Joint IWCM Evaluation Study

Job number A060

Section 4B

Technical Note 4B

Weddin Shire Council Data and System Mapping

This technical note describes the water cycle context of Weddin Shire Council (WSC). WSC operates wastewater services within its Council area. Water is supplied by Central Tablelands Water (CTW) to the towns of Grenfell and Quandialla, and by Cowra Shire Council to the township of Greenethorpe. This document examines WSC's catchment, water resources, urban environment, sewerage scheme and stormwater systems. The purpose of this technical note is to describe the study area context and identify data gaps and issues.

1 Weddin Shire Council Water Context

1.1 Overview

WSC is bounded by the Shires of Forbes, Bland, Cowra and Young. Villages in the WSC include Grenfell, Caragabal, Greenethorpe, Bimbi and Quandialla. Grenfell is the main urban centre of the Shire and is located on the central western slopes of NSW, in the Lachlan River Catchment. The Lachlan River Catchment covers an area of approximately 87,000 km^2. Figure 11 in Appendix A shows the Lachlan River Catchment and Grenfell location.

2 Catchment

2.1 Introduction

The Grenfell Stormwater Management Plan (Grenfell SMP) report contains information on Shire catchment as follows. Grenfell is located south of the Lachlan River in the Tyagong sub-catchment (840 km^2). The main tributary creeks of this sub-catchment include Emu Creek, Tyagong, Bungalong Creek, Brundah Creek, Burrangong, Cudgell and Bulla Creek. The majority of these creeks are ephemeral (flows occurring in the winter and early spring months). The salinity levels of the stream are increasing.

Emu Creek is the major waterway draining Grenfell's urban area. It is an ephemeral creek with flows occurring in the wetter months of the year. The creek flows into Grenfell from the northeast, flowing in a south easterly direction through the town.

Creeks of the Tyagong sub-catchment flow to Lake Cowal via Bland Creek. Lake Cowal is the largest natural lake in the catchment. It is a terminal drainage lake of Bland Creek, located on the Lachlan River floodplain between Forbes and West Wyalong. The total area of the lake and associated wetlands is approximately 20,500 ha. The wetland is an extensive freshwater lake with a maximum depth of 4.2 m. It forms part of a chain of wetlands including Lake Cowal, Nerang Canal and Bogandillon Swamp. Lake Cowal provides important drought refuge when wetlands in other parts of the state are dry (Grenfell SMP, 2001).

Data gaps:
- **Which stream shows increased salinity level?**
- **Salinity levels**

Potential Issue: Stream's salinity level

2.2 Principal Landscape Characteristics

2.2.1 Land Form

"Weddin Shire consists of generally more elevated and, at times, steep and rocky hill country in the east, grading through undulating land, to the level plains in the far western section.

The urban area of Grenfell is characterised by a number of small hills at an altitude of approximately 400 m located in the central, south eastern and north western sections of the Grenfell urban area. These hills are described as moderately steep.

The landscape generally slopes in a westerly direction, becoming gentle to flat topography at the western boundary of the shire.

The two northern tributaries of Emu Creek flow to either side of the hill in Grenfell's northwest. Emu Creek flows in westerly direction along a depression between the central/south eastern hills and the north western hill.

Grenfell is also located between larger hills to the North, East and South" (Grenfell SMP, 2001).

2.2.2 Soils

The Grenfell SMP provides some relevant points regarding the soils within the Shire. These are presented below.

"The soils of the Weddin Council area include shallow sandy and earthy soils and yellow podsolics of the eastern and central hill country along with red earths, red and yellow podsolics and yellow solodic soils of the undulating farmlands in the central section. Further to the west, and along the floodplains of the main creeks, the soils are red-brown earths and deep grey and brown clays which at times are associated with gilgai soils in the level plains country" (Grenfell SMP, 2001).

"Grenfell is situated upon what is known as the Grenfell Granites. Amongst these Grenfell Granites are large patches of phyllite, schilst, micaceous silty sandstone and siltstone, andesite and limestone lenses.

The Weddin Mountains comprise an assortment of sedimentary rocks including sandstone, white and buff sandstone conglomerate, and green and white siltstone deposited in the Upper Devonian geological era.

East of Grenfell are horizontal folds including andesite, dacite rhyolite, tuff and tuffaceous sediments, and limestone folded with conglomerate, red sandstone siltstone and shale layers. Soils derived from these sediments vary widely in their fertility and suitability for agricultural use" (Grenfell SMP, 2001).

2.2.3 Vegetation

The Grenfell SMP report contains information on local vegetation, which was obtained in the Weddin Catchment Action Plan (WCAP, 1999) report. The vegetation within Weddin LGA is described below.

The majority of undulating lands have been cleared for grazing and cropping and there remains very little remnant vegetation. The areas remaining are generally associated with soils of low fertility on steeper slopes.

The main areas of remnant vegetation are presently located in the Weddin Mountains and Conimbla National Parks, State Forests, Crown lands and the steeper lands that are adjacent to them, and on roadsides and travelling stock routes with some strands along the major creeks.

Urbanization of the catchment has led to deterioration of Emu Creek and a change in the extent and availability of wetland ecosystems, riparian vegetation and flood zones.

The riparian vegetation of Grenfell can be best described as modified vegetation consisting grassy areas, a variety of introduced species of grasses and herbs, and areas containing exotic trees including willows. Native aquatic and terrestrial vegetation remnants are in the minority along the banks of Emu Creek at Grenfell. While in the correct situation willows can provide good bank stabilisation, reducing erosion and sedimentation of a watercourse, within faster flowing streams they can block and divert running water, causing stream banking erosion. Willows also tend to spread and colonise new areas downstream, thereby threatening native vegetation communities.

Land managers in the Weddin Catchment study area have expressed concern at the spread of noxious weeds as a potential land and water degradation threat. These species are also of concern to the local councils in the Weddin Catchment study area (Grenfell SMP, 2001).

The WSC SOE (2006/07) report states that WSC has continued its direct weed control activities on Council controlled lands. In addition, infestations of noxious weeds on private lands and those controlled by other public bodies have been monitored and appropriate action has been taken, to ensure suppression, where this has been needed.

Following a Government review of noxious weed species in New South Wales during the last reporting year (2006/07), there are now ninety seven weed species or species groups are declared noxious within Weddin Shire. Many of these species do not occur within the Shire but have been added to the noxious weed list following their declaration as noxious weeds for the whole of New South Wales.

Potential Issue: noxious plants - potential land and water degradation threat

Data gap: WCAP (1999) report

2.3 Main Population Centres

The total Weddin Shire population recorded at the last census in 2006 is 3,641 - a reduction from 3,653 in 2001. However, it should be noted that the reduction in population occurred between 2001 and 2003 and that the number of residents has increased by 35 since 2003 (WSC SOE 2006/07).

The main population centre within Weddin Shire is Grenfell which has a population of 1,922 people in 2001 and 2,414 people in 2006. Council staff has advised that current population in Grenfell will probably stay the same or drop slightly.

Population data for towns and villages in the Weddin district is shown in Table 1.

Table 1: Census Data

Towns and Villages	2001 Census	2006 Census
Grenfell	1,922	2,414
Quandialla	NA **(Note 1)**	312
Caragabal	NA **(Note 1)**	199
Weddin LGA	3,653	3,641

Note 1: NA (not available) Source: 2006 Census Quickstats

CTW staff consider that Census figure for Quandialla population from the 2006 Census is high. CTW has registered 86 water connections in Quandialla. According to Census data the average household size in Quandialla is 2.5, thus the population would be 215.

Data gaps:
- 2001 Census data by region
- Quandialla 2006 or current population

2.4 Climate

The climate in Weddin Shire is similar of the climate in Blayney.

The Grenfell SMP report states that the climate data recorded at Grenfell (from Bureau of Meteorology - BOM) suggests that generally, Grenfell experiences hot and dry summer and cool and moist winter. 2007 figures show a slightly different climate condition with hot summer and high rainfall especially during November and December. A summary of rainfall and maximum/minimum temperature in 2007 is shown in Figure 1. Section 3.4 presents a discussion in climate change from the BOM.

The mean annual rainfall received at Grenfell, based on the records of the BOM is 631.7 mm. The occurrence is relatively uniform throughout the year although there is a tendency for winter to dominate and more intense storms are experienced in the summer months. Rain is generally less than evaporation throughout the year (see Figure 2).

Average daily maximum temperatures vary from 31.6°C in January to 12.6 degrees Celsius in July while average daily minimum temperatures vary from 16.1°C in January to 2.9°C in July. Prevailing winds are predominantly from the west and north westerly direction from July to February and southwest to south easterly direction from March to June (Grenfell SMP, 2001).

The climate data presented in Figure 1 and Figure 2 is the same data used for the water demand modelling (refer to Technical Note 3 – Demand Projection). The climate data provided below is the same data for Blayney, Cabonne and Weddin Shires. Figures below represent an average of rainfall, maximum and minimum temperatures and evaporation figures for 2007 records.

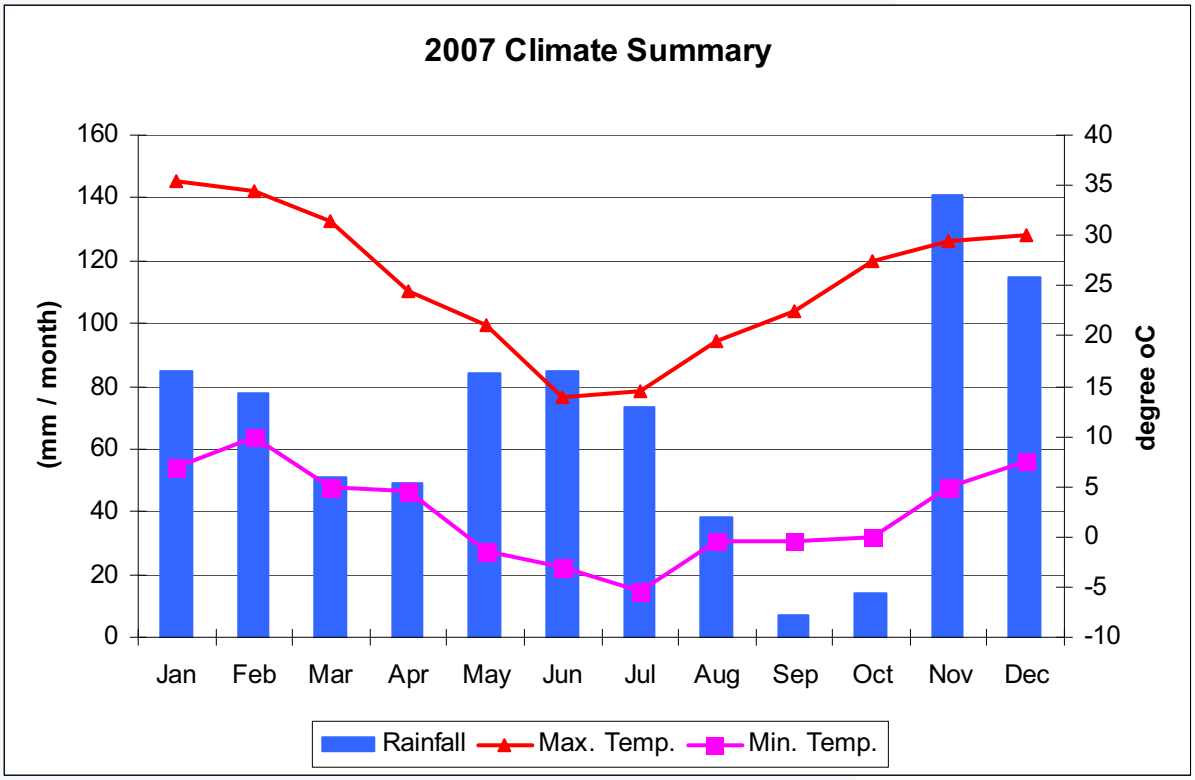


Figure 1: Central Tablelands Climate Data Summary. Source: SILO Data Drill, March 2008.

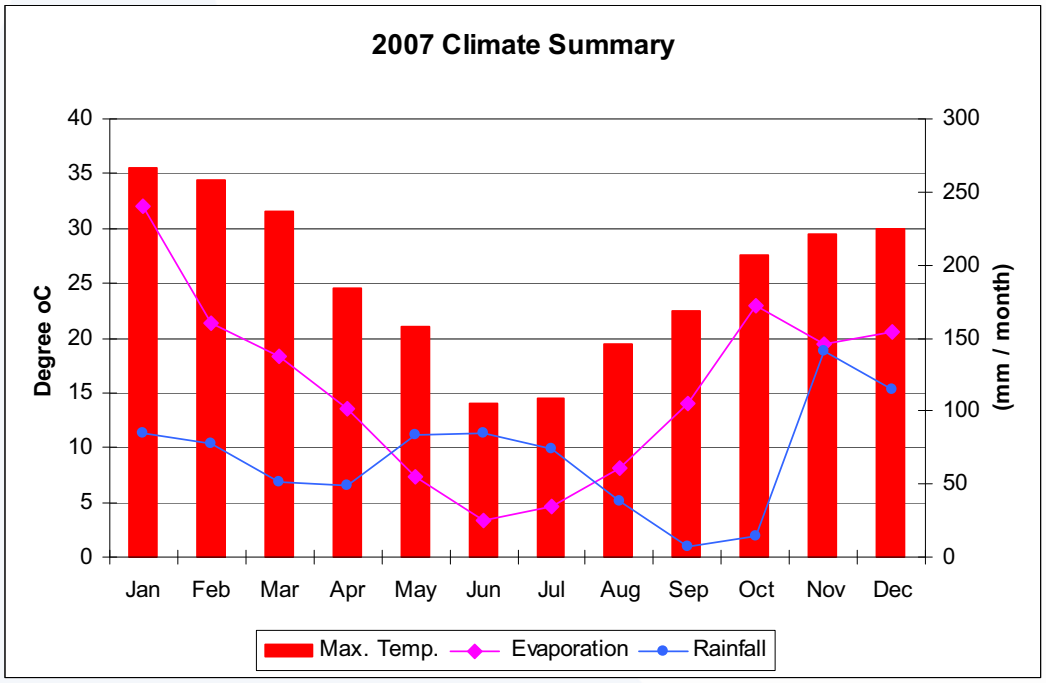


Figure 2: Central Tablelands Climate Data Summary. SILO Data Drill, March 2008.

