Joint IWCM Evaluation Study

Job number A060

Section 4C

Technical Note 4C

Cabonne Shire Council Data and System Mapping

This technical note describes the water cycle context of Cabonne Shire Council (CSC). CSC operates water and wastewater services within this Shire. The catchment, water resources, urban environment, sewerage scheme and stormwater systems are examined. The purpose of this technical note is to describe the study area context and identify data gaps and issues.

1 Cabonne Shire Council Water Context

1.1 Overview

Cabonne Local Government Area (LGA) is located in the Central West of NSW primarily to the north and west of the Orange LGA. Cabonne LGA is bounded to the north by Narromine Shire Council and Dubbo City Council, to the east by Bathurst Regional Council, to the south and southeast by Cowra and Blayney Shire Councils and Orange City Council and to the west by Forbes and Parkes Shire Councils. CSC covers an area of 6,026 km^2. A map of CSC is provided in Appendix A.

2 Catchment

2.1 Overview

The 2006 Blayney, Cabonne and Orange (BCO) Land Use Strategy states:
"Cabonne LGA is drained by the tributaries of two major rivers systems, the Macquarie and the Lachlan. Most of the northern portion of the Council area drains northward via the Little and Bell Rivers, Summerhill Creek and Lewis Ponds Creek, all of which join the Macquarie River outside the Council's territory. The remainder drains in a westerly to south westerly direction through the Belubula River and Mandagery Creek systems.

The Little River rises in the Curumbenya Range and the Noahs Ark Ridge at elevations between 550 and 700 m and drains most of the north western portion of the Council area. Its major tributaries are the Buckinbah and Sandy Creeks, which meet at Yeoval. Floodplain development on these watercourses is limited within the Cabonne LGA.

The Bell River drains the central northern portion of the Council area, its headwaters rising at over 800 m elevation to the west and north of Orange. Its catchment area is separated from the Little River catchment by the Noahs Ark Ridge and from the Mandagery Creek catchment by the Macquarie range. Within the Cabonne LGA, the Bell's principal tributary is Molong Creek (sometimes known as Molong Rivulet), which flows through Molong and joins the main river 12 km downstream of the town" (BCO Land Use Strategy, 2006).

According to the 1999 Floodplain Management (FPM) Study report, Molong Creek is situated in the Macquarie River basin. The catchment area above Molong is 210 km^2. Molong Creek begins at Mount Canobolas, about 30 km to the south of Molong. Tributaries include Heifer Station and Borenore Creeks which also begin near Mount Canobolas. Molong Creeks discharges into the Bell River 12 km downstream of Molong (Molong FPM Study, 1999).

The 2006 BCO Land Use Strategy report also states the following. "The land to the east of the Mullion Range is rugged and is drained by the Lewis Ponds Creek. The major tributary of this creek is Summerhill Creek, the headwaters of which rise in the Orange and Blayney Council areas at elevations up to more than 1,100 m in the Mt. Canobolas area. Tributaries of Summerhill Creek have been dammed to form the Gosling Creek and Spring Creek reservoirs and Summerhill Creek itself includes the Suma Park Reservoir.

The Belubula River rises outside the Council area in the undulating country along the Orange-Blayney and Blayney-Bathurst Council boundaries and in the Stringybark and Bugs ridges. In its upper and middle reaches the river flows through undulating and hilly country interspersed with only limited areas of alluvial floodplain. About 16 km upstream of Canowindra the floodplain widens and downstream of the town is several kilometres wide. On this lower stretch, various creeks leave and re-join the main channel and numerous low levees protect farmlands from relatively low-level flooding.

The Mandagery Creek and its tributaries' system drain a catchment area of some 2,000 Km^2. Flooding of rural areas along this creek and its tributaries are common and the town of Eugowra is especially flood liable" (see section2.7.1 for further information on flooding issues) (BCO Land Use Strategy, 2006).

2.2 Principal Landscape Characteristics

2.2.1 Land Form

The 2008 draft BCO Land Use Strategy indicates that most of the land within Cabonne Council area is undulating or hilly, with extensive floodplain areas in the lower stretches of the creeks and rivers especially in the north and south west. However CSC staff consider that Cabonne LGA does not have extensive floodplain.

Floodplains are referred to in the Floodplain Management Plans, however these relate to the specific studies in Molong, Eugowra and Canowindra and cover the urban areas only.

2.2.2 Soils

According to 2006 BCO Land Use Strategy report, the dominant soil type covering some 28% of Cabonne LGA is Non-Calcic Brown soils that occur on slopes of undulating to rolling hills where rainfall is less than 750 mm. These soils have low fertility, mottling of subsoils and neutral pH. If managed, these soils can successfully grow cereal crops and canola.

Red Brown Earths, Red Earths, Red Podzolic and Red Solodic Soils combine to account for 36% of the soil type in Cabonne LGA. Red Podzolics soils occur on a variety of landforms, from well drained mid to upper slopes. Red Podzolic soils are low to moderate in chemical fertility. (BCO Land Use Strategy, 2006)

2.2.3 Vegetation

The 2006 BCO Land Use Strategy provides general information about the vegetation in the South East highlands Bioregion (which includes Cabonne area) under the Interim Biogeographic Regionalisation for Australia. The vegetation in this area consists of a range of eucalypt forests and woodlands, native grasslands and montane swamps. The vegetation types that are most threatened includes native grasslands, box woodlands, montane wetlands and riparian vegetation.

The 2008 draft BCO Land Use Strategy provides a map of the remnant native vegetation within Cabonne Shire area. This map is in Figure 9 in Appendix B.

2.3 Main Population Centres

Population data for towns and villages in the Cabonne district is as shown in Table 1. This information has been obtained from the Australian Bureau of Statistics (ABS) Census data.

