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

9. BEST PRACTICE COMPLIANCE

Griffith City 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

10. MANAGEMENT AND BUSINESS PLANS

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

Strategic Business Plans for Water Supply and Sewerage were last prepared by Council in 2005 and are now being updated (completion by December 2009).

11. 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.

Griffith City 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.

b. Water Sharing Plans and Water Entitlements

The water supplies to Griffith, Yenda and Villages are subject to the requirements of the Water Sharing Plan (WSP) for the Murrumbidgee River Water Source (September 2004) as far as the Plan applies to Murrumbidgee Irrigation which acts as the bulk supplier.

The **objectives** of the Murrumbidgee WSP are to:

a) protect and restore in-river and riparian habitats and ecological processes
b) provide for appropriate watering regimes for wetlands
c) sustain & enhance population numbers and diversity of indigenous species
d) protect basic landholder rights, including native title rights
e) maximise early season general security allocations
f) protect **town water supplies**
g) protect end-of-system flows
h) provide for commercial consumptive use
i) provide for identified recreational needs
j) protect identified indigenous and traditional uses of water
k) within the ability of the plan, promote the recovery of known threatened species

The **strategies** for reaching the objectives are to:

a) establish environmental water provisions
b) identify water requirements for basic landholder rights
c) identify water requirements for access licences
d) establish rules for granting access licences
e) establish provisions that place limits on the availability of water
f) establish rules for making available water determinations
g) establish rules for the operation of water allocation accounts
h) establish provisions specifying circumstances under which water may be extracted
i) establish access licence dealing rules

The Murrumbidgee River is located in south west NSW and is almost 1,600 kilometres in length from its source in the Snowy Mountains to its junction with the Murray River. About 1,200 kilometres of this is regulated. The River drains an area of some 84,000 square kilometres and is a major tributary of the Murray-Darling system.

The volume and pattern of flows in the River have been significantly altered by the construction and operation of Burrinjuck Dam on the Murrumbidgee River and Blowering Dam on the Tumut River to supply water to downstream users and the diversion of the Snowy River through the Snowy Mountains Scheme into the Murrumbidgee River. These changes have impacted on the environmental health of the River and its wetlands and contributed to water quality decline.

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.

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.

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.

Use of Effluent by Irrigation (2004) – DECC Guidelines

These Guidelines are to apply to any scheme utilising treated effluent in landscape watering, irrigation of pasture, crops, orchards, vineyards, plantation forests or rehabilitated sites and for the irrigation of golf courses, racecourses and other recreation grounds.

The Guidelines provide advice on best management practices in the planning, design, construction, operation and management of effluent irrigation schemes such that beneficial environmental outcomes are achieved.

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.

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".

Griffith's Strategy (On-site Sewage Management Plan) 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.
All on-site systems are registered and maintained on Council's data base and sites are inspected annually (based on a risk assessment approach) to ensure sludge is being pumped out and that there is no effluent discharge off-site. A monitoring system is also in place to ensure compliance and Council can revoke approval where conditions are not complied with. Council also runs an education program for owners of on-site systems.

e. NSW Groundwater Quality Protection Policy

Griffith City Council does not draw on groundwater for water supply within the Shire, but there are a number of Groundwater Licences applying to agricultural enterprises within the shire.

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 by DWE (now 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.

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.

Griffith Council adopted its Stormwater Management Plan in April 2001.

Gap: Griffith Stormwater Management Plan not available

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. The Griffith Flood Study was completed in 2006

The Griffith Floodplain Risk Management Study and Plan is programmed to be completed in first draft by June 2010.

Gap: Floodplain Risk Management Plan not available

APPENDIX F

APPENDIX F: IWCM & OTHER ISSUES

Contents

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 Griffith IWCM Evaluation Study are also listed here with the Department / Agency to which they should be referred.