2.5 Land Uses

2.5.1 Land Use in the Lachlan and Tyagong Catchments

Industry in the Lachlan catchment is predominantly agricultural including wool production, horticulture, feedlots and piggeries, viticulture, beef production, wheat and other cereals, lucerne and other irrigated crops.

The breakdown of land use in the Tyagong Creek catchment is shown in Table 2. The table indicates that urban areas account for 0.5% of land use while cropping/pasture account for 85% (Grenfell SMP, 2001).

Table 2: Land Use in the Tyagong Sub- catchment

Land use	Area (Ha)	Proportion of Total Area (%)
Cropping	32,937	39.4
Horticulture	93	0.1
Flood irrigation	0	0.0
Mining	43	0.1
Pasture	38,088	45.6
Timber	11,942	14.3
Urban	429	0.5
Total	**83,532**	**100%**

Source: Grenfell SMP, 2001.

According to the WSC SOE report (2006/07) land use patterns within Weddin Shire continue to be similar to those of previous years.

The summer 2006 harvest of winter grains crops was relatively poor due to drought. Patchy storm activity was recorded in the Shire over the early months of 2006 and the prospects for the winter grain crops appeared good after autumn rains encouraged the sowing of large areas.

No detailed livestock production figures were available for the Shire, but it is understood many properties are carrying reduced stock numbers because of the drought and the retained stock have in generally been hand-fed for at least in part of the report year.

No additional lands have been added to the National Parks in the Shire during the 2006/07 reporting year.

During 2006/07, Council gave development consents for Broula King Gold Mine located at Bumbaldry and a new poultry farm (WSC SOE, 2006/07). It is envisage that the gold mine will operate for 2 years following construction.

2.5.2 Land Use in Grenfell

The majority of land in the Grenfell urban area has been used for residential housing. The commercial/tourist centre of Grenfell is located around a few central streets such as Main and Burrangong Streets. Tourism is a significant industry in Grenfell; there are a number of museums, festivals and other attractions in the area.

Accommodation numbers in Grenfell are as follows:

- Post Office Residence – 6 people
- Grenfell Guest Accommodation – 8 people
- Wondilagong B&B – 6 people
- Calico Duck – 4 people
- Motel – 68 people
- The Albion – 25 people
- Railway – 25 people Exchange – 22 people
- Royal – 20 people

The Economic Development Officer at Grenfell assumes that there will be 2000 additional people staying in the town with friends or family over the festival weekend.

Grenfell has some “day” events. The population expected for those days are as follows:

- Open Day – 500 people
- Show – 200 people
- Picnic races – 200 people
- Loaded Dog Race day – 200 people

According to Grenfell SMP the businesses operating in Grenfell include:

- Manufacturing and Service
- Finance
- Mining and Extractive Industries
- Sand, Gravel, Soil and Concrete Suppliers

- Intensive Animal Industries
- Produce Mills and Grain Storage Facilities
- Sawmills

A redundant Gasworks site is located in north Grenfell which has been identified as a contaminated site. Council staff has advised that the gasworks site has been assessed and results are not available yet.

Data gap: Impact of contaminated site on water quality

Potential Issue: contaminated site at Gas works site

The Koorawatha Grenfell Railway follows the outskirts of Grenfell from the southeast and terminates at Camp Street near Emu Creek. Grenfell's light industrial zone and the sewerage treatment plant are located south west of the urban area at Bradley and South Streets, in proximity to Emu Creek. The saleyards are also located south west of Grenfell, outside the urban area, on Grenfell Bimbi Rd. The yards are not close to Emu Creek but are located near a minor tributary which flows toward the creek. The saleyards were decommissioned in September 2001, thus it is not considered a threat to Emu Creek.

Council staff has advised that a new Depot has been constructed on the saleyards site. It comprises of a covered and closed truckwash area, covered fuel area, water reuse scheme, etc.

2.5.3 Land Use Planning

The Weddin LEP 2002 was gazetted on 1st July, 2002. Zonings under this LEP are as follows

- 1[a] - agricultural zone - 333,184 ha
- 1[ci] - rural residential zone - 203 ha
- 1[cii] - small farm zone - 286 ha
- 1[ciii] - rural retreat zone - 950 ha
- 2[t] - township zone - 475 ha
- 2[v] - village zone - [Village of Quandialla 162 ha], [Village of Caragabal 36 ha], [Village of Greenethorpe 57 ha], [Village of Bimbi [12 ha]
- 8 - national parks and reserves zone - 10, 432 ha

This LEP remains in force. Weddin LEP 2002 map is provided in Appendix B.

2.5.4 Significant Industries within the Local Area

Historically, primary production was the reason for the development of the economy and produced products that were consumed locally and were exported to the rest of NSW and to the world. The WEDS report states that most of the 2004 production was exported out of the region for processing with only a small proportion consumed in Weddin.

Primary production increased as additional land was developed for farming. In 2004, most of the suitable land was developed and there are now restrictions on further land development. Production can increase through better production systems (this tends to be a slow source of growth) or by producing higher quality products that achieve higher market prices (this tends to be a slow source of growth too in the absence of access to irrigation or significant new technologies). Primary industry is important to Weddin and employed 627 people in 2001, with others employed in providing the materials and services used in production and in marketing

and transporting the products produced by the farmers. Increased use of purchased materials and services has substituted for farm employment over many decades.

CTW staff has advised that the main significant industries in the Weddin Shire are pig farming and a Poultry Breeder Farm.

Consumption for a substantial pig farming operation in the last few years in Weddin Shire was as follows:

- 10.95 ML in 2005/06
- 9.24 ML in 2006/07
- 8.65ML in 2007/08

The Poultry Breeder Farm operation has an annual demand requirement of 34 ML and a peak daily demand of 332 KL.

The Broula King gold mine operations have been delayed therefore there is no water consumption for this industry yet.

Bayada poultry it is connected to the water supply system but it is not in production yet. The expected annual demand would be 121 ML/a.

Further information on industries of employment is provided in section 4.

2.6 Sensitive Areas

2.6.1 Land Degradation

Since the early 1850's the soils of Weddin Shire were found to be most favourable for mixed farming activities. These lands were extensively cleared and farmed and combined with heavy stocking rates and rabbit infestation there has been a significant and continuous decline in the native vegetation.

The land and water degradation problems of Weddin Shire as the direct result of tree and vegetation decline are:

- Sheet erosion of steeper slopes
- Increased occurrences of stream bank erosion due to the removal of trees
- Rising water tables, resulting in increases in areas affected by dryland salinity and decline in water quality
- Increased die back in existing trees from insect attack and other stresses
- Old age and death of remaining trees in the landscape increasing the difficulty in achieving natural vegetation; and
- Decline in wildlife habitat and population of insect eating birds

Data gap: salinity levels in runoff

Soils have been variously affected by the more common forms of land degradation such as water and wind sheet erosion, scalding and gullying in the past. During severe drought, soils in parts of the Shire, where ground cover is absent or has been removed, have been subjected to moderate to severe wind erosion (Grenfell SMP, 2001).

2.6.2 Water Quality

The Grenfell SMP includes the ambient water quality guidelines published by the NSW Government for the reference of stormwater managers in Grenfell. These guidelines relate to

long term average dry weather concentrations and are not directly applicable to wet or dry weather stormwater discharge concentrations. They can, however, be used as a guide for developing ambient water quality objectives.

The absence of water quality data and macro-invertebrate data for Emu Creek has been noted as a stormwater issue for Grenfell (Grenfell SMP, 2001).

Data gap: water quality and macro-invertebrate data for Emu Creek

Potential Issue: Stormwater quality at Grenfell

2.6.3 Natural Hazards – Flooding

The 2007, Emu Creek Flood Study report presents the results of the assessments undertaken to identify floodways areas within Grenfell. Two approaches were used in assessing the floodways. The results are summarised below:

- *"The Company Dam Overflow (Downstream of the dam)*. The floodway may be defined by the extent of inundation reached by the 20 year ARI flood as far as North Street. Downstream of that location, the floodway widens and most of the waterway cross section is important for the conveyance of flow.
- *Star Gully*. Between Makins Street and Sullivan Street, the extent of inundation reached by the 20 year ARI flood is a reasonable representation of the 100 year ARI Emu Creek floodway. Further downstream, the floodway widens and includes North Street which conveys significant flows.
- *Star Gully Tributary*. There are significant flows on the overbank. The hydraulic analysis confirmed that the 100 year ARI extent of inundation was a reasonable representation of the floodway.
- *Gooloogong Tributary*. The extent of inundation reached by the 20 year ARI flood is a good representation of the floodway, except at its downstream end at Cross Section 25 near the junction with Emu Creek, where it widens slightly.
- *Emu Creek*. This is the main stream in the drainage network. Hydraulic analyses supported the adoption of the 100 year ARI extent of inundation as the floodway between North Street and Camp Street. In this reach, constrictions of the flow resulted in a cumulative increase in afflux which was compounded by the "natural" constrictions imposed by the existing bridge crossings. The analyses showed that further downstream, the 20 year ARI flood extent could be adopted as the floodway.
- *Emu Creek Tributary*. In general, the floodway approximates the extent of 20 year ARI flood, except in the vicinity of Manganese Road where the extent of inundation widens due to the effects of the bridge and would be a conservative representation of the 100 year ARI floodway.
- *O'Brien Tributary*. In the undeveloped portion of the catchment above Warraderry Street, the 20 year ARI extent defines the 100 year ARI floodway. Downstream of that point the floodway widens to the extent of 100 year ARI inundation. Melyra Street functions as a floodway during major flood events.
- *Southern Tributary*. Hydraulic analysis showed that the 20 year ARI extent could be adopted as the floodway upstream of Cross Section 4. Further downstream, where the inundation extends over several hundred metres, the floodway is somewhat narrower than the 20 year ARI extent." (Emu Creek Flood Study, 2007).

Council staff has advised that a new Emu Creek Flood Study is to be done.

2.6.4 Land Contamination

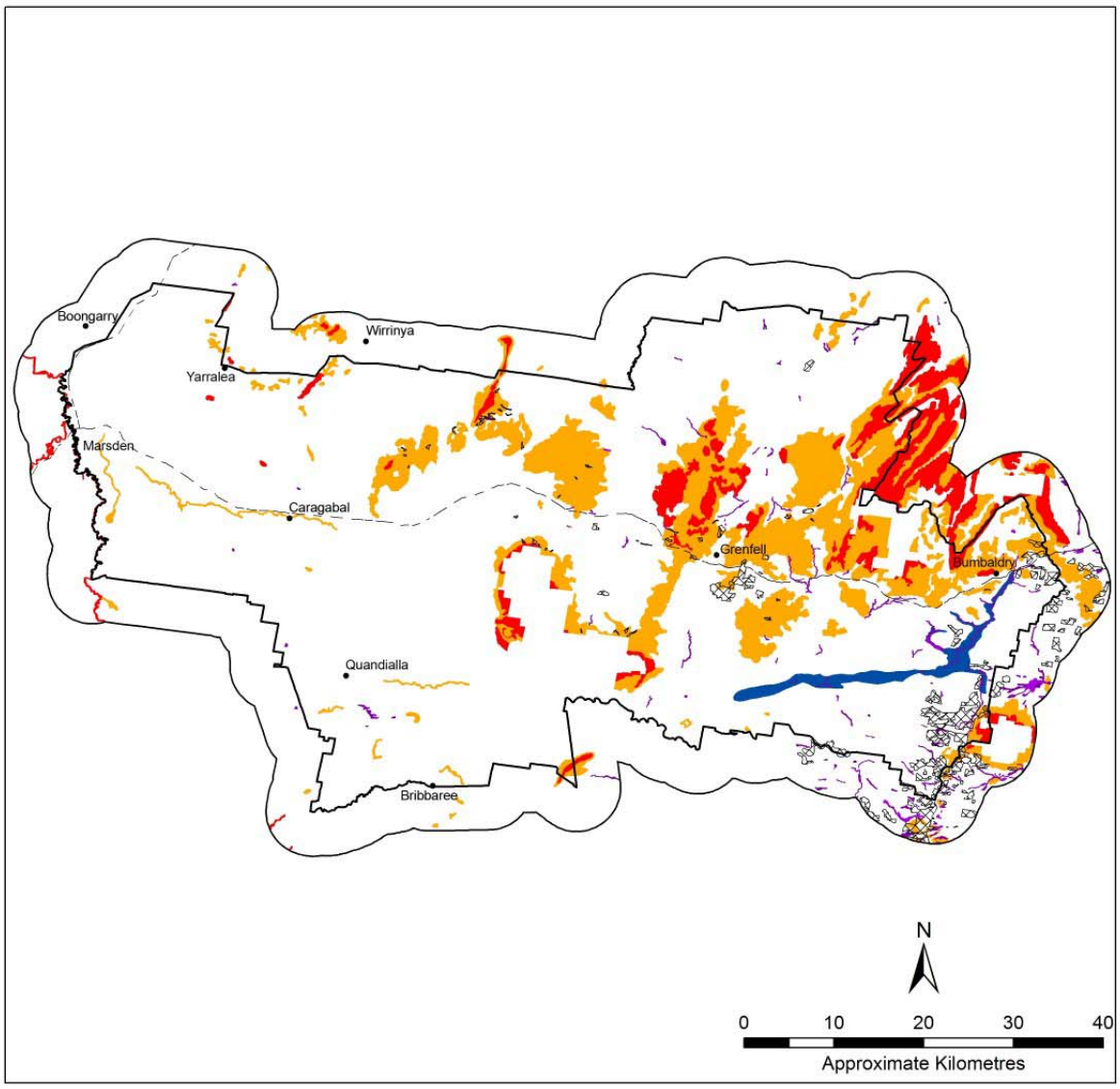
The WSC SOE report states that no contaminated sites were identified in the Shire during the report year (2006/07).

Drilling works were conducted at the former Grenfell Gasworks from 02/09/08 to 04/09/08. Soil bores were drilled at 11 locations and soil samples were collected for analysis. Groundwater monitoring wells were installed at 5 soil bore locations and groundwater samples were collected for analysis. Results of the analysis are not available yet.