Table 1: Census Data

Towns and Villages	2001 Census	2006 (Source 1)
Canowindra	1,516	1,421
Cargo	260	253
Cudal	409	381
Cumnock	270	262
Eugowra	589	487
Manildra	513	484
Molong	1,560	1,469
Yeoval	313	235

Source: BCO Land Use Strategy (2008)

Population of Cabonne LGA is as shown in Table 2.

Table 2: Cabonne LGA Population

	1991	1996	2001	2006
Cabonne LGA	11,735	11,944	11,888	12,396

Source: BCO Land Use Strategy, 2008.

Data gap: Tourism and population numbers, accommodation and recreational interests

2.4 Main Catchment Water Uses

Council staff has advised that in 2007/08 the volume sourced from Molong to the Molong private water supply to rural residents were 3.0 ML and to road works 2.0 ML.

Further information on water users within Cabonne Shire is provided in section 2.6.3.

Data gap: Is there any other major water licence holder within Cabonne? E.g. mining, irrigators

2.5 Climate

The BCO Land Use Strategy provides information about the climatic factors within Blayney, Cabonne and Orange area. The average annual rainfall in this area ranges between 540 and 1150 mm with higher rainfall occurring in a belt around Orange and lower rainfall in Cabonne Shire area. There is also a strong influence of altitude with higher rainfall generally associated with higher altitudes. Average annual rainfall is an important determinant of the type of agriculture production, with the more intensive horticultural industries generally based in areas of higher rainfall and cropping and livestock enterprises based in areas of lower rainfall.

Other important climatic factors include rainfall variability, mean maximum and minimum temperatures. Topography also has an impact on climate with areas of higher altitude generally being colder than others. A summary of climate information for selected sites in Cabonne are shown in Table 3.

Table 3: Climate Information from Bureau of Meteorology 2006.

	Molong	Canowindra
Mean annual rainfall (mm)	705	602
Mean number of rain days per year	89	77
Mean daily maximum temp (°C)	22.3	24.7
Mean daily minimum temp (°C)	6.2	8.1

Source: BCO Land Use Strategy (2006).

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 is for the Central Tablelands area and 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.

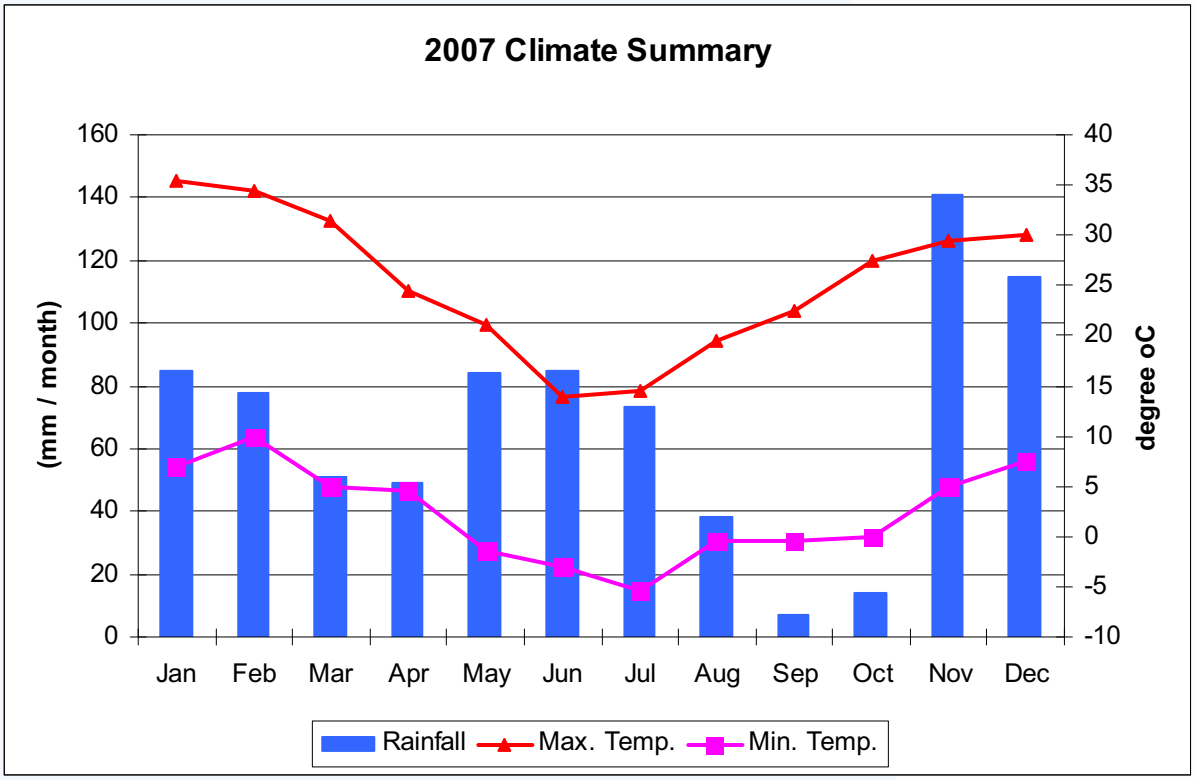


Figure 1: Central Tablelands Climate Data Summary. **Source: SILO Data Drill, March 2008.**