A. IWCM Urban Issues

No.	Reference	IWCM Issue	Comments/Recommended Actions	Required Strategy
1.	App. A: Section 1 (Page A2)	Biosolids Management Council does not have a long term strategy for biosolids management	Council has significant land areas available and intends to continue anaerobic digestion, air drying and spreading onsite. (Approximately 1000 tonnes is processed annually) The REF for the new plant proposed that sludge disposal continue onsite.	BaU
2.	App. App. A: Section 2 (Page A8)	Population Growth Is a population growth rate of 0.7% pa Appropriate for Griffith?	A report commissioned by Council (the McCrindle Report) projected growth rates of approximately 1.4% pa. Council has adopted a growth rate of 0.7% pa; which is more in line with Department of Planning Projections to 2036. Council will review the growth projections after the 2011 Census.	BaU
3.	App. A: Section 2: (Page A17)	Environmentally Sensitive Areas Potential for pollution of environmentally sensitive areas	Council has water and wastewater monitoring programs in place and is subject to compliance under the POEO Act and Health Act.	BaU
4.	App. A: Section 4: (Page A41)	Water Supply Assets A high percentage of distribution and rectification pipework is at or older than 30 years	Council has an asset replacement and renewal program in place and is developing an Asset Management Plan (to be completed in 2011)	Simplified
5.	App. A Section 4: (Page A42)	Sewerage to Villages Lake Wyangan (60ET), Nericon (40ET) and Tharbogang (40ET) are predicted to grow. These Villages are not currently sewered`	Council's forward planning has identified the need to provide sewerage to these Villages with implementation planned for: Lake Wyangan: Reticulation provided in 2009; Construction scheduled for 2013/14 Nericon: Provision: 2013/14 Tharbogang: Provision: 2018/19	Simplified
6.	App. A: Section 4: (Page A45)	Pollution Reduction Program Compliance with more stringent discharge conditions under PRP issued by DECCW	Council is proceeding to develop a new MBR Treatment Plant, with construction scheduled to commence in August 2010	BaU

No.	Reference	IWCM Issue	Comments/Recommended Actions	Required Strategy
7.	App. A: Section 4: (Page A45)	Algae in Maturation Lagoons Carry over of algae in discharge from the Maturation Lagoons	This will not be an issue upon commissioning of the new MBR Plant	BaU
8.	App. A: Section 4: (Page A46)	Sewerage Assets Sewerage assets are aging	Sufficient annual expenditure is being directed to asset replacement. Council is preparing an overall Water Supply and Sewerage Asset Management Plan (refer No.4 above)	Simplified
9.	App. A: Section 4: (Page A51)	Secure Yield – Climate Change Impacts Office of Water/CSIRO Climate Change models predict: • average surface availability may reduce by up to 9% by 2030 • "best" estimate of change in rainfall (from historical) is a reduction of 4% • runoff may reduce by 1% • groundwater extraction is predicted to increase by around 22%, to become 21% of total average use	It is recommended that Council determine "secure yield" and identify potential back up supplies from groundwater as well as developing targets for securing water from alternative sources (eg improved uptake of rainwater tanks and or recycling).	Simplified
10.	App. C	Demand Management Targets A range of potential demand management options has been identified in the modelling undertaken. Council has not yet adopted Target Water Savings	Council is preparing a Demand Management Strategy and will implement water saving measures with associated targets. Council will consider the Demand Management Plan in 2010	BaU
11.	App. C: Section 4: (Page C21)	WTP Upgrade Provision for increasing the capacity of the Water Treatment Plant has been allowed in Council's Capital Works Program for 2023/24. Demand Management modelling has	Future upgrade timelines will be evaluated when the proposed demand management initiatives are completed and assessed	Simplified

No.	Reference	IWCM Issue	Comments/Recommended Actions	Required Strategy
		indicated that this could be deferred beyond 2038		
12.	App. E: Section 7: (Page E14)	TBL Performance Results (2007/08) A number of issues have been identified from a review of Griffith's service provision performance (based on 2007/08 TBL Performance Reports). These are listed below:		
		a) Water Supply		
		• low residential water charge	Council will review as part of Demand Management Development Strategy	Simplified
		• high average duration of interruptions to supply	Nature of ageing water supply system. Council will address as part of Asset Management Plan	Simplified
		• annual residential water usage is high	Addressed as part of Demand Management Strategy	Simplified
		• water losses are high	Addressed as part of Demand Management Strategy	Simplified
		b) Sewerage		
		• odour complaints are high on a Statewide basis	Council will investigate sources and implement control strategies	Simplified
		• high suspended solids in effluent	Will be addressed when new MBR Plant is commissioned	BaU
		• Operating costs per property are high	Council will review its processes and analyse data to understand why costs are high	Simplified
		• Pumping costs are high	This is the nature of the topography in Griffith with a larger than normal number of pump stations	BaU
13.	PRG Issue (1)	Water Restrictions and Impact on Revenue	Council sets its income/revenue annually. The pricing is based on anticipated lower demands. Prices will continue to be increased in line with demand and the potential impacts of demand management issues	BaU
14.	PRG Issue (2)	Long term viability of Lake Wyangan as a raw water back up water source	Water can be transferred to Lake Wyangan from the Canal and stored or transferred to provide off-stream storage.	Simplified