2.6.5 Environmentally Sensitive Areas

The Department of Water and Energy & Environment and Climate Change has recently prepared maps of Weddin LGA which identify environmentally sensitive areas within Weddin Shire. These maps show the location of sensitive areas related to land and water resources/capability and biodiversity and native vegetation. See maps in Figure 3, Figure 4 and Figure 5.

Data gap: Do these environmentally sensitive areas impact LWU ability to meet levels of service now and in the future? Is there any planned development in these areas that might impact water resources and quality?



WEDDIN LGA

Environmentally Sensitive Areas - Sensitive Land Resources

This land use decision making tool is based on information produced by the Department's of Water and Energy, Environment and Climate Change and Primary Industries and does not represent other NSW Government agency information.

This information should be used as a guide only and scale must be taken into consideration when used with cadastral information.

Environmentally Sensitive Areas Land Overlay Data

Data Source	Data Codes
Land Capability-Unsuitable for development	Classes 7,8
Land Capability-Development Capability will vary	Classes 5,6
NSW Erosion Mapping-Salting	45
Dryland Salinity Mapping 2004	Salinity_C
NSW Erosion Mapping-Moderate to severe sheet and rill erosion hazard	23,24,43,44
Soil Regolith Mapping	R4
Karst Extent North West CCEPG	

Legend

- Local Government Boundary
- Local Government Area 5km buffer
- Severe to Extreme Sheet & Rill Erosion
- Salt Affected Land - unsuitable for intensive development, maintain and/or restore groundcover with salt tolerant vegetation
- Land Capability Class V & VI Development capability of these areas will vary.
- Land Capability Class VII & VIII Development of these areas would not be considered appropriate.
- Karst Extent
- Soil Regolith R4 - Development of these areas would not be considered appropriate
- NSW Highway
- Town

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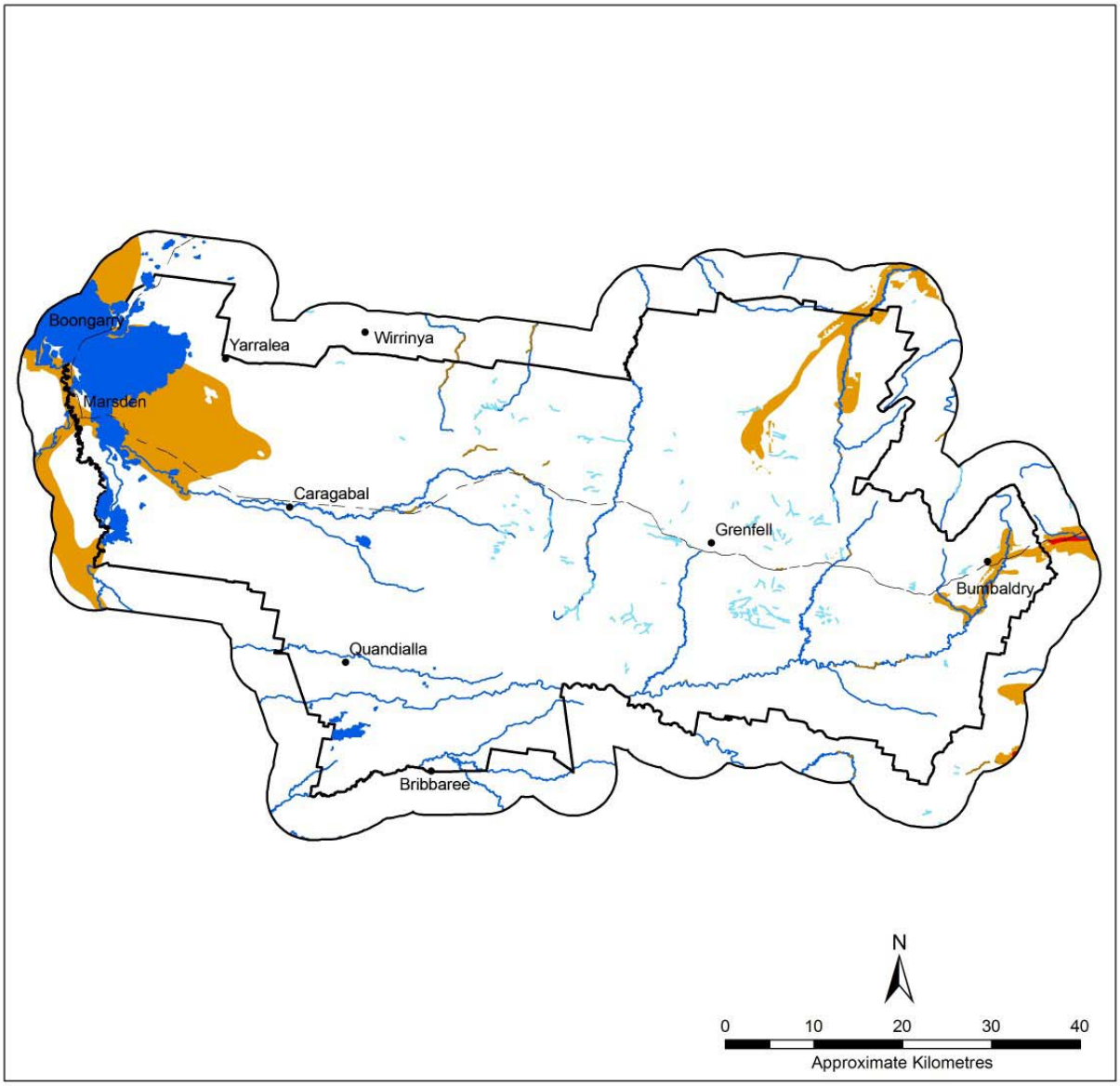
Figure 3: Sensitive Land Resources



WEDDIN LGA

Environmentally Sensitive Areas - Sensitive Water Resources

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Legend

- Local Government Boundary
- Local Government Area 5km buffer
- Major freshwater habitats (40m buffer either side for bed & bank stability; protection of riparian vegetation & connectivity of habitat) These areas should be excluded from development.
- Very severe streambank erosion
- Very severe gully erosion
- Wetland
- Moderately High Groundwater Vulnerability. Developments with the potential for significant contamination of groundwater sources (such as intensive animal agriculture) would not be considered appropriate in these locations.
- High Groundwater Vulnerability Developments with the potential for significant contamination of groundwater sources (such as intensive animal agriculture) would not be considered appropriate in these locations.
- NSW Highway
- Town

Environmentally Sensitive Areas
Sensitive Water Resources

Data Source	Data Codes
Vulnerable Riparian Areas	All codes + 40m buffer either side of high bank
Groundwater vulnerability	High and Moderately High
Kingsford Wetlands Data	

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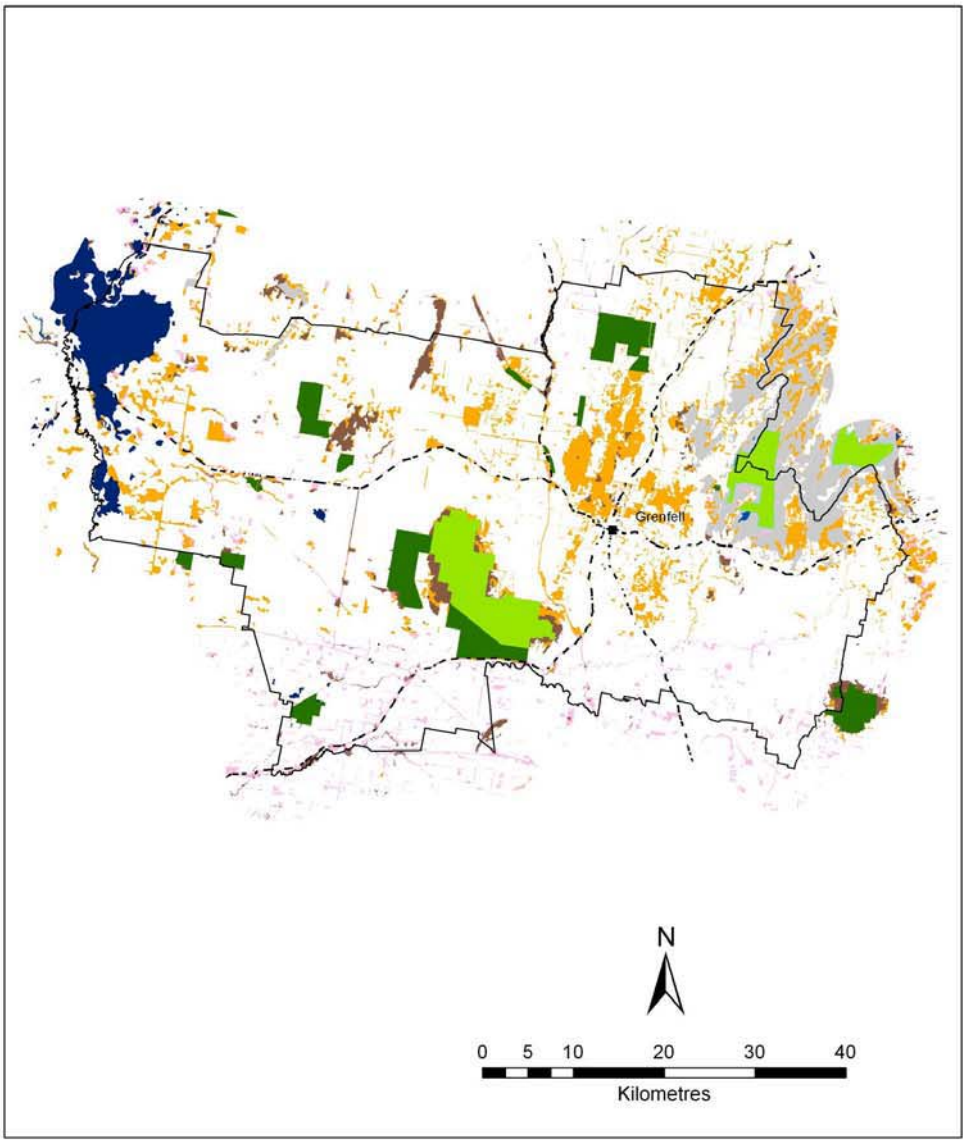
Figure 4: Sensitive Water Resources



WEDDIN LGA

Environmentally Sensitive Areas
- Biodiversity and Native Vegetation

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Environmentally Sensitive Areas
Biodiversity and native vegetation

Data Source	Data Codes
Native vegetation mapping	DECC data
Wetlands	DECC data

Legend
- Wetland
- NSW Highway
- EEC
- <30% Remaining
- <1000 ha Remaining
- Vegetation on Overcleared Landscapes
- Riparian Vegetation
- Vegetation within 100m of a National Park
- Other Native Vegetation
- Local Government Boundary
- NSW Highway
- Town
- DECC Estate
- Forests NSW

Figure 5: Biodiversity and Native Vegetation

2.7 Regional Catchment Plans

The Grenfell SMP states that the Weddin Catchment Action Plan (WCAP) covers parts of six local government areas namely Cabonne, Cowra, Forbes, Harden, Weddin and Young Shire. It covers four sub-catchments: Ooma, Kangarooby/Warraderry, Tyagong and Burrangong.

The Plan gathers together a range of information for stakeholders in the catchment who are concerned about resource management. It presents indicators of waterway "health" and pressures on that "health" and outlines current activities which aim to improve the condition of the creeks in the sub-catchment.

The WCAP involved the identification and collation of land and water management issues and community values as understood by catchment land managers.

The report describes the environmental characteristics of the Tyagong Creek sub-catchment including, waterways, stream health, land and water degradation issues and biodiversity and conservation (Grenfell SMP, 2001).

Data gaps:

- **Water degradation issues couldn't be identified because the WCAP (1999) report has not been provided**
- **Is there any other relevant catchment plan?**

3 Water Resources

3.1 Overview

Water is supplied by CTW for the towns of Grenfell and Quandialla, and by Cowra Shire Council for the township of Greenethorpe. CTW water resource information is provided on the Draft Technical Note 4A – Blayney Shire Council Data and System Mapping. WSC staff has advised that Weddin Council doesn't own any alternative water resource within Weddin LGA.

Council staff has advised that Bogolong Dam is not operating due poor water quality. Bogolong dam's water is high in manganese and there are algal blooms in summer due shallow and silted water. The dam is fenced off in its dangerous areas; however anyone who wants to use water from this dam could get it. CTW is wants WSC to take the dam over. According to the "Australian Natural Resources Atlas" website, Bogolong Creek Dam capacity is 290 ML.

WSC is the LWU responsible for the supply of low quality water from Company Dam for parks and gardens in Grenfell. The dam provides limited flood protection and it is also used for recreation. The dam is located on Emu Creek approximately 1 km north of Grenfell (Portfolio Risk Assessment, 2002). WSC has published a letter in the Council's website dated 23 June 2008 which has information on Company Dam (below).

Company Dam is back on the government's radar again, despite the recent work to improve its safety by raising the wall and widening the spillway. The Department of Water and Energy has forwarded a report on an inspection in June 2007, which makes fourteen recommendations for Council as the owner of the dam. Some of the recommendations will be quite expensive. The dearest is for an automatic water level recorder at an estimated cost of up to $30,000.

Council staff has been informed that Company Dam is still rated by the Department as being in the same category as Warragamba Dam, something which most people would have trouble accepting. The immediate conclusion is that the Department and the Dams Safety Committee should review their classification system to include a component for common sense, something lacking in the present system.

Company Dam, when it used to have water, was an occasional recreational area and fishing spot. The old railway water main was also used to supply water to the Caravan Park and the Union Field. As the compliance costs increase, Council is beginning to wonder whether it is

worth retaining the Dam. Council staff has shown concerns regarding Company Dam desilting, which hasn't been done. According to the "Australian Natural Resources Atlas" website, Company Dam capacity is 95 ML.

Council staff has advised that DWE has undertaken a desktop investigation about the location of aquifers in the region to provide water to Bimbi and Caragabal. CTW staff has advised that CTW has undertaken to conduct the investigation of Caragabal proposed water supply, but it has been put on hold pending the outcome of the State Government's enquiry into the supply of water and sewerage services.

Data gap: Water resources locations in Bimbi

Potential Issues:

- **Permanent water supply for Bimbi - issue identified by Council staff**
- **Concern in regards to Grenfell water supply: if the Gooloogong to Grenfell water pipeline is rendered unusable, there is no other main to Grenfell – issue identified by Council staff**
- **Bogolong Dam and Company Dam water quality**

3.2 Water Sharing Plans

Data gap: Is there any water sharing plan in action?