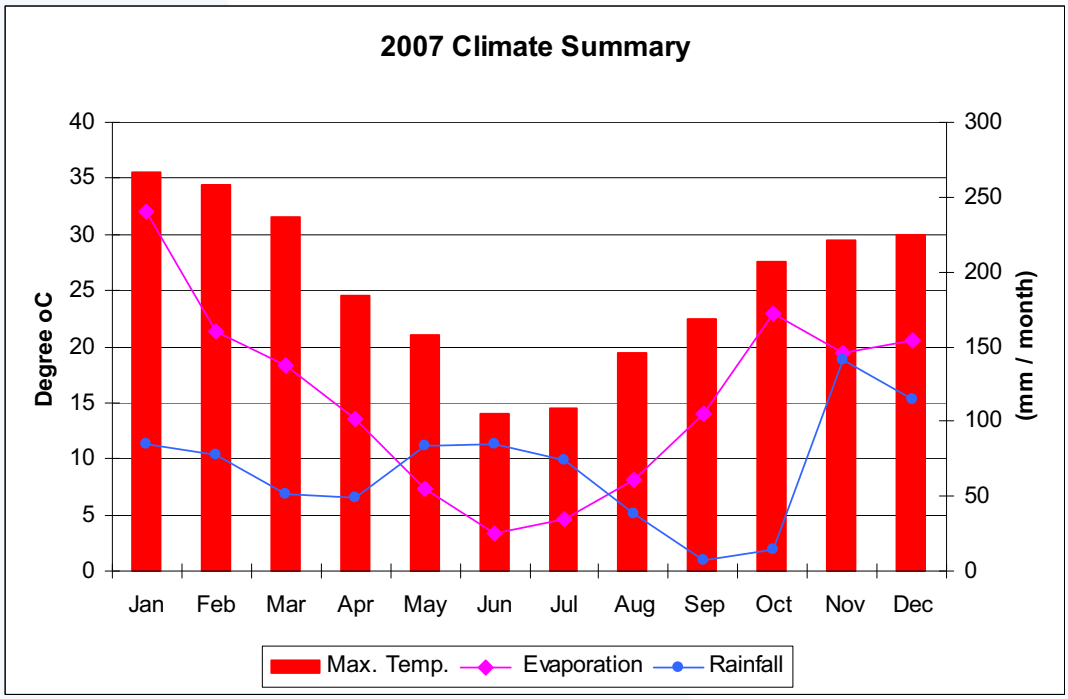


Figure 2: Central Tablelands Climate Data Summary. Source: SILO Data Drill, March 2008.

2.6 Land Uses

2.6.1 Overview

The 2006 CSC Management Plan states the following:

"The Cabonne area covers a number of recreational and tourist attractions including Mount Canobolas, Lake Canobolas and Ophir. Numerous activities and annual events are conducted within the towns and villages, the most notable of which include Marti's Balloon Fiesta, the Australian national Field Days and Cabonne Country Week Celebrations.

Primary industries within the Cabonne area include sheep, grain growing, viticulture orcharding, cattle, timber and mining. Substantial mineral deposits can be found at Cadia, Ophir, Cargo and to the north of Molong. Quality granite and limestone deposits are also quarried within Cabonne near Molong and Cargo and make a significant contribution to the local economy" (CSC MP, 2007/08).

2.6.2 Land Use Planning

A breakdown of Cabonne area of land use for various purposes is provided in Table 4.

Table 4: Land Use in Cabonne Area (1993 and 2004)

	Cabonne Area (ha)		
Description	**1993**	**2004**	**Change**
Cliff/rock outcrop		60	
Conservation Area		2,963	
Cropping	88,722	91,636	+ 2,914
Pasture / Grazing	400,755	384,108	- 16,647

	Cabonne Area (ha)		
Description	**1993**	**2004**	**Change**
Horticulture	2,278	4,133	+ 1,855
Intensive Animal Production		147	
Mining & Quarrying	151	1,496	+ 1,345
Not Mapped	23		
River & Drainage System		4,833	
State Forest / National Park		39,995	
Transport & Other Corridors		4,558	
Timber / Tree Cover	109,078	62,178	- 46,900
Urban	1,238	5,459	+ 4,221
Water Body	2	675	+ 673
Wetland		4	
Total	**602,247**	**602,245**	

Source: BCO Land Use Strategy (2008)

The main key points from the analysis of the land use data from the 2008 BCO Land Use Strategy document, indicates that:

- The majority of the cropping in the Sub-Region is undertaken in the Cabonne LGA
- Horticultural products are mainly grown within the Orange and Cabonne LGAs, with only a small area grown in the Blayney LGA. However, between 1993 and 2004 the area of horticulture has increased in the Cabonne LGA but decreased in the Orange LGA
- The main areas of conservation are located within Cabonne LGA
- Between 1993 and 2004 there has been a substantial increase in mining and quarries in the Blayney and Cabonne LGAs.

The Cabonne 1991 LEP does not have a separate industrial zone. However, Cabonne DCP numbers 7 and 8 identify parts of Canowindra and Molong for industrial purposes respectively Most industrial activities are carried out in the village zone (which permits industries) and in the rural area. Significant industrial activities include the Manildra flour mill and a number of wineries. (BCO Land Use Strategy, 2008). Maps of the 1991 LEP are provided in Appendix C.

CSC has recently released Amendment 20 to Cabonne Local Environmental Plan (LEP) 1991. It rezones the land to which this plan aentionpplies from Zone 1 (a) (General Rural) to Zone 1 (c) (Rural Small Holdings) to allow rural residential development. A map of the LEP rezoning is provided in Appendix C. See section 4.3 for current new land development within Cabonne Shire.

2.6.3 Significant Industries within the Local Area

The 2007/08 CSC MP states that employment within Cabonne relates mostly to primary industries including viticulture and mining. Service industries are a growing sector within Cabonne with tourism and community services adding to this. There has been mixed population growth within Cabonne with most growth appearing to occur in centres located within easy travelling distance of Orange.

In the Cabonne LGA, the main activity is agriculture. Commodities produced include red meat, grains, dairy products, apples, berries, canola oil, wine, flour, eggs and honey.

The main significant industries in the Cabonne Shire and their respective water consumption are as show in Table 5.