No.	Reference	IWCM Issue	Comments/Recommended Actions	Required Strategy
			A Management Plan for Lake Wyangan is being developed with Murrumbidgee Irrigation. The strategy will review storage levels	
15.	PRG Issue (3)	Reclaimed water reuse Reduce demand on potable supplies by using reclaimed water for irrigating parks, sporting fields, open space areas, etc	Council is reviewing reuse. Target date for possible implementation is 2011/12. Incorporated in Council's Demand Management Plan	Simplified
16.	PRG Issue (4)	Water Storage Capacity Is there enough storage capacity in service reservoirs?	Current capacity is 55ML or 1.5 times Peak Day Demand	BaU

B. Non-Urban Water Servicing Issues

No.	Item	Issue	Relevant Department/Agency for Referral
1.	Flooding App. A: Sections 2 & 4: (Pages A15 & A47)	Problems with existing trunk drainage system to cope with 1/100 year recurrence interval events. System designed for 120 year events	Griffith City Council and Murrumbidgee Irrigation
2.	CMA Targets: App. A: Section 2: (Page A17)	A number of the Murrumbidgee CMA's Resource Condition targets impinge on Salinity, Soils, Vegetation, Aquatic Ecosystems etc	Murrumbidgee CMA
3.	Water Quality Objectives: App A: (Page A20)	Achievement of water quality objectives under the NWI. Intergovernmental Agreement on Over Allocation	Murrumbidgee CMA
4.	Water Quality: App. A: (Page A24)	Limited monitoring for pesticides in Little Mirrool Creek has revealed the presence of pesticides (low concentration).	Murrumbidgee Irrigation Limited

APPENDIX G

APPENDIX G: GLOSSARY & ABBREVIATIONS

Contents

1. GLOSSARY

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

Acid sulphate (sulfate) soils Includes acid sulphate soils and potential acid sulphate soils.

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.

Alluvial Deposited by rivers in low-lying areas and flood plains.

Aquifer 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.

Basix 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.

Best Practice An industry standard recognising the most effective management methods of the time.

Biodiversity The variety of life forms, the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form.

Capital works program A schedule of planned capital expenditure, normally over a period of thirty years for water supply and sewerage businesses.

Catchment The area of land drained by a river and its tributaries.

Colluvial (deposits) Deposits of loose material that have been carried by gravity and are usually found at foot slopes of hills.

Dissolved oxygen The concentration of oxygen which is dissolved in water and compared with oxygen 'saturation' at a particular temperature.

Dual reticulation 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.

Electrical conductivity 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'.

Faecal coliform	A type of bacteria found in the faecal material of humans and other mammals that is an indicator of faecal pollution.
Floodplain	Flat land beside a river that is inundated when the river overflows its banks during a flood.
Fractured rock strata	These occur in rocks eg slate, phyllite and basalt, and allow water to move through broken joints, bedding plains or faults.
Geology	Science of learning about the earth: its origin, structures, composition, historical changes and processes.
Greywater	Water form a household, excluding toilet water.
Groundwater	Water beneath the surface held in or moving through saturated layers of soil, sediment or rock.
Ground water flow system	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.
Hydrogeology	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.
Landscape	An area of land and its physical features. A term that we use to describe an area that has common features. For example Griffith may be in a range of landscapes, depending on whether we are looking at the type of agricultural production, vegetation or landforms.
Local water utility	The water supply and sewerage businesses of a local council.
Nutrients	A source of nourishment. Key nutrients in wastewaters are phosphorus and nitrogen.
Piezometer	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.
Permeability	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.
Potable water	Water of a standard fit to drink.
Rainwater tank	Storage tank for collecting rainwater from the roofs of buildings.
Recharge	Water that infiltrates through the soil surface to the watertable.

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

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

2. 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
DECCW	Department of Environment, Climate Change & Water
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
GL	Gigalitre
GMA	Groundwater Management Area
GCC	Griffith City Council
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
MDBC	Murray Darling Basin Commission
mg/L	Milligram per litre
MI	Murrumbidgee Irrigation
mL	millilitre
ML	Megalitre
mm	Millimetre
NFR	Non Filterable Residue
NPV	Net Present Value
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
WSUD	Water Sensitive Urban Design
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
yr	Year