3.3 Environmental Impacts

Data gap: Is there any environmental impact regarding water resources within WSC?

3.4 Climate Change

This section was lifted from Draft Technical Note 4A - Blayney Shire Council Data and System Mapping.

2007 and 2008 climate impacts (climate change, El Niño or other) on dam yields in other parts of the Murray Darling Basin (Murray and Murrumbidgee) have led to suspension of water sharing plans and 50% reductions in town water allocations. Such reductions in yield may be attributed to reductions and increased variability in annual rainfall and runoff.

Further to this, CSIRO and the Australian Bureau of Meteorology (BOM) long term climate change projections are presented below.

Key findings from: CSIRO, Australian Bureau of Meteorology. 2007. *Climate change in Australia: technical report 2007*.

"The key findings of this report include that by 2030, temperatures will rise by about 1°C over Australia – a little less in coastal areas, and a little more inland - later in the century, warming depends on the extent of greenhouse gas emissions. If emissions are low, warming of between 1°C and 2.5°C is likely by around 2070, with a best estimate of 1.8°C. Under a high emission scenario, the best estimate warming is 3.4°C, with a range of 2.2°C to 5°C.

Further, the report indicates that there will be changes in temperature extremes, with fewer frosts and substantially more days over 35°C. It also predicts that decreases in annual average rainfall are likely in southern Australia - rainfall is likely to decrease in southern areas during winter, in southern and eastern areas during spring, and along the west coast during autumn. For 2030, there will be little annual rainfall change in the far north.

As with temperature, the report indicates that rainfall projections for later in the century are more dependent on greenhouse gas emissions. Under a low emission scenario in 2070, the best estimate of rainfall decrease is 7.5 per cent. Under a high emission scenario the best estimate is a decrease of 10 per cent.

The report indicates that although there will be more dry days, when it does rain, rainfall is likely to be more intense.

Other findings include:

- Droughts are likely to become more frequent, particularly in the south-west
- Evaporation rates are likely to increase, particularly in the north and east
- High-fire-danger weather is likely to increase in the south-east
- Tropical cyclones are likely to become more intense
- Sea levels will continue to rise"

Such uncertainty about future climatic conditions indicates the need for water supply planners to take a precautionary approach.

4 Urban Environment

4.1 Local Communities

The main WSC towns and villages are listed in section 2.3, as well as pertinent population data. Information regarding population within the Weddin Shire has been obtained from the Australian Bureau of Statistics (ABS) Census data. This information was used to assess demand on the sewer infrastructure resulting from population.

The ABS 2006 Census QuickStats Weddin LGA estimates the resident population at 25 October 2007 as 3,641 as shown in Table 3. The average household size in Weddin LGA is 2.3.

Table 3: Age Demographics in WSC

Age	Numbers	% of total persons in Weddin	% of total persons in Australia
0 - 4	203	5.6	6.3
5 - 14	495	13.6	13.5

Age	Numbers	% of total persons in Weddin	% of total persons in Australia
15 - 24	329	9.0	13.6
25 - 54	1,326	36.4	42.2
55 - 64	548	15.1	11
65 plus	740	20.3	13.3
Total	**3,641**	**100%**	**100%**

The main contributors to employment in the Weddin LGA in 2006 were as shown in Table 4.

Table 4: Employment Occupation

Occupation	Number	% of employed aged 15 years and over in Weddin LGA
Managers	584	39.4
Labourers	186	12.6
Professionals	167	11.3
Technicians and Trades workers	137	9.3
Clerical and Administrative workers	112	7.6
Community and Personal Services workers	109	7.4
Machinery Operators and Drivers	97	6.5
Sales workers	66	4.5

Source: 2006 Census Quickstats

According to the Weddin Economic Development Strategy (WEDS); in 2004, employment in building activities in Weddin were around three per cent of all employment compared with a NSW average of around seven per cent of all employment. At the time of the 2001 Population Census, there were more people working in building in Weddin than were living in Weddin – building workers were travelling into Weddin from outside (WEDS, 2004).

In the 2006 Census, the most common industries of employment for persons aged 15 years and over usually resident in Weddin LGA were as shown in Table 5.

Table 5: Industry of Employment

Industry of Employment	Number	% of employed aged 15 years and over in Weddin LGA
Sheep, beef cattle and grain farming	514	34.7

Industry of Employment	Number	% of employed aged 15 years and over in Weddin LGA
School education	96	6.5
Local Government administration	48	3.2
Hospitals	39	2.6
Cafes, restaurants and takeaway food services	31	2.1

Source: 2006 Census Quickstats

Table 6: Dwellings Characteristics

Private dwellings	Number	% of total occupied private dwellings in Weddin LGA
Total private dwellings (includes unoccupied dwellings)	1,856	-
Occupied private dwellings	1,522	100
Separate house	1,432	94.1
Semi-detached, row or terrace house, Townhouse etc	3	0.2
Flat, unit or apartment	62	4.1
Other dwellings	25	1.6
Not stated	0	0

Source: 2006 Census Quickstats

Data gap: Infill and new development

4.2 Water Service Infrastructure

Water service infrastructure related to Central Tablelands Water and Cabonne Shire Council water supply is addressed in Technical Note 3 – Demand Projection.

Water is supplied by Cowra Shire Council to the town of Greenethorpe. The water is extracted from the Lachlan River at Cowra, treated at the Cowra Water Filtration Plant then pumped to Koorawatha. Additional pumps transfer water from a 1ML reservoir at Koorawatha to a 0.23ML reservoir approximately 5km from Greenethorpe. There is also a booster pump station between Koorawatha and the Greenethorpe reservoir. The pumps at Koorawatha and the booster station were installed in 2005/2006 and the 1ML reservoir at Koorawatha was built at the same time. The transfer main from Koorawatha to Greenethorpe is 150 mm, a combination of poly and asbestos cement (AC). The poly was installed in 2005 (about 2 km) and the AC has been in place since the 1960s. The reticulation in the village of Greenethorpe is 100mm AC and has been there since the 1960s. Smaller diameter pipe extends beyond the village to the localities of Brundah and Landra. The conditions of these mains are below average. A number

of rural poly mains in the area have been replaced in the last 3-4 years. The reservoirs and pump stations are monitored remotely in Cowra via radio telemetry (Source: Council staff).

A schematic map showing the water mains from Cowra to Greenthorpe is provided in Figure 6.

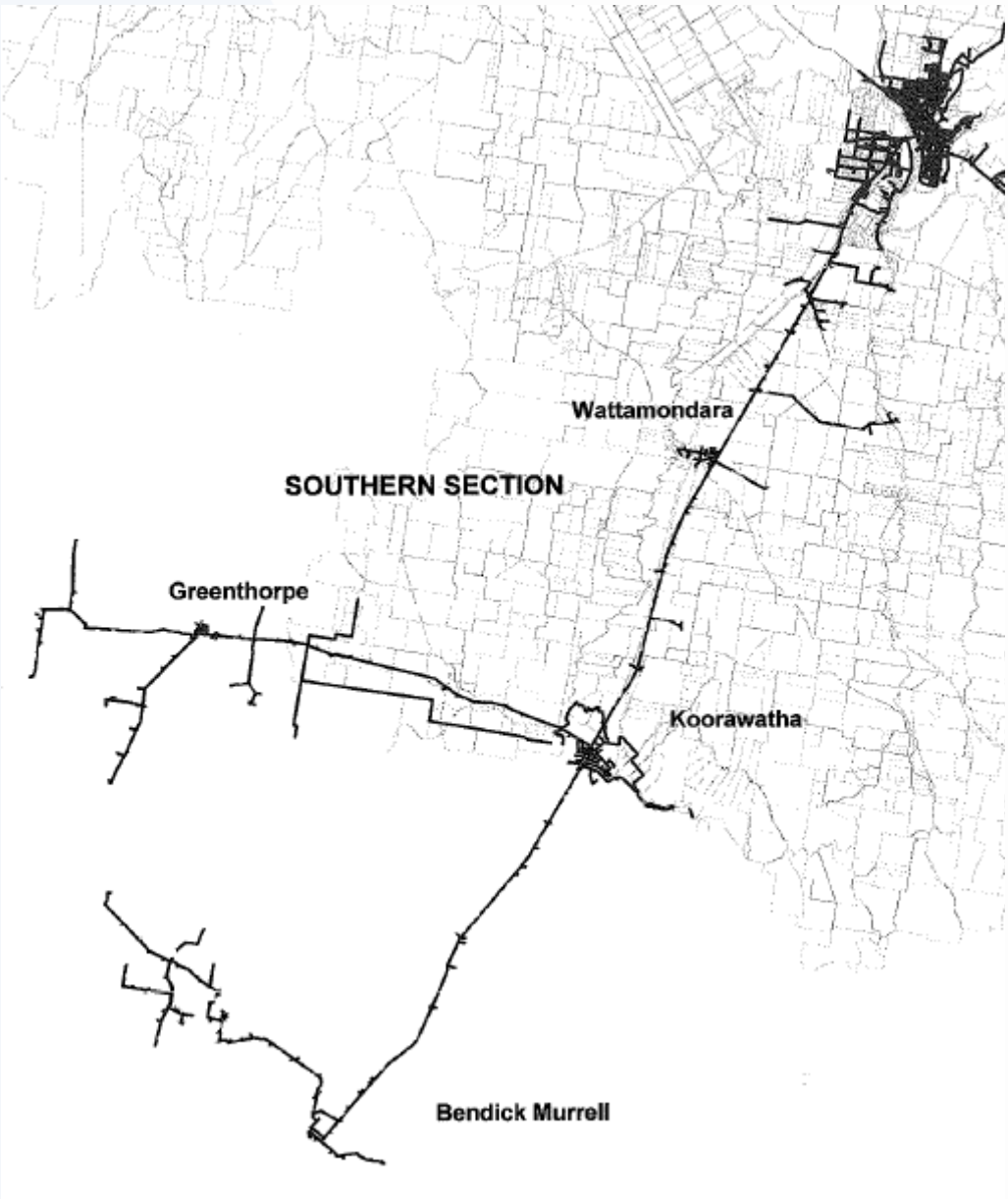

Figure 6: Water mains

4.3 Water Service Customers

The WEDS (2004) report states that households have become less reliant on producing goods and services for their own use – they buy them from other producers. As a result, there has been an increased proportion of employment in activities that provide services to households such as education, health and various forms of entertainment and recreation. Services were once considered to be produced and consumed locally. Nowadays, the services consumed by households and businesses need not be supplied locally.

In 2004, Weddin had a turnaround in business activity, population, property sales and building activity. The latter is primarily undertaken by builders outside of Weddin. The growth in Weddin is able to support significant additional employment in building activity that should be a level equivalent to the NSW average of about seven per cent or close to 100 people (WEDS, 2004).

O'Brien's Hill is an old goldmine full of brackish water of unknown quality. The gold mine is no longer operating and it has been sealed up.

Data gaps:

- Type and number of commercial buildings, subdivision and developments
- Type and number of industries (including water demand)
- Recreational interests and areas for recreation

4.4 Water Service Management

As per the WSC SOE report, there are 12 active Landcare groups in Weddin Shire. These groups are addressing a wide range of land degradation issues including dryland and irrigation salinity, induced soil acidity, vegetation decline and soil structure decline.

The current list of Landcare groups in Weddin Shire is as follows:

- Brundah Landcare Group
- Caragabal Landcare Group
- Emu Creek Landcare Group
- Eualdrie Valley Landcare Group
- Grenfell Urban Landcare Group
- Nags Head Bridge Landcare Group
- Pinnacle Landcare Group
- Upper Barbingal Creek Landcare Group
- Warraderry Landcare Group
- Weddin West Landcare Group
- Wheogo Landcare Group
- Yuline Landcare Group

No additional land resource surveys dealing with soils or geology within Weddin Shire were published during the 2006/07 WSC SOE report period to add to the knowledge about these resources within the Shire boundaries.

WSC water service management current activities are as follows:

- Since 2006/07 Council has not developed any new management plans related to the land resources of the Shire, nor has it any ongoing plans of this nature
- No Council activities or activities of individuals or corporations have had a major or significant impact on the land resources of the Shire during the reporting year (WSC SOE, 2006/07)
- In Grenfell there are currently no community groups in place to focus on stormwater issues such as water quality and community awareness (Grenfell SMP, 2001)

4.5 LWU Best- Practice Management Status

DWE has six criteria for best-practice management of water and wastewater services. CTW owns and operates the water supply services in Weddin, therefore some of the documents listed below are CTW's documents. The status of each of these practices in the WSC is detailed in Table 7.

Table 7: WSC Best- Practise Management Status

Criteria	Status
Integrated Water Cycle Management	In progress (this document)
Strategic Business Plan (SBP) and Financial Plan	▪ WSC SBP for Sewerage Services – April 2004 ▪ CTW SBP for Water Supply – 2005
Pricing	▪ WSC Development Servicing Plan - unknown ▪ CTW Development Servicing Plan for Water Supply Lake Rowlands & Quandialla – August 2004 ▪ Compliance with pricing guidelines - unknown
Water Conservation (Demand Management Plan)	CTW Demand Management Policy in place and CTW is currently engaging a consultant to prepare the Demand Management Plan
Drought Management Plan	Unknown
Annual TBL Performance Reporting	▪ WSC TBL Sewerage Performance Report – 2005/06 ▪ CTW TBL Water Performance Report - 2005/06

Data gaps:
- **WSC Development Servicing Plan for sewerage services**
- **Drought Management Plan**

5 Sewerage Scheme

5.1 Introduction

Within the Shire there is one major sewerage scheme at Grenfell serving the Grenfell Township. The scheme is currently entirely a gravity system, which operates without the need for pumping stations. The scheme is operated as a self-contained activity, separate from the general fund. The system involves:

- Operation and maintenance of the treatment works
- Upgrading and improvement of the sewerage treatment works
- Maintenance and repair of the sewer mains
- Planning for and extensions of the sewer mains
- Operation of an effluent recycling scheme providing irrigation water to parks and reserves
- Implementation of the Strategic Business Plan adopted 19 January 2006 (WSC MP, 2007/08).