Table 5: Industries Water Consumption

Industry	Water consumption supplied by CTW
Macsmith Milling	15 ML/a
Manildra Flour Mill	64 ML/a

Source: CTW staff

Data gaps:
- **Number of wineries in the area and their water consumption, if major**
- **Economic value of these significant industries**

2.7 Sensitive Areas

2.7.1 Natural Hazards - Flooding

The 2006 Blayney, Cabonne and Orange Land Use Strategy report states:

"None of the CSC's territory is remote from the headwaters of its various streams, and flood warning times are characteristically short – that is, in the order of hours rather than days. Flood waters tend often to be deep and fast-moving and are usually quick both to rise and fall.

Canowindra is cut in two by a major flood, the main bridge across Belubula River being closed to traffic. A nearby footbridge (the Swing Bridge) is closed before the major flood level is reached and there is significant disruption to traffic on roads upstream and downstream of the town. In Canowindra itself, the main bridge has been closed for periods of up to eight hours during floods.

About 16 km upstream of Canowindra the floodplain widens, and downstream of the town is several kilometres wide. On this lower stretch, various creeks leave and re-join the main channel and numerous low levees protect farmlands form relatively low-level flooding. Periodically, floods overtop these levees and inundate large areas of rural lands. Particularly at and upstream of Canowindra, flood flows can be dangerously fast.

At Cargo, no flood problems sufficient to inundate dwellings or require evacuations are know to exist for this village. However flash flooding could occur after heavy rain and could close some local roads.

At Cudal, a number of low lying residential properties in Cudal can be inundated by Boree Creek after heavy rainfall. Boree Creek can rise quickly with little or no warning causing significant damage.

Cumnock has three houses which may be flood liable at the northern end of Obley Street during a significant flood on Doughboy Creek. In an extreme flood event, up to three additional dwellings could be at risk of inundation.

Eugowra experiences particularly severe problems when the Mandagery Creek is in flood. Flows along the Mandagery River escape the main creek during floods and move down flood ways on wither side. They can be dangerously fast-moving, with velocities of up to 2 metres per second having been recorded. Puzzle Flat Creek, which joins the Mandagery at Eugowra, has been known to worsen flooding within the town in the past. Levee banks constructed in 1992 will reduce the frequency of flooding within the town in the past. Levee banks constructed in 1992 will reduce the frequency of flooding from this creek in the future, although the banks could be overtopped in a very large flood event.

Manildra is located at the confluence of the Manildra and Mandagery Creeks. There are a very small number of houses which could be flooded and the river flats are inundated during flood periods. Local roads can be closed and the railway line cut.

Molong, located on the Molong Creek, is subject to flooding of residential areas and shops. Major flooding can occur with very little warning. Much of the commercial area lies within the floodplain and overbank flow is know to have entered the shopping area on four occasions, the last in 2005. See section 3.3 for further information about flood prone areas in Molong.

Yeoval is sited at the confluence of Sandy and Buckbinbah Creeks and its low-lying areas are flood liable. Up to five houses at the low end of Obley and Ganoo Streets could be flooded from Sandy Creek. Other areas that could be flooded in a major flood event include the low-lying areas of golf course and showground located at the northern edge of the town" (BCO Land Use Strategy, 2006).

CSC has prepared a 5 year plan of works for urban stormwater. Detail of this plan is given in Table 29 in section 6.1.

Floodplain management studies were prepared in 1999 to identify practical measures to minimise the impacts that floods have on the communities of Molong and Eugowra towns.

Although most of the town of Molong is located on high ground, most of the commercial properties and a significant portion of residential properties are located on low lying ground adjacent to the creek. A total of 28 houses and a further 42 non-residential properties would be inundated in the 100 year flood. There is a further serious risk in floods larger and less frequent than the 100 year event. The probable maximum flood (PMF) would be 4 to 5 m higher than the 100 year flood and would result in approximately 170 properties being affected. A number of mitigation options have been identified and a criteria assessment was conducted to identify the high priority options. These are:

- Vegetation management
- Building and Development Controls
- Community information and education
- Flood warning system
- Emergency planning and management (Molong FPM Study, 1999).

According to the Eugowra FPM Study, different sections of Eugowra are affected in a variety of different ways by floods depending on their proximity to Mandagery Creek and Puzzle Flat Creek or to a number of flood ways which traverse the flood plain. The most obvious impact of a flood on the town is that, even in a relatively minor flood, the town is cut in two by Mandagery Creek. Table 6 summarises the numbers of properties which are either "affected" (flood water on the land but not above the floor (A)) or "damaged" (flood water above floor level (D)) for floods of different average recurrence interval (ARI).

Table 6: Total Number of Properties Affected

	Nº of properties flooded					
	Residential		Commercial/Industrial		Public	
Flood event ARI	A	D	A	D	A	D
20	30	18	18	13	6	3
50	101	51	25	25	13	8
100	148	86	31	31	14	14
3 X 100	189	188	36	36	14	14

Source: Eugowra FPM Study (1999)

A summary of Eugowra draft floodplain management plan's measures are below:

- Implement recommended planning controls based on defined floodplain area and floodway zone
- Develop guidelines for flood compatible construction on the floodplain
- Investigate and, if warranted, implement a voluntary purchase scheme to remove selected residential development in high hazard areas
- Investigate and implement, if warranted, a subsidised house raising scheme to raise individual residential development in high hazard areas
- Improve flood warning system and emergency response procedures
- Prepare and implement a riverine corridor management plan to manage vegetation and provide flood mitigation, aesthetic and habitat benefits
- Implement flood awareness and education program
- Flood data collection (Eugowra FPM Study, 1999)

The 1999 Floodplain Study for Eugowra is currently under review. The new study will cover a much broader area and will extend downstream from Eugowra to the Lachlan River. The study will also investigate the impact the Puzzle Flat Creek land conservation and flood mitigation works will have on the township."

The Canowindra Floodplain study has been completed and the draft plan will be considered by Council in November 2008. There has not been any significant flood mitigation works undertaken in Canowindra.

The Molong Flood plan is also under review. A review of the plan was called after the devastating floods in November 2005 when flooding of the main commercial precinct caused major damage and disruption to the local community. Significant up grades to existing stormwater drainage in Bank and Watson Street, Molong has been completed. Further works will be identified in the new study."

Data gap: Has any of the flood mitigation options identified in the floodplain management studies been implemented?

2.7.2 Land Contamination

Council staff has advised that CSC has commenced investigation into potential ground contamination sites. The results of these studies will be available at a later date. The old gas works site located in Molong is a site noted for the investigation

2.7.3 Environmentally Sensitive Areas

The 2008 BCO Land Use Strategy report identifies salinity issues in the Lachlan River and Macquarie River catchments as stated below:

"Lachlan River catchment - salinity

In 2003, the Department of Sustainable Natural Resources undertook an assessment of riverine salinity in the Lachlan River catchment. A number of sites in the Lachlan Catchment exceeded the drinking water taste threshold of 800 µS/cm during 2000-2001, the Lachlan River at Narrawa and Numby in the upper catchment, the Lachlan River at Cowra and Forbes, and the Belubula River at Canowindra. Salt sensitive agriculture and industry, particularly around Canowindra, Cowra and Forbes may have been affected by salinity concentrations exceeding the 800 µS/cm threshold.

For 2000/2001 the main tributary contributing the largest salt load in the Mid-Lachlan appears to be the Belubula River, with the remaining tributaries contributing similar loads. The Salinity Strategic Plan for the Lachlan River Catchment (Gammie *et al.*, 2002) assigned the Belubula River and its tributaries below Carcoar Dam as having a very high potential salinity hazard. The rating was based on geological characteristics, rainfall and land use. The Belubula River was thought to have geological characteristics with a large salt store potential and rock types that were significantly fractured (Gammie *et al.*, 2002). Rainfall in the catchment was considered sufficient to move salts through the landscape and the irrigation along the river would also contribute to this (Gammie *et al.*, 2002). Land use such as cropping, horticulture, annual and low water use perennial pastures contribute to movement of salt through the landscape (Gammie *et al.*, 2002).

A number of important salt-sensitive industries rely on the Belubula for irrigation, including large viticulture enterprises. The threat to these industries and added stress to the aquatic environment makes the Belubula River a high priority for salinity strategies to be put into place as soon as possible. Downstream impacts on the Lachlan reinforce this recommendation.

Macquarie River catchment - salinity

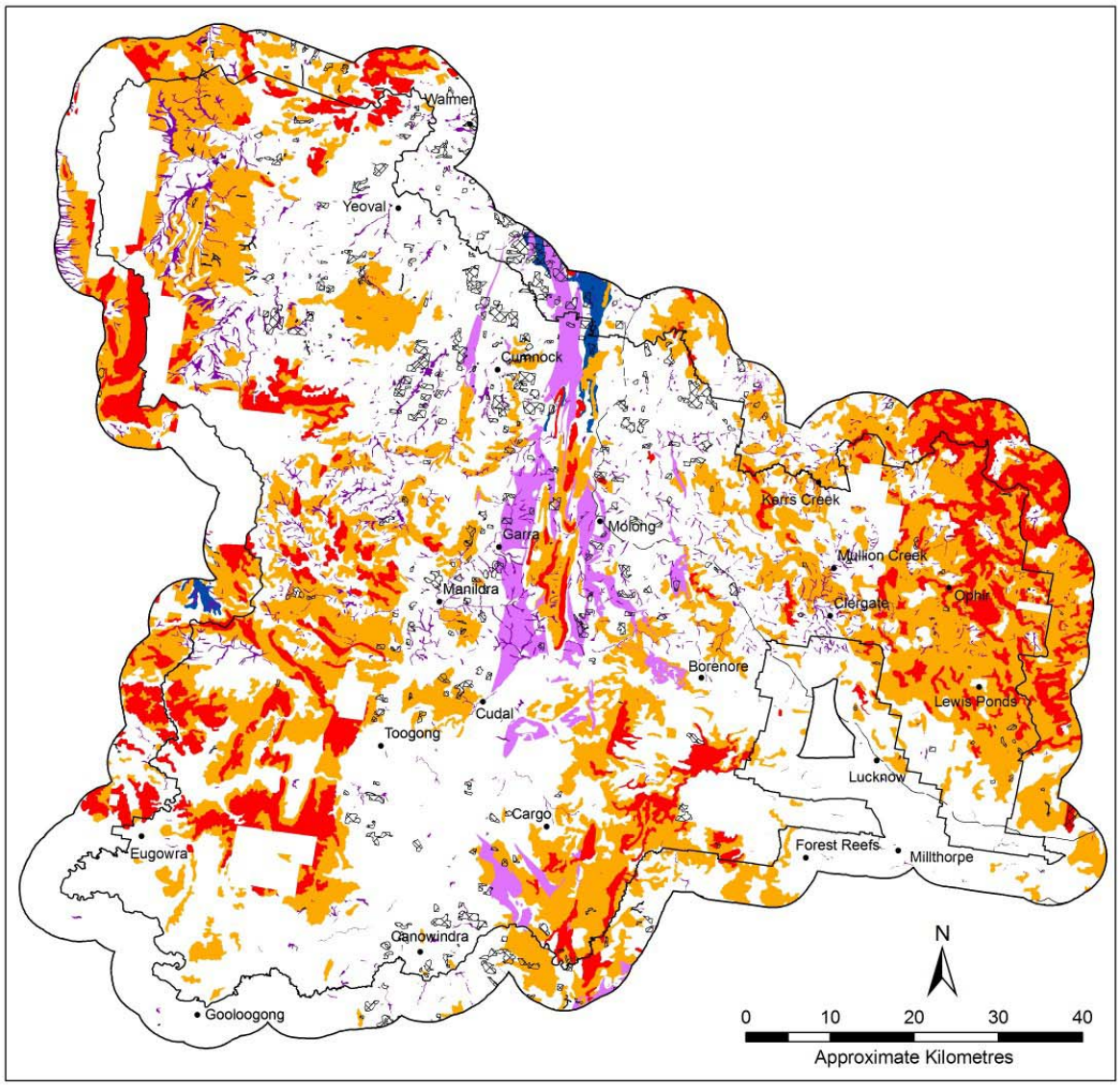
In 2001, the Department of Land and Water Conservation undertook an assessment of riverine salinity in the Lachlan River catchment. The salt concentration of the Macquarie River generally increases along the longitudinal profile of the river. Burrendong Dam interrupts the progression as the dam was filled during a flood event and therefore contained a reservoir of floodwater with a low salt concentration. The floodwater stored in the dam dilutes the salt concentration of all inflows. For this reason in 1999/2000 all water releases from Burrendong Dam exhibited a lower concentration of salt than is shown from the inflows. Water released from Burrendong Dam progressively increases in salt concentration through inputs from each of the major tributaries.