5.2 Sewerage Reticulation System

The WSC sewerage scheme is comprised of 28 km of reticulation pipes. The letter sent from WSC's Director Environmental Services to the Head Regional Operations Unit on 10th July 2007, states that the current sewerage network provides efficient transportation of wastes to the

treatment works. The system has been designed as gravity mains with no designed overflow points. Council responds to all sewerage spills within preset guidelines and best industry practice. Typically there are around 50 chokages in the system per annum.

The types of chokes are generally as a result of:

- Roots
- Rags
- Grease
- Foreign objects

WSC has adopted levels of services as per WSC SBP (2004) for monitoring and containment of spills and customers' complaints. A spill to the environment is either contained within the reticulation or localised to the immediate environment (PRP 100 – SOIR, 2007).

Currently Council does not meet all levels of service targets as defined in the Council SBP. See Table 8 for current situation.

Table 8: Non compliance with LOS

Description	Current	Target
Frequency of system failures		
Category 1	1 every 3 years	Nil
Category 3	40 to 50 number / year	Nil
Response time to system failures		
Priority 1 – during working hours	60 minutes	30 minutes
Priority 2 – during working hours	60 minutes	45 minutes
Response times to general or minor customer complaints and inquiries – written complaints	5 days	4 days

Source: PRP 100 – SOIR, 2007.

Maps of the sewerage system in Grenfell are provided in Appendix C.

5.3 Pumping Stations

As mentioned above the WSC sewerage scheme is currently entirely a gravity system, which operates without the need for pumping stations.

5.4 Sewage Treatment Plant

5.4.1 Weddin Sewage Treatment Plant Description

The most recent data on the Weddin Sewage Treatment Plant (STP) was from WSC 2004 Strategic Business Plan (SBP). There is one sewage treatment works (2,500 EP capacity) providing primary, secondary and tertiary treatment in the Weddin LGA.

The system comprises two trickling filters and five polishing ponds at the treatment works, 28 km of reticulation, and overflow discharge into Emu Creek. Reuse water is utilised for several parks and recreational fields. As at 2004, there had been no major malfunctions of the treatment processes (WSC SBP 2004).

The scheme is currently entirely a gravity system, which operates without the need for pumping stations. The scheme is operated as a self-contained activity, separate from the general fund. The system involves:

- Operation and maintenance of the treatment works
- Expansion and upgrade of the sewerage treatment works
- Maintenance and repair of the sewer mains
- Planning for and extensions of the sewer mains
- Operation of an effluent recycling scheme providing irrigation water to parks and reserves

The sewerage treatment plant has a design capacity of 2500 EP. The plant is currently servicing approximately 1800 people in the town of Grenfell. Council estimates expect that the plant will require a significant upgrade in 2020. It should be noted that EP capacities have not been calculated as part of the SBP and no specific design has been carried out (WSC SBP 2004).

Table 9: Weddin STP Capacity.

Treatment Unit	Total Capacity
Trickling filters	2,500 EP
Polishing ponds at the treatment works	NA **(Note 2)**
Overflow discharge	NA **(Note 2)**

Note 2: NA (not available)

WSC has a Trade Waste Policy in place. This policy is concerned with the approval process for liquid trade wastes discharged into Council's sewerage system and the levying of appropriate sewerage and liquid trade waste fees and charges. It has been developed to ensure the proper control of liquid trade waste discharged to the sewerage system and hence protection of public health, worker safety, the environment, and Council's sewerage system. The policy also promotes waste minimisation and water conservation. This policy includes information on the exemption for obtaining approval of liquid trade waste discharge and criteria for approval to discharge liquid trade waste into council's sewerage system

Data gap: Sewerage treatment works units and capacities of each unit

Potential Issues:
- **Need for a new STP in 2020**
- **Asset Management Plan and Emergency Plan for STP – issue identified by Council staff**

5.4.2 Effluent Management

The 2006/07 WSC SOE report states that no changes have occurred in the management of sewerage effluent from the previous SOE report. The management processes continue to operate successfully. Council has not developed any new management plans related to waste management within the Shire, nor has it any ongoing plans of this nature.

One of the objectives of the 2004 WSC SBP is to expand effluent storage capacity by providing an additional pond. The Weddin Shire Capital Works Schedule provided in the 2004 SBP has allocated $30 K in 2005/06 for the construction of an additional pond. However this pond has not been built due financial reasons.

Effluent reuse and management is considered to be an important part of environmental management in the Shire. Effluent reuse is current in operation for parks and recreational facilities. The Golf Club in Weddin has its own dam. Current effluent reuse is at Taylor Park, Rotary Park, Henry Lawson Oval and High School Oval. Irrigation in these areas is made using pop up sprinkles only between 10pm and 6am.

Council staff has provided data on Grenfell STP's load figures for June 2008. The inflow into the STP was 15.8ML. 2.1ML was used to irrigate the town and 10 ML was discharged into Emu Creek.

The reuse scheme has been in operation since 1980. Council has a 100 days retention period before using the effluent. The retention period does not guarantee the complete removal of organisms from the effluent. Council staff has advised that WSC is looking at tertiary treatment of effluent prior to reuse, but no funds are available to this stage.

A schematic of Grenfell STP operation and effluent management is shown in Figure 7.

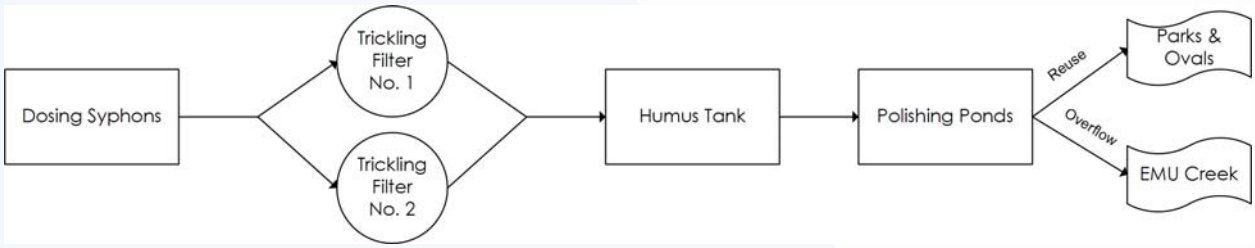

Figure 7: Schematic of Grenfell STP operation and effluent management

Potential Issue: Chlorination of the effluent reuse – issue identified by Council staff

5.4.3 Performance Requirements

DECC regulates environmental protection, issues licences to discharge effluent and administers the various pollution control acts. Council discharges effluent from sewage treatment plant under licence from the DECC as shown in Table 10. WSC does not have load limits agreement both Category 3 Trade waste discharges (greater than 20kL/d) and discharges of industrial waste.

Table 10: DECC Standards for Effluent Treatment at Weddin Shire

Parameter	Current (2007) Licence Conditions
	100th Percentile
pH (mg/L)	6.5 – 8.5
BOD (mg/L)	20
Suspended solids (mg/L)	30
Total N (mg/L)	40

Parameter	Current (2007) Licence Conditions
Total P (mg/L)	10
Oil and grease (mg/L)	10

Source: DECC Environment Protection Licence for WSC

WSC staff have stated that WSC is committed to an ongoing DECC licence Pollution Reduction Program (PRP) and is continually monitoring and reviewing various aspects of the program in an attempt to minimise the number of pollution events associated with the STP and the reticulation system. Supplementary information on WSC PRP is provided in a letter from Director Environmental Services at Weddin Shire Council to the Head of Regional Operations Bathurst, dated 14 December 2007.

The results of the DECC STP licence compliances are publicly listed in the database at DECC website. The statuses of these licences are shown in Table 11.

Table 11: DECC Licence Non- Compliances

Annual Return Information	Licence Condition Number	Type of Non-Compliance	No. of Incidents
01 May 07 to 30 April 08	L4.1	Minor exceedances of 600 kilolitres volumetric discharge limit on 13 occasions	13
01 May 2006 to 30 April 2007	L4.1	The volume of effluent discharge to land irrigation areas has exceeded 100kl	195
01 May 2005 to 30 April 2006	Complied		
01 May 2004 to 30 April 2005	Complied		
01 May 2003 to 30 April 2004	M6.1	Council failed to monitor the volume discharged from points 1 and 2 of the licence.	1
	R5.1	Annual System Performance Report (ASPR) not submitted by the due date (i.e. 30 June 2004)	1

Data gap: Does WSC have sensitive water quality requirements?

Potential Issue: Weddin STP licence non-compliance:
- **2007/08 - Exceeded volumetric discharge limit**
- **2006/07 – Exceeded volumetric of effluent discharge to irrigation**
- **2003/04 – Monitoring failure at points 1 and 2**

5.4.4 WSC Sewerage Performance Report

The WSC 2005/06 DWE TBL sewerage performance report figures are shown in Table 12.

Table 12: 2005/06 DWE TBL Performance Report

TBL Performance Indicators	WSC Result	Ranking (200 to 1,500 properties) (Note 3)
Urban properties without reticulated sewerage service (%)	14.9	4
Service complaints per 1000 properties	-	-
Volume of sewage treated per property (kL)	171	4
Percentage effluent reclaimed for recycling	-	-
Compliance with BOD in licence (%)	-	-
Compliance with SS in licence (%)	-	-
Sewer main chokes and collapses per 100km of main	-	-
Sewer overflows to the environment per 100 km of main	-	-
Categories 1, 2 and 3 environmental incidents per 1000 properties	-	-

Note 3: Ranking of 1 indicates that WSC is in the top 20% of LWUs; ranking of 5 indicates it is the bottom 20%

Table 12 shows that the percentage of urban properties without reticulated sewerage service is high. The villages of Greenethorpe, Caragabal, Quandialla and Bimbi have septic system and Council has no plan for sewerage treatment in those villages. The detailed capital works schedule for sewerage shows that Council plans to spend $50 K per year in sewer mains extensions from 2005/06. It is unknown the number of assessments that will be benefit by sewerage services.

The WSC SOE report states that there were no upgrading works carried out on existing sewerage systems during 2006/07 and there were no sewerage spills recorded although 34 sewer chokes had to be removed.

Data gaps:
- **Current DWE TBL performance report**
- **Information about number of urban properties (assessments) that will be provided with sewerage services**

5.5 Assets Summary

No detailed condition audit of underground assets has been carried out as yet Council does not know the cost or timing of the replacement needs. At this stage it must be assumed that there is a growing liability that will have to be met at some point in time and the level of cost is indicated by the accumulated depreciation less cumulative replacement expenditure.

The 2007 PRP Supplementary information report states that Council has adopted a sewerage business plan and it is committed to the planned camera inspection of the mains. Whilst the plan is in the initial stages, it can be anticipated that Council will be more informed as to the status of its assets and what problems, if any, that are identified with priorities determined for remedial works. The business plan objective is due for completion in June 2010.

WSC has prepared a sewerage asset summary as shown in Table 12. The following condition codes have been used in this schedule.

1 - Newly constructed
2 - Over 5 years old but fully maintained in "as new" condition
3 - Good condition
4 - Average condition
5 - Partly worn – beyond 50% of economic life
6 - Worn but serviceable
7 - Poor – replacement required

Table 13: Condition of Council Major Assets.

Asset	No./Capacity/ Length	Construction Date	Asset Condition
Reticulation mains	28 km	1940 onwards	4
Sewerage Treatment Works	2,500 EP	1940	5
Recycling system	-	-	-

Source: WSC SBP, 2004.

Table 13 shows that the condition of Weddin's reticulation mains is average. Council staff has advised that condition and age of assets are the main drivers of replacement works. Phosphor and nitrogen improvements to Emu Creek are also driving some replacement works.

The most recent capital works schedule for sewerage and drainage service from the WSC MP (2007/08) shows that Council has allowed approximately $10 K for sewerage mains extension and $50 K for sewerage mains rehabilitation (transfer to reserves). Council has also allocated $10K for sewerage treatment works rehabilitation (transfer to reserves). These figures are different from Weddin Shire Capital Works Schedule from WSC SBP (2004) (see Appendix D).

Potential Issue: capital works for sewerage and drainage services

A summary of proposed improvements of Weddin's sewerage assets is shown in Table 14.

Table 14: Sewerage Future Works

Proposed Improvement	Justification for Improvement
Upgrade sewerage treatment plant	To meet expected population growth and increase in economic development in the Shire
Extension of sewer mains	To meet expected population growth
Install pump stations	To service low lying areas that are expected to be developed

Proposed Improvement	Justification for Improvement
Maintenance and replacement of existing sewer mains	Aging assets will exceed their useful life

Source: WSC SBP, 2004.

Data gap: WSC to confirm sewerage future works and capital works program

5.6 Areas Serviced

The Weddin Shire Sewerage System serves all of the urban residential development within the town of Grenfell and does not extend to the rural development. The unserviced rural properties are isolated and not economically viable to service and hence there is no intention to extend services to these areas.

Council is responsible for the installation, maintenance and operation of the sewerage reticulation pipe network, sewerage treatment plant and sludge disposal. The area sewered is approximately 325 ha, serving Grenfell (WSC SBP 2004).

Table 15 below from WSC SBP (2004) summarises the details of sewerage service in 2004 and future (2034) sewerage service areas within WSC. As indicated by the table, Council plans to provide secondary off-site treatment to the towns of Greenthorpe, Quandialla and Caragabal. Greenethorpe is a priority as there are insufficient lot sizes to contain on site septic treatment. Works at Quandialla are required due to the soil type (typically clay type soils) and recent availability of water. Caragabal will be considered for secondary treatment in 20 years, depending on growth.

Council's intentions in the provision of services for 2034 are shown in Table 15.

Table 15: Current and Future Service Provided

	Current Service Provided		Future Service Provided	
Towns	**Population**	**Sewerage Service**	**Expected Population**	**Sewerage Service**
Grenfell and surround	Approx 100 **(Note 4)**	All Grenfell urban area is serviced. No rural areas are serviced except for Grenfell Country Club. **(Note 5)**	Similar to existing	Connect to town system
Greenethorpe	117	Septic system	Minimal growth	Septic and secondary off-site treatment **(Note 6)**
Quandialla	118	Septic system	Minimal growth	Septic and secondary off-site treatment **(Note 6)**
Caragabal	96	Septic system	Minimal growth	Septic and secondary off-site treatment
Bimbi	20	Septic system	Minimal growth	Septic system

Note 4
This is an estimate based on those that could be connected with short mains extensions or other methods such as pumping short distances to manhole.
Note 5
Source: PRP 100 – SOIR, 2007.
Note 6
Town water is supplied to Greenethorpe and Quandialla by Cowra Shire Council and Central Tablelands, respectively.
Source: WSC SBP, 2004.

It has been stated in the WSC SBP (2004) that with the expected average annual growth rate of approximately 3% up to 2007 and 0.5% thereafter, and considering the capacities of the existing

system, that expansion/upgrades of the current sewerage reticulation system would be required to meet future demand. This is addressed in Council's capital works program as mentioned on section 5.5.

5.7 Population Growth Projections

WSC had a negligible population decline in growth in the five-year period between 1996 and 2001 of 0.2% per annum, compared to the average annual growth rate of 1.3% in New South Wales (Source: ABS, *Estimated Residential Population Local Government Areas* – NSW 1991 – 2001, ref 3218.0).

The ABS Census data, Council residential population projections and the NSW Planning (1995) population projections are shown graphically in Figure 8. The graph indicates that the total number of persons in 2001 was 3,856. While the NSW Planning forecasts are the most recent that are available, it should be noted that they were published in March 1994 and are of questionable value since they do not reflect more recent population trends. Council's projections are based on known and foreseeable residential property development that is expected to translate into additional occupants. Council residential population projections estimated 4,004 people in 2006. However, 2006 Census data show that the population in 2006 were 3,641 (see section 2.3)

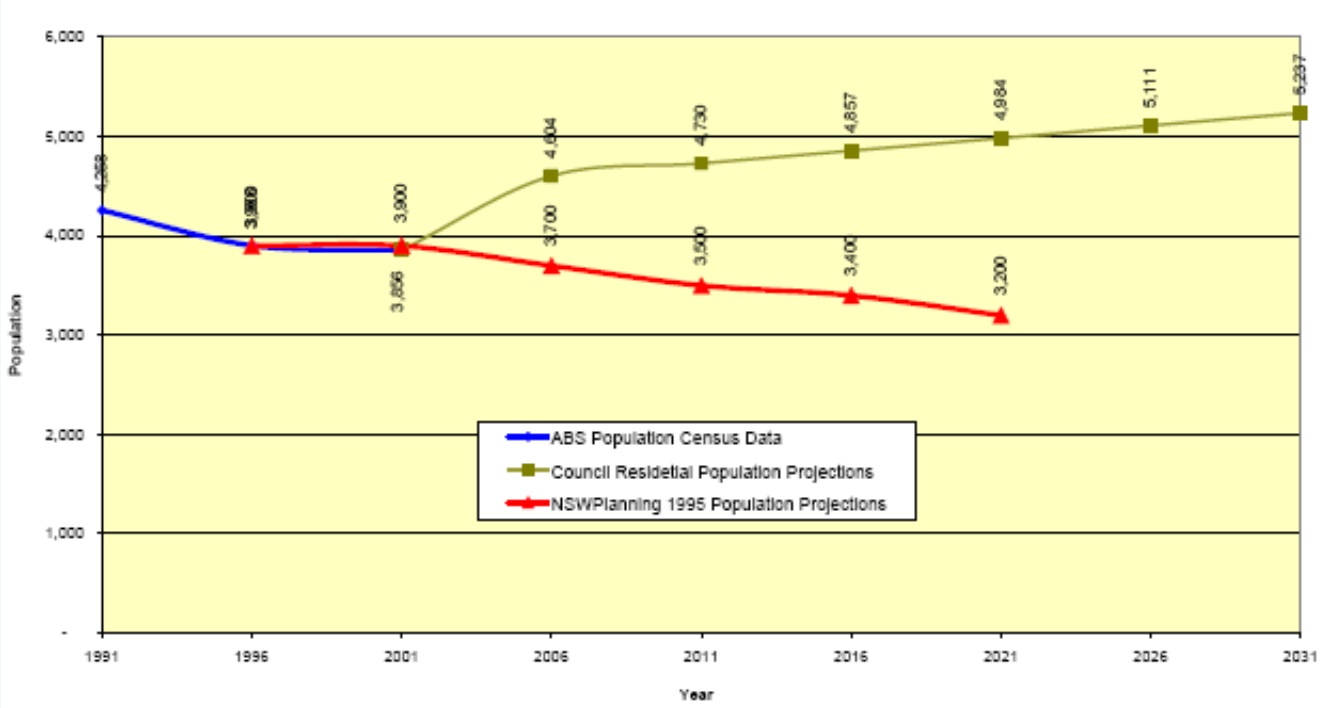

Figure 8: Population Growth Projections. Source: WSC SBP, 2004.

Potential Issue: Council predictions for STP upgrade

The WSC SBP report states that Council estimated a growth additional in future assessments as shown in Table 16. Council staff has advised recently that current population in Grenfell will probably stay the same or drop slightly.

Table 16: Council's Estimated Growth

Financial year	Residential	Non-residential
2003/04	32	4
2004/05	32	4

Financial year	Residential	Non-residential
2005/06	23	3
2006/07 onward	5	1

The above growth estimated by Council in 2004, equate to an average annual growth rate of approximately 3% over the initial 3 years of the 30 year forecast period and then approximately 0.5% growth for the following 27 years.

Council was expected to initiate an economic development promotion of Weddin Shire to attract new residents and business into town. Council staff has advised that WSC promotes an Open Day and the Henry Lawson festival which aims to show the opportunities and advantages of moving to Grenfell. The main objective of these festivals is to bring young families and professionals from different areas to live in Grenfell to promote the development of the village.

A sensitivity analysis has been carried out based on an annual 2% increase in residential and non-residential assessment over the 30 year period. The projected number of assessments for financial modelling purposes was based on the 30 June 2002/03 figures i.e. 821 residential assessments and 132 non-residential assessments. These figures have been factored up on a pro-rata basis in line with the above forecasts.

Data gap: Update growth projection figures

5.8 Hydraulic Loading

The PRP 100 – SOIR letter states that, WSC intentions in the management of loadings on the sewerage system are to reduce hydraulic and biochemical loading. This reduces hydraulic load on treatment works and the evaporation ponds. Currently the major issues are unknown amount of inflow and infiltration and quality of sewage from dump point.

Data gaps:
- **Equivalent population projections (future sewer load)**
- **Hydraulic loading assessment**
- **Analysis of the ability of the current sewerage infrastructure to meet future needs including collection and disposal of future loads**
- **Sewer overflow investigation report**
- **Wet and dry weather flows**
- **Likelihood of sewer overflow**

5.9 Current Developments

Data gaps:
- **Current development (if any) and their impacts on the existing sewerage system.**
- **Current and future potential reuse markets**

5.10 Weddin Sewerage Scheme Main Issues

Senior Council staff and Councillors have identified a number of issues as the major concerns facing Council's sewerage operation. The most important of these were ranked and listed in the WSC SBP (2004). Current services are generally satisfactory. However, there are some issues which need to be addressed as listed below. Some of these issues have been already mentioned in this technical note.

- The sewage treatment plant is nearing its design capacity and is expected to become a problem with future population growth
- The age of the treatment plant assets and pipework assets are nearing their design life

- It is becoming increasingly difficult to comply with the water discharge standards for overflow discharges to the Emu Creek
- Environmental issues need to be reviewed - especially ESD
- There are a number of properties within the urban area of Grenfell Shire that do not have access to the reticulation sewerage system
- Areas with on-site systems are experiencing public health issues
- The register of asset condition is currently not monitored and requires review
- Council staff has advised that appears that Council does not meet any DECC (EPA) requirements of disposal of backwash water. The water must be discharged to the sewer and requires urgent attention.

6 Stormwater System

6.1 Description of the System

Stormwater in Grenfell urban area drains to various reaches of Emu Creek. Emu Creek cuts across Grenfell, so that the majority of the urban area is to the south of the creek's bank. It is in this area that most of Grenfell's stormwater infrastructure exists, it includes a mixture of kerb and gutter, pipe stormwater, surface flows (table drains) and open grassed channels.

Table 17 describes Grenfell's stormwater infrastructure including which land use zones contribute stormwater to each drainage system (Grenfell SMP, 2001).

Table 17: Land Use Areas Drained by Stormwater Infrastructure in Grenfell

Drainage System Reference	Description	Land use areas drained by infrastructure system
Melyra Street outlet (south bank)	Underground drainage pipe. A feature of this system is an old open drain constructed out of concrete (approx. 36 years old according to Council). This drain crosses a private property between Short St. and Nash St. and is subject to flooding during periods of high rainfall.	Central business district and residential
Grafton Street outlet (south bank)	Underground drainage pipe.	Central business district, some fertiliser industries, some residential
Camp Street outlet	Underground drainage pipe.	Residential
Young Street outlet	Underground drainage pipe.	Residential

Drainage System Reference	Description	Land use areas drained by infrastructure system
South Street to East Street	Underground drainage pipe – drains to an outlet in a paddock behind the high school.	Henry Lawson High School and residential
Rose Street	Underground drainage pipe and existing open drain – outlets to kerb and gutter in West Street.	Residential
Melyra Street outlet (north bank)	Underground drainage pipe.	Residential
Grafton Street outlet (north bank)	Underground drainage pipe.	Residential

Source: Grenfell SMP, 2001.

6.2 Stormwater Flows

Data gap: Stormwater flows (volume, location)

Potential Issue: Stormwater inflow into the sewer mains – issue identified by Council staff

6.3 Stormwater Management Responsibilities

Current stormwater management responsibilities in WSC are the same as it was structured in 2001 in the Grenfell Stormwater Management Plan. WSC has a primary responsibility for urban stormwater management in Grenfell. In 2001, Council structure and allocation of function and responsibilities with regards to stormwater management were as listed below. Council organisation structure is provided in Figure 9. Stormwater management responsibilities may overlap into the roles of other Council staff, therefore, communication between all managers is essential for effective implementation of the SMP.

The Director of Engineering is responsible for the allocation of staff and plant to carry out the following:

- Routine maintenance of stormwater infrastructure
- Allocation of funds and design staff for the design of extensions to the existing system
- Allocate staff and plant for the installation of new underground drainage lines, as funds permit
- Program staff and plant for the removal of the following from the urban catchments of the stormwater systems:
  - Removal of organic matter and sediment from existing kerb and gutter lines

- Street sweeping and litter collection in the Main Street three times a week and other areas on an as needed basis

The Director of Environmental Services is responsible for:

- The assessment at the Development Application stage of the disposal of stormwater from the property to ensure that it is in accordance with the appropriate legislation
- Assessing each application for a new sub-division to ensure stormwater is dealt with appropriately

Council staff has advised that kerbs and gutters are constructed in Grenfell on a planned basis.

The Roads and Traffic Authority (RTA) are ultimately responsible for the management of state roads in Grenfell. However, Council maintains the highway under contract to the RTA. Other roads maintained by Council within Grenfell from the RTA Block Grant are the Regional Roads which include MR No 237, 239 and 398. Council is required to carry out road works and maintenance activities on these roads with the appropriate erosion and sediment control measures in place.

An RTA representative attended the SMP stakeholder meeting in February 2001 and was consulted regarding the preparation of the SMP. Stormwater management options requiring RTA input were not identified through the SMP process (Grenfell SMP, 2001).

Data gap: Is there any update information regarding stormwater management options required by RTA?

Potential Issue: Stormwater Management at Quandialla

WEDDIN SHIRE COUNCIL - ORGANISATION STRUCTURE (as at 17 May 2007)

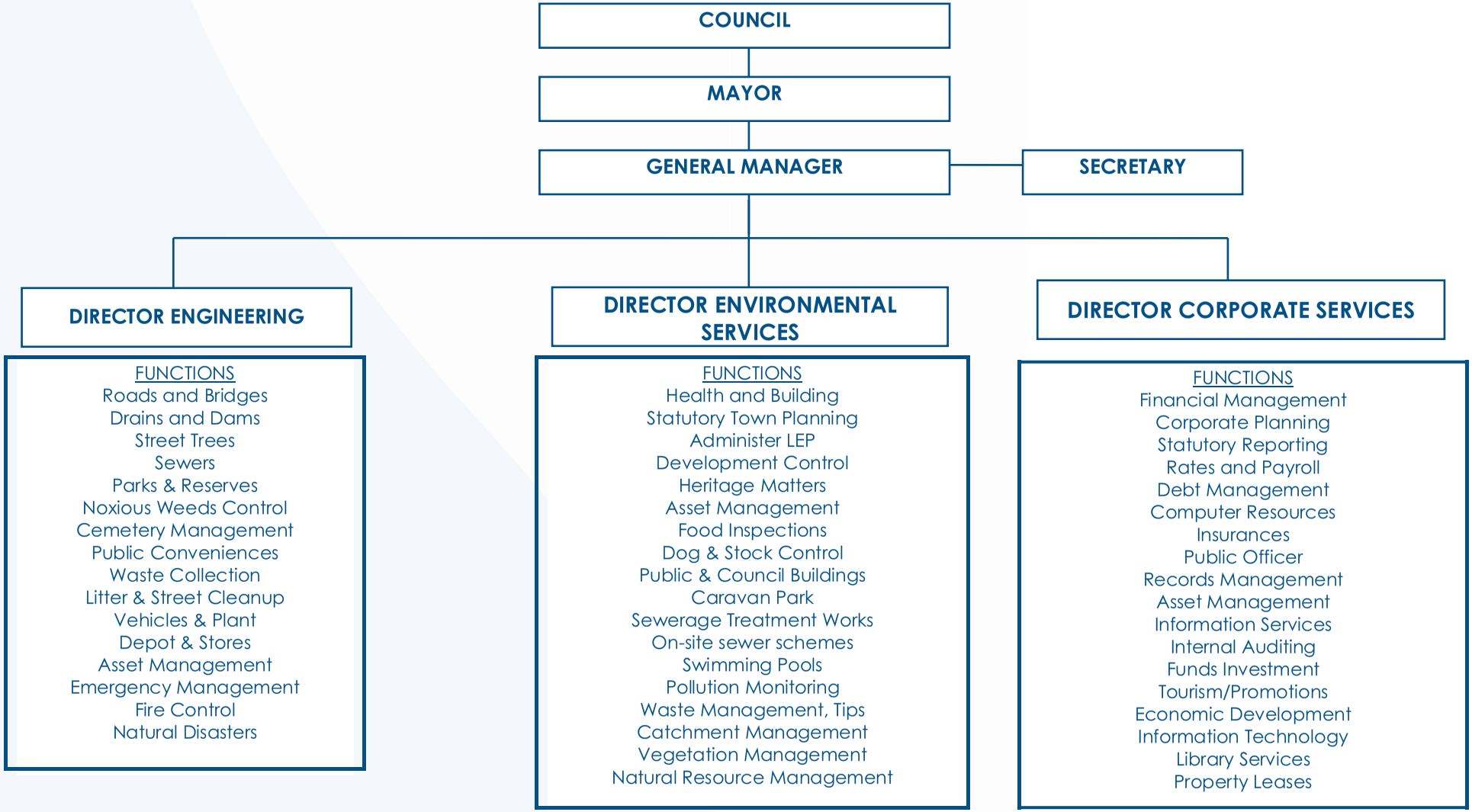

Figure 9: WSC Stormwater Management Responsibilities and Organisation Structure

6.4 Source of Pollution within Stormwater Catchment

6.4.1 Point Sources of Pollution

According to Council 1999 SOE report there was only one recognised polluted site, the old Grenfell gasworks, which is owned by Council. The site was investigated but in the period up to the Grenfell SMP report (2001), no remedial action was taken.