Most study sites were found to exceed the World Health Organizations guideline for acceptable levels of salinity of drinking water of 800µS/cm at specific times during the study period.

The Bell River at Neurea contributed 6% to the total salt load, while the Little River at Obley contributed 2% to the total salt load."

The Departments of Water and Energy & Environment and Climate Change have recently prepared maps of Cabonne LGA which identify environmentally sensitive areas within Cabonne 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?



CABONNE 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-Severe to extreme 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.
- Soil Regolith R4 - Development of these areas would not be considered appropriate
- Karst Extent
- NSW Highway
- Town

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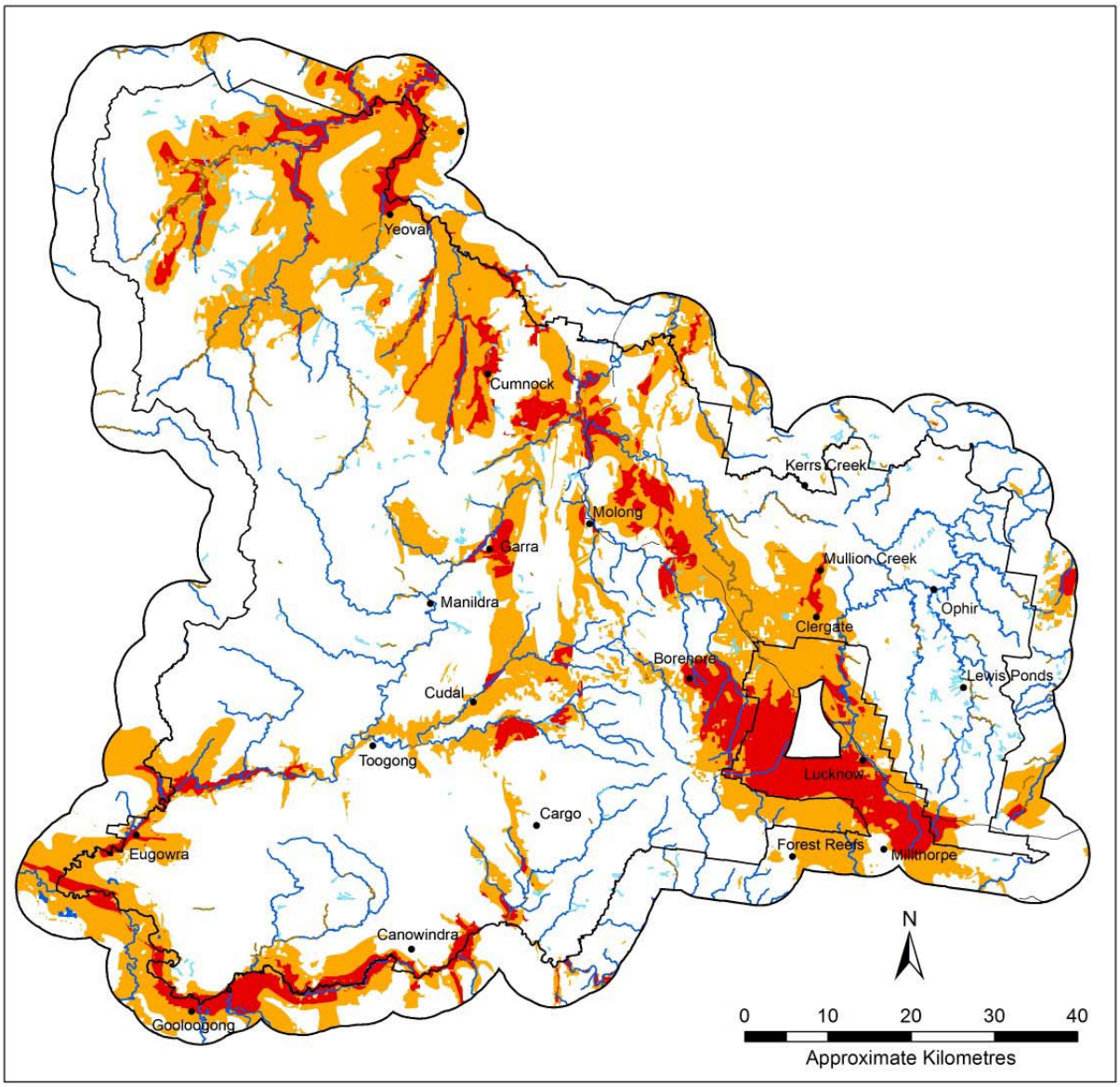
Figure 3: Sensitive Land Resources