According to Council 2000 SOE report there were no records of escapes of industrial waste likely to cause pollution problems. However, a spill of diesel fuel from a ruptured fuel tank on a trunk road occurred in the business section of Grenfell during the report period. Some fuel escaped into Emu Creek but this was contained by action from local Fire Brigade personnel.

In 2001, Council was concerned about the accession of nutrients to waterways from urban runoff. However, at that time (2001) no work was done to quantify the level of accession.

According to the Grenfell SMP (2001), the majority of point sources of pollution in Grenfell were located in the central business district and in the industrial zone. Identified point sources are listed in Table 18 (Grenfell SMP, 2001).

Table 18: Point Sources of Pollution in Grenfell

Pollution Point Source	Description / comment	Pollutants
Sewage Treatment Plant (STP)	STP located outside the urban area. Potential to flow to Emu Creek in the event of a spill. STP maintained and monitored by WSC	Faecal Coliforms, nitrogen, phosphorus, chemicals, pathogens
Hydrocarbon storage and workshops	Service stations in the Central Business district, auto-electricians and vehicle repairs (including Fire station)	Hydrocarbons, oil, diesel
Concrete batching plant	Material storage, chemicals, workshops	Cement, chemicals, hydrocarbons
Council depot	Chemicals storage, workshops, redundant underground fuel tanks. New depot on the saleyards site.	Chemical spillage
Fertiliser storage	Fertiliser industries potential to spill into stormwater drainage e.g. some industries located adjacent to Emu Creek	Fertilisers (nutrients), chemical storage

Pollution Point Source	Description / comment	Pollutants
Gasworks contaminated site	Potential for hydrocarbons and heavy metals to be transported to stormwater system and present a health hazard unless the site is treated as per EPA requirements	Hydrocarbons, heavy metals, sediment

Source: Grenfell SMP, 2001

Data gap: Has the 2001 information been updated?

Potential Issue: Has Grenfell gas works site been addressed?

6.4.2 Major Sewer Overflows

Council policy requires the removal of illegal connections of stormwater from houses in Grenfell to minimise the possibility of overtaxing the system and causing sewerage spills during major rains. Despite the adoption of this policy, Council believes that sewer overflows are still an issue for Grenfell. According to Grenfell SMP (2001), there is limited information about the location of stormwater infiltration points and there is a lack of funds and resources to address the issue. Sewer overflows in Grenfell have been identified as a stormwater issue and corresponding management options have been indentified in the Grenfell SMP report.

Potential Issues:
- **Has Council applied the stormwater management options identified in the Grenfell SMP 2001 report?**
- **Location of illegal stormwater connections and sewer overflow**

6.5 Estimate Pollution Loading from Sources

6.5.1 Pollution Load

Data gap: Stormwater pollution loading data

6.5.2 Point Source Estimate

The 2001Grenfell SMP report provides a table including stormwater issues and 'hot spots' for Grenfell. It also presents possible causes associated with each issue. Figure 10 is a map of the hotspot location in Grenfell.

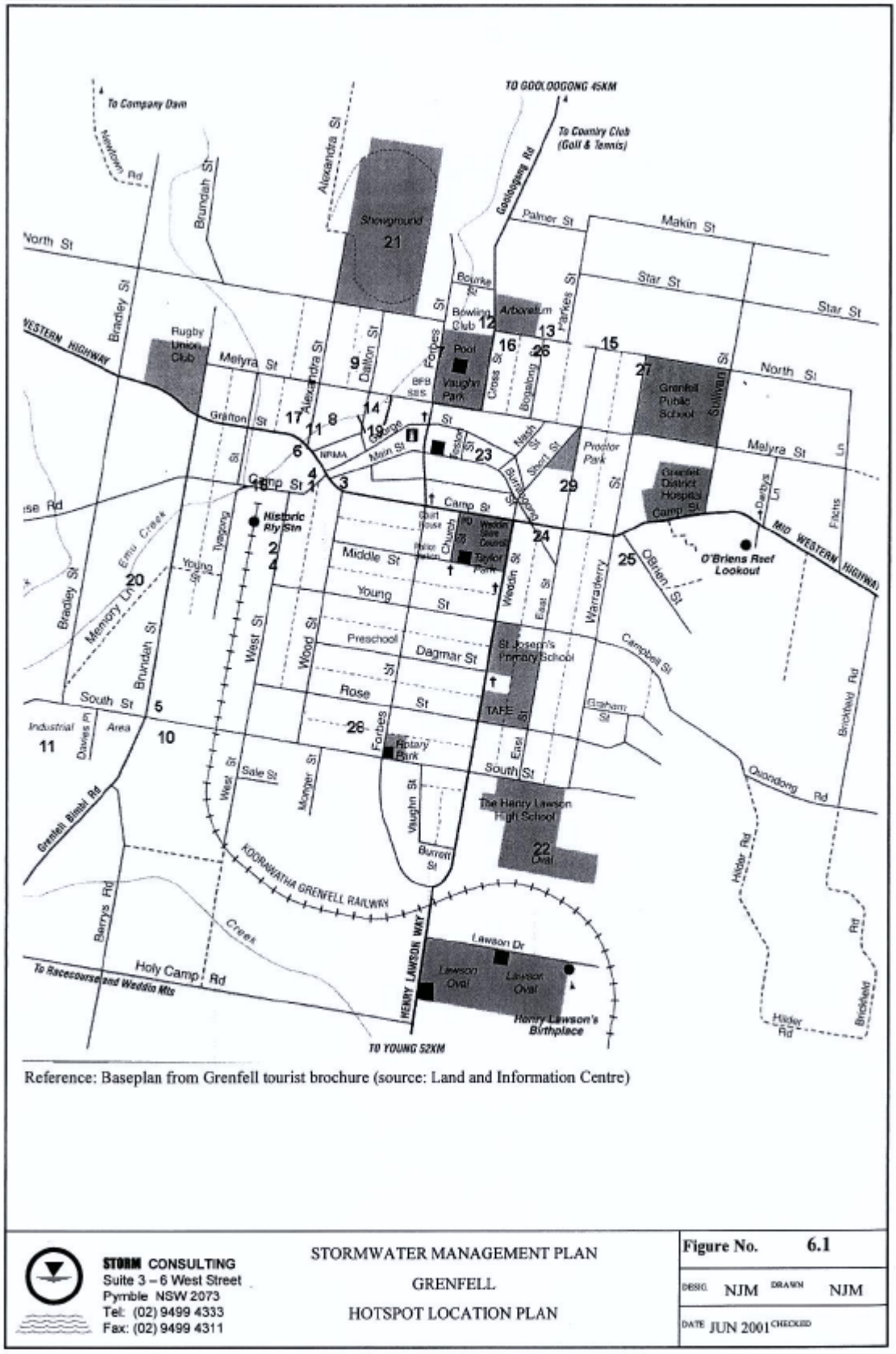

Figure 10: Grenfell Hotspot Location Plan. Source: Grenfell SMP, 2001.

Potential Issue: There are four point sources pollution which did not have agreements for waste minimisation in 2001. Is this information current?

6.5.3 Diffuse Source Estimate

Data gap: Diffuse source of stormwater pollution in Grenfell

6.6 Infrastructure Capacity

Information on the ability of the current infrastructure to meet future needs, including collection, treatment and disposal of stormwater has not been identified.

Data gap: Stormwater infrastructure capacity

6.7 Summary of Findings of the Stormwater Management Plan

The 2001 Grenfell SMP report contain sections of stormwater management issues in Grenfell, as well as potential management options, evaluation of options and implementation strategies. Significant outcomes from the Grenfell SMP are summarised in Table 19.

Table 19: Grenfell SMP Key Outcomes

Values	Water quality, ecosystem health, visual and recreational amenity, education and functional stormwater infrastructure
Objectives	Protect ecosystems from impact, prevent pollution before it occurs, treat pollution, enhance educational opportunities along Emu Creek and mitigate flooding hotspots
Stormwater issues	▪ Pollution sources in Grenfell require management ▪ Lack of water quality data for Emu Creek ▪ Emu Creek is degraded in some places ▪ Erosion and sediment controls at construction / road works sites require regulation ▪ All staff is now trained in sediment control measures ▪ Stormwater infrastructure is inadequate causing flooding in some locations
Stormwater hotspots	▪ Chemical, fuel and fertiliser storage areas ▪ Stormwater outlets to Emu Creek from CBD and industrial area ▪ Litter is a problem in school areas and in the central business district ▪ Truck washes in Grenfell and at saleyards ▪ Old gasworks site

Management options	▪ Development of a Plan of Management (POM) for Emu Creek at Grenfell ▪ Devising and implementing a community awareness campaign about stormwater issues in Grenfell and good stormwater behaviour ▪ Preparation of an environmental audit for pollution hotspots in Grenfell (including chemical, fuel and fertiliser storage areas) ▪ Development of a water quality / macro invertebrate sampling program, possibly in association with Streamwatch and Landcare

Source: Grenfell SMP, 2001.

Potential Issues:
- **Pollution sources in Grenfell require management**
- **Lack of water quality data for Emu Creek**
- **Emu Creek is degraded in some places**
- **Erosion and sediment controls at construction / road works sites require regulation**
- **Stormwater infrastructure is inadequate causing flooding in some locations**

In 2001, Council was required by the DECC (EPA) to incorporate stormwater management options identified in the Grenfell SMP report into Council's works budget over the following three years from that date. Options which are more expensive have been categorised as "future options" giving Council the opportunity to apply for funding or plan to allocate funding, to undertake options in the future.

The capital works program from WSC SBP (2004) does not include any stormwater related work.

Data gap: Has WSC included any stormwater work into Council's current capital works schedule since 2004?

The Grenfell SMP had incorporated a monitoring / reporting mechanism allowing Council, stakeholder and community members to assess the success of stormwater management options with regards to addressing local stormwater issues. The progress of SMP implementation is to be reviewed and reported to Council every six months to updated Council on progress.

Data gap: Is the monitoring / reporting mechanism been implemented?

6.8 Flood Study

Council staff has advised that a new Emu Creek Flood Study is to be done.

Data gap: Flood study including flooding issues and costs related

Potential Issue: Mitigation works for Grenfell Floodplain Management Plan - issue identified by Council staff

6.9 Potential Areas for Water Sensitive Urban Design

The Grenfell SMP report identifies Water Sensitive Urban Design (WSUD) as a potential stormwater management option. Potential WSUD identified for Grenfell are as follows:

- ❒ Car park areas and large paving areas are designed to harvest and divert water into planted areas or grassed swales
- ❒ Temporary ponding basins minimise erosion by retarding stormwater flow

- Urban planning employing creek buffer zones to aid drainage as well as protect creek banks, riparian vegetation and natural habitats. Creek corridors can be seen as positive contributors to developments by providing landscape corridors

Potential areas to implement WSUD are provided in Table 7.1 of the Grenfell SMP (2001). This table also presents stormwater management issues and the options to address the issues (see Appendix E).

Council staff has mentioned potential use of Company Dam for watering parks, gardens, Showground and private personal gardens. This option needs further assessment due potential desilting of the Dam.

Council staff has advised that any of the WSUD options identified in the Grenfell SMP have been implemented.

Data gap: Is there any further area where WSUD could be implemented?

7 References

Emu Creek Flood Study (2007). *Emu Creek Flood Study*, February 2007. Prepared by: Lyall & Associates Consulting Engineers.

Grenfell SMP (2001). Grenfell *Stormwater Management Plan 2001* for Weddin Shire Council. Prepared by STORM Consulting Pty Ltd.

PRP 100 – SOIR (2007). Letter to the Head Regional Operations Unit: RE: *Licence 1732. PRP 100 – Sewer Overflow Investigation Report*, from WSC's Director Environmental Services, 10 July 2007.

PRP 100 Supplementary Information (2007). RE: PRP 100 Supplementary Information. Letter from Director Environmental Services at Weddin Shire Council to the Head of Regional Operations Bathurst. 14 December 2007.

Portfolio Risk Assessment (2002). Portfolio Risk Assessment – 21 NSW Local Water Utility Dams, July 2002. Copy of Section 2 – Company Dam on page 2.

WEDS (2004). *Weddin Economic Development Strategy*, 2004. Report to the Weddin Shire Council. Prepared by Powell Centre for Agricultural and Regional Economics Pty Ltd, ARMIDALE.

WSC MP (2007/08). Weddin Shire Council *Management Plan* (2007/2008).

WSC news letter (2008). http://www.weddin.nsw.gov.au/printversion/1716.html, 23 June 2008.

WSC SBP (2004). Weddin Shire Council *Strategic Business Plan* for Sewerage, April 2004.

WSC SOE (2006/07). Supplementary *State of the Environment Report*, Weddin Shire, 2006 – 2007, October 2007. Prepared by Geoff Cunningham Natural Resource Consultants Pty Ltd.