CABONNE LGA

Environmentally Sensitive Areas - Sensitive Water Resources

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Environmentally Sensitive Areas
Water Overlay Data

Data Source	Data Codes
Vulnerable Riparian Areas	All codes + 40m buffer either side of high bank
Groundwater Vulnerability	High and Moderately High
Drainage Polygon	Reservoirs
Gully Streambank Erosion 1995	81,82,83,84,85,102,103,104

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
- Reservoir
- 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

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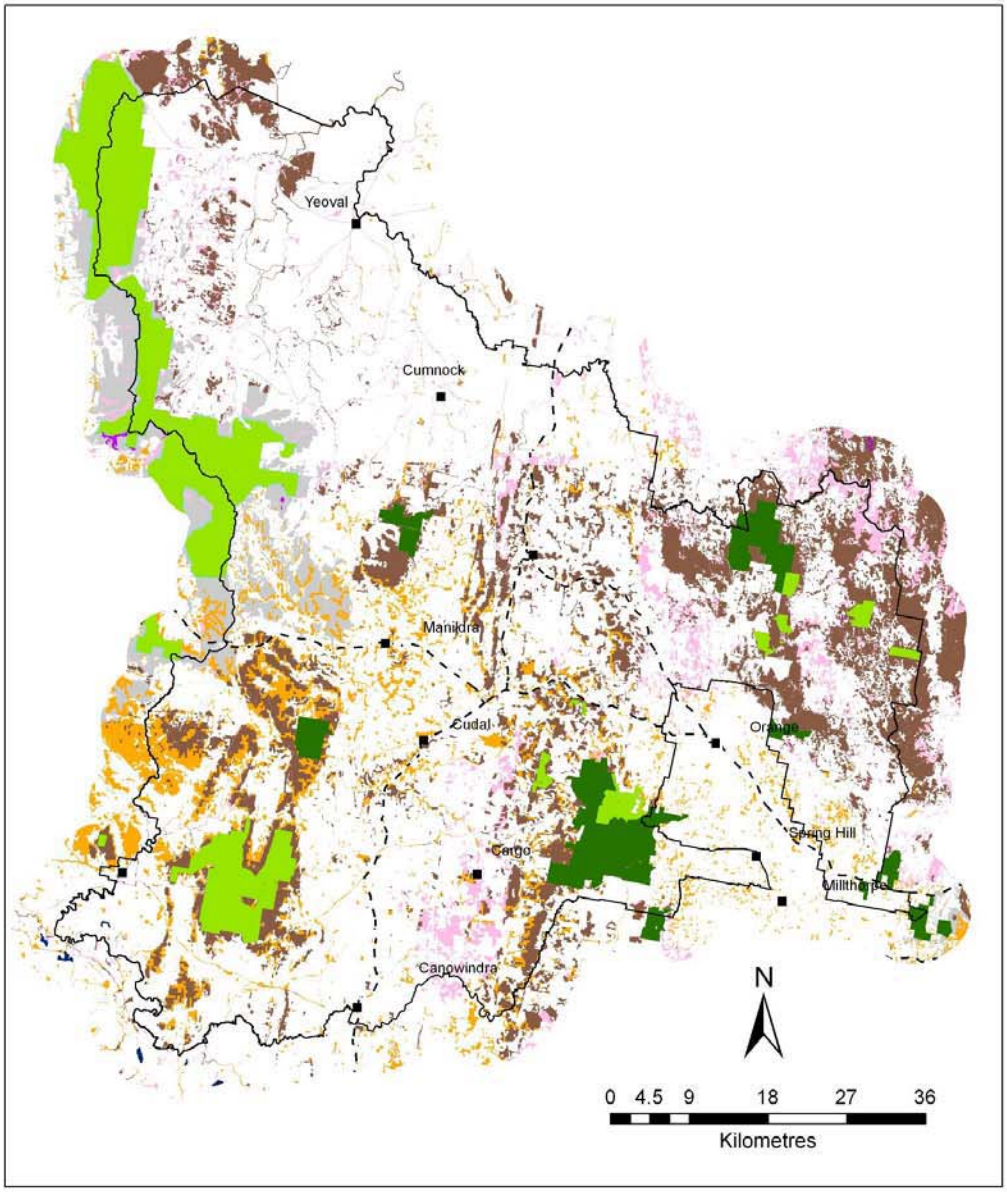
Figure 4: Sensitive Water Resources

Potential issue: Figure 4 indicates that there are high groundwater vulnerability around Molong and Eugowra. As developments have been identified in these areas (see section4.3) does this represent long term issues with the groundwater availability within CSC?



CABONNE 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
- major roads in nsw
- 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

2.8 Regional Catchment Plans

The Central West Catchment Management Authority (CMA) has developed the Central West Catchment Action Plan (CW CAP). The CW CAP was drafted in 2005 and outlines a number of catchment and management targets for the catchment. The targets were originally based on the Central West Catchment Blueprint. The CAP targets were reviewed by government and community and were based on the best available information at the time. The CAP is divided into 7 themes which are further divided into Catchment Targets and Management Targets. Themes included in the CAP are salinity, water, vegetation, biodiversity, soils, people & community and aboriginal and non-aboriginal cultural heritage.

Council staff has advised that activities undertaken along the Molong Creek includes extensive clearing of willows and other exotic vegetation. This is a program undertaken in partnership with the CMA and extends downstream along the Bell and Macquarie Rivers into adjoining LGA's.

Data gaps:

- **Are the CAP targets being achieved within Cabonne LGA?**
- **Is there any other regional catchment plan that covers Cabonne Shire area?**

3 Water Resources

3.1 Overview

Water resources within by CSC are shown in Table 7.