Appendix A

Weddin Shire Maps

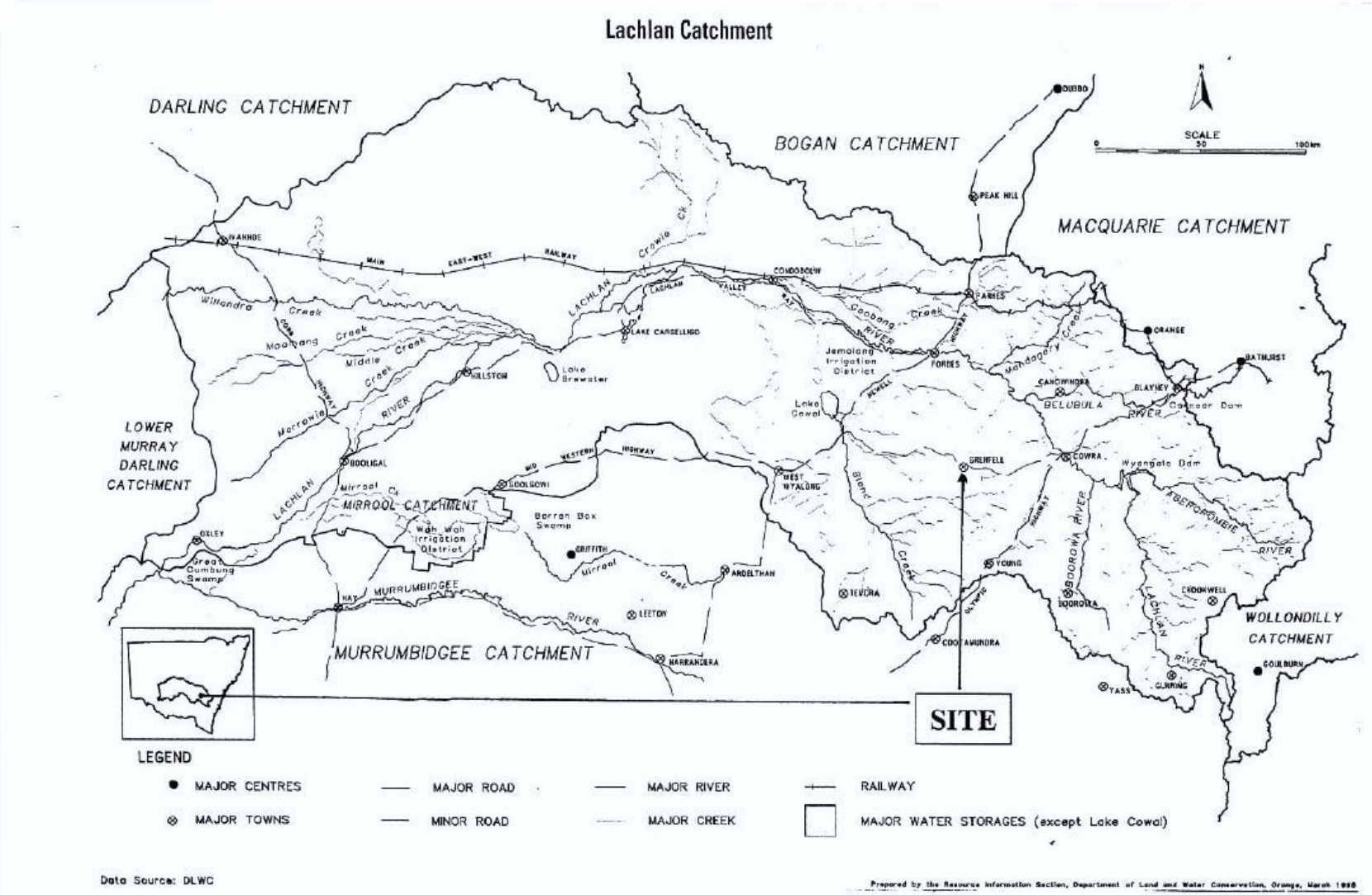

Figure 11: Lachlan River Catchment and Grenfell Location

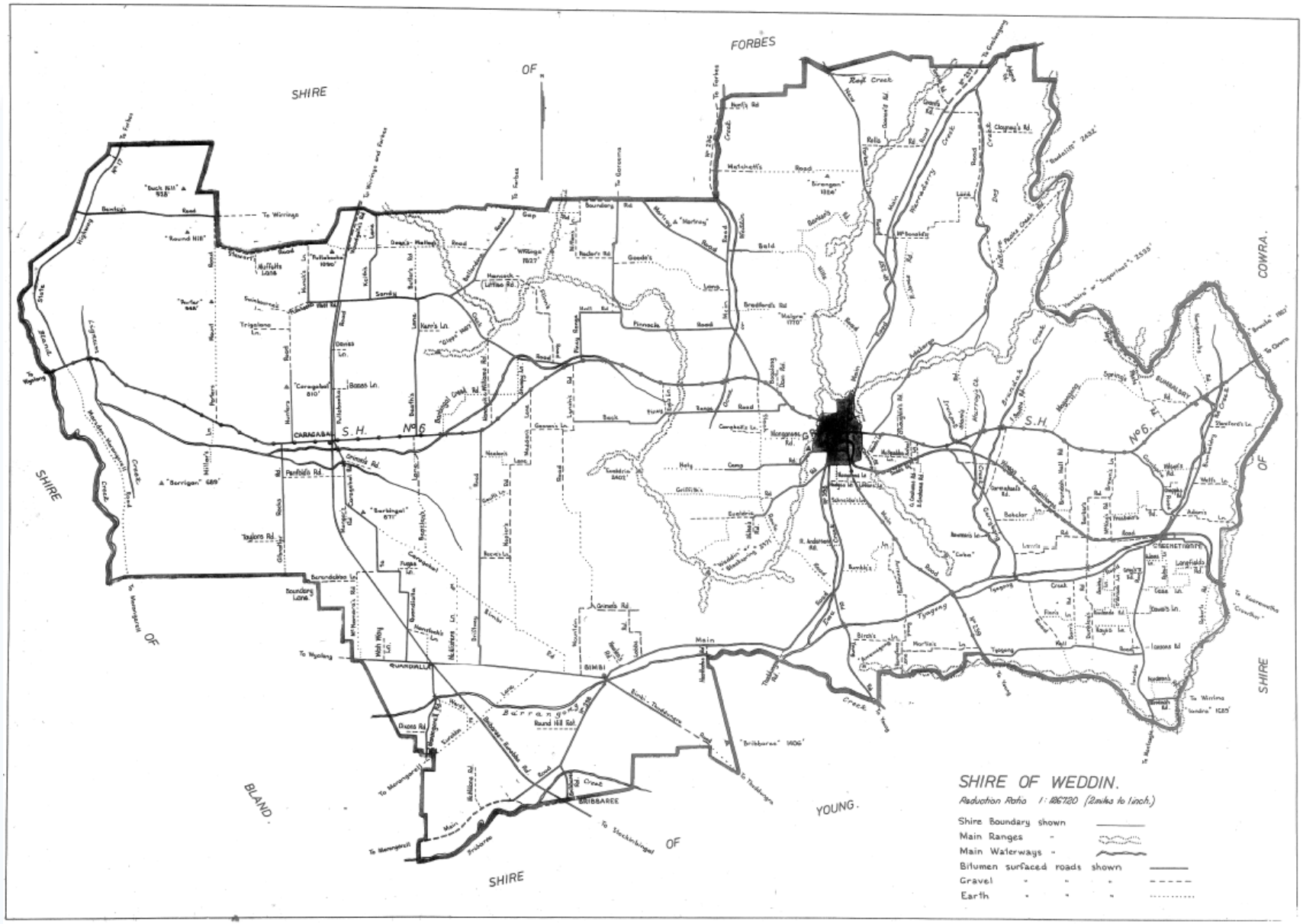

Figure 12: Weddin Shire Council map

Appendix B

Weddin LEP Map

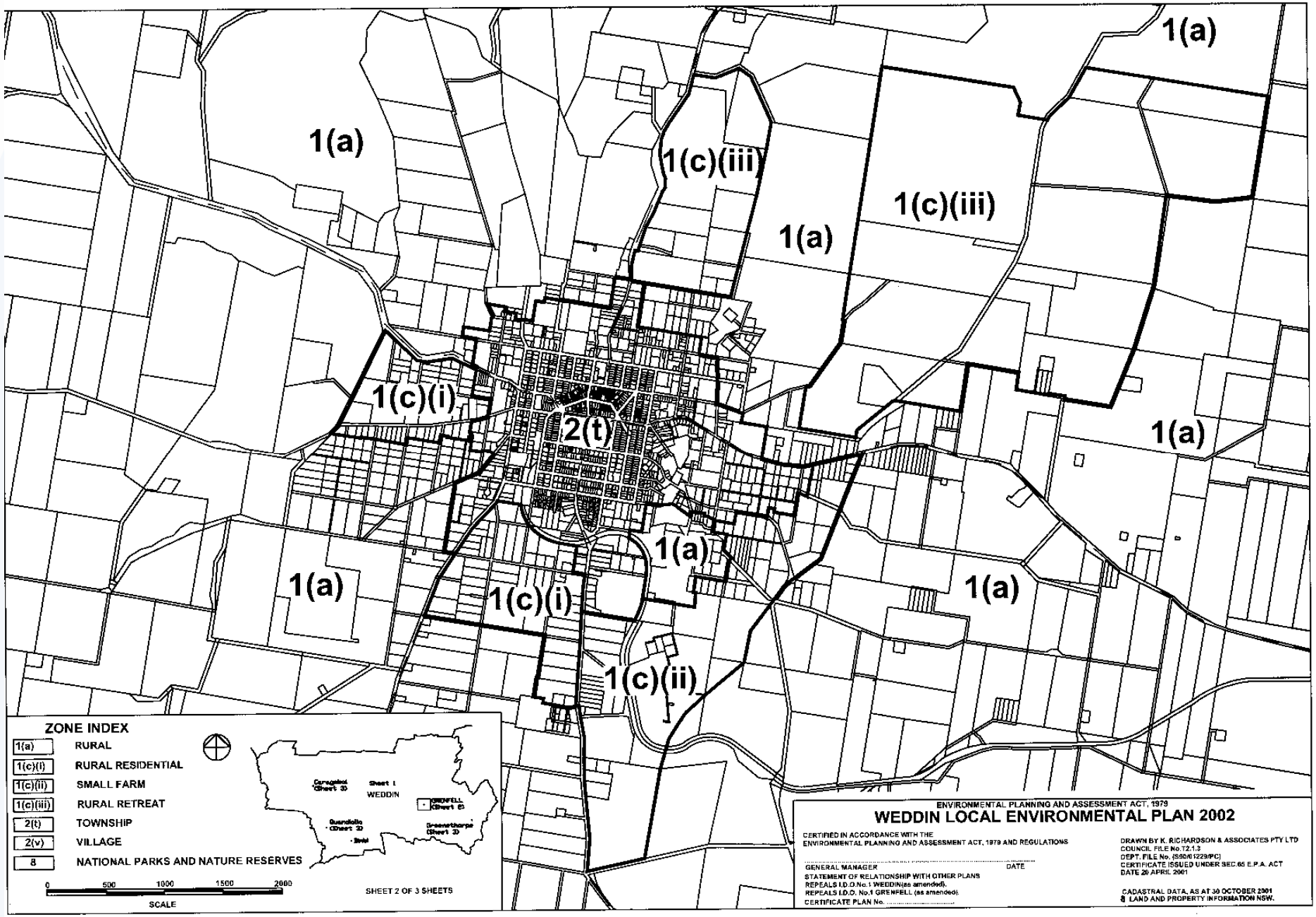

Figure 13: Weddin LEP 2002

Appendix C

Weddin Sewerage System

Figure 14: Weddin Shire Sewerage Town Service Area. Source: WSC SBP (2004)

Figure 15: Weddin Shire Sewerage Town Service Area (continued). Source: WSC SBP (2004)

Appendix D

Weddin Sewerage Capital Works Program

SEWERAGE - CAPITAL WORKS PROGRAM (2003/04 $000)

	30 YEAR TOTAL	01/02	02/03	Year 1 03/04	2 04/05	3 05/06	4 06/07	5 07/08	6 08/09	7 09/10	8 10/11	9 11/12	10 12/13	11 13/14	12 14/15	13 15/16	14 16/17	15 17/18	16 18/19	17 19/20	18 20/21	19 21/22	20 22/23	21 23/24	22 24/25	23 25/26	24 26/27	25 27/28	26 28/29	27 29/30	28 30/31	29 31/32	30 32/33
Subsidised Scheme (for improved levels of service)																																	
	0			0	0	0	0	0																									
	0																																
Total Subsidised Scheme	0	0	0	0	0	0	0	0																									
Other New System Assets																																	
Expand effluent storage capacity by providing an additional pond	30					30																											
Expansion and upgrade of sewerage treatment plant	2,500																			1,250	1,250												
	0																																
Total Other New System Assets	2,530	80	10	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	1,250	1,250	0	0	0	0	0	0	0	0	0	0	0	0
Renewals																																	
Rehabilitate pipe work	1,400					50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Rehabilitate sewerage treatment plant	300					10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Rehabilitate pump station	270						10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Modifications and stewardship of STP following commissioning	100																					50	50										
Sewer main extensions	1,400					50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Upgrade pump stations, replace pumps and associated works (incl.)	60											10				10				10				10				10				10	
	0																																
Total Renewals	3,510	0	0	0	0	110	120	120	120	120	120	130	120	120	120	130	120	120	120	130	120	170	170	130	120	120	120	130	120	120	120	130	120
TOTAL CAPITAL WORKS	6,040	80	10	0	0	140	120	120	120	120	120	130	120	120	120	130	120	120	120	1,380	1,370	170	170	130	120	120	120	130	120	120	120	130	120
Expected Grant For Acquisition of Assets																																	
Total Grant for Acquisition of Assets @ 50%	0			0	0	0	0	0																									
Developer Provided Assets																																	
Estimate based on $1,500 per new assessment ($000)				54	54	39	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total Developer Provided Assets	390	0	0	54	54	39	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

Figure 16: WSC Sewerage 30 years Capital Works Program. Source: WSC SBP, 2004.

Document Control					
Revision	Author	Reviewer	Approved for Issue		
			Name	Signature	Date
2	ARA	AFR	Andrew Fraser	Andrew Fraser	11th November 08