Table 7: Water Resources within CSC

Water Storage	Capacity	Usage	Comments
Molong Creek Dam	1000 ML	Main water supply source for Molong	Secure yield – 300 ML/year
Borenore Creek Dam	230 ML	Currently not in use	Back-up dam – Poor water quality
Molong Creek Weir	50 KL	Not in use	It hasn't been in use since the construction of the Molong Creek Dam (CSC staff advice)
Bell River (intake works) **(Note 1)**	Unknown	Cumnock Water Supply	-
Buckinbah Creek Weir **(Note 1)**	Unknown	Yeoval Water Supply	-
Yeoval Bores **(Note 1)**	Unknown	Yeoval Water Supply	-
Delgany Bore (Mullion Creek) **(Note 1)**	Unknown		-

Source: Technical note 3 – Demand Projection. Note 1: Data provided by Council staff

As stated in the 2003 Molong and Borenore Dambreak Study report, Molong Creek Dam is located on Molong Creek and is about 12 km northwest of Orange and 16 km southeast of Molong. This dam is about 15 km downstream of Lake Canobolas Dam on the same Molong Creek forming a cascade of dams.

Council staff has advised that Molong Water – "Weir Site" is not used because it has no storage and it was only used when the creek flow exceeded the town demand, i.e. winter mostly. Molong Creek Weir was effectively replaced by Molong Creek Dam but it is kept in reserve as possible water treatment of Dam water by aerating between dam and weir.

Council staff has advised that Borenore Creek Dam supplied water to Molong town for many years over the summer months when the Molong Creek Weir had no flow. The quality after filtration meets the potable standards. However customer opinion on colour and taste was generally negative, particularly once manganese sediments and laundry stains arose from time to time at lower storage levels.

Most customers were comparing the treated Borenore supply to their own roof rainwater supply. Until the recent severe drought supply from Molong Creek, the Molong Creek Dam supply had always been a better quality than the Borenore Creek Dam. Hence, the attitude to rely on Molong and to discard Borenore. Borenore Creek Dam can still be used to supply Molong. Council staff have formally advised Council a number of times to retain the storage for town supply when downstream riparian groups have asked for it to be released for environmental benefits during droughts. Council has to date accepted this advice. Hence it has remained in storage available for possible use when the better quality Molong Creek first option is not available.

Even though Lake Canobolas Dam is within Cabonne LGA, it is owned and operated by Orange City Council. At full supply level Lake Canobolas Dam storage capacity is 480 ML and it is for recreational use only. Due its location upstream Molong Creek Dam, the Lake Canobolas Dam usage might affect water storage in the Molong Creek Dam. Further information about Lake Canobolas Dam is provided in section 3.4.3.

Lake Burrendong Dam is a rock fill dam with a volume of 1,188,000 ML when full. The dam is located on the Macquarie River, northeast of CSC. Although it is not within the Cabonne Shire area it is a major regional water resource that may be considered.

CTW staff advised that Cadiangullong Dam which is on the Cadiangullong Creek and is in Cabonne Shire is one of the water sources for Cadia mine operation. It's unclear who is responsible for the dam. Dam capacity is unknown. This dam is a potential water source to supply CTW.

Data gaps:

- **Bell River water extraction licence**
- **Buckinbah Creek Weir, Yeoval and Delgany Bores yields, water quality, existing licensing arrangements**
- **Are there any other potential water sources (e.g. rivers, groundwater, and agricultural dams) that need to be considered?**
- **Seasonal and annual variations in flow or availability of all water sources within Cabonne Shire**
- **Cadiangullong Dam information**

3.2 Water Sharing Plans

Cabonne Shire is within the Central West and Lachlan catchments. The Central West catchment has the following plans:

- Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers (Macquarie-Cudgegong River Management Committee, 2004) - outlines a range of operational flow rules to remedy some of the impacts of river regulation
- All other streams within the catchment are regarded as — unregulated

- Central West Catchment Action Plan (CAP), 2006 - 2016. It outlines a number of catchment and management targets for the catchment (see section 2.8 for more information)

Within the Lachlan catchment there are three plans that cover all surface water sources:

- Water Sharing Plan for the Lachlan Regulated River Water Source (DIPNR, 2004a)
- Water Sharing Plan for the Mandagery Creek Water Source (Department of Infrastructure Planning and Natural Resources, 2004c)
- Macro Plan currently being finalised (DNR, in press) (Lachlan CMA, 2008).

It is unknown which of these plans are applied in the Cabonne Shire area. Council staff has advised that there is no water sharing plan in action within Cabonne Shire area.

3.3 Environmental Impacts

Data gaps:

- **Are there any environmental impacts regarding existing or alternative water resources within CSC (listed in Table 7)?**
- **Environmental flow requirements for rivers in the Cabonne Shire area**

3.4 Dams Failure Impacts

3.4.1 Consequence Category of Molong Creek Dam

A summary of the 2003 Molong Creek Dam Dambreak study report is below:

- The residences affected by the dambreak floods in the study area are mainly in the town of Molong and adopting 2.6 persons per house the Population at Risk (PAR) are estimated to be as shown in Table 8.

Table 8: Dambreak Flood Consequences

Case	Inundated Houses	PAR
Sunny Day Dambreak	75	195
Dam Crest Flood (DCF)	120	312
DCF Dambreak	140	Incremental PAR 52
Probable Maximum Flood (PMF)	190	494
PMF Dambreak	205	Incremental PAR 52
DCF Cascade Dam Failure	145	Incremental PAR 65

Source: Molong and Borenore Dambreak Study (2003)

- The criterion for safe wading is that the product of flood depth and flow velocity should be less than 0.4. Considering the high flow velocity and the relatively large incremental flood depths, the criterion for safe wading is not met for the cases considered. It is therefore likely that people caught in the flood would be swept away and could be drowned. The likely loss of life is therefore possible.

- According to the latest ANCOLD Guidelines on Consequences Assessment and in view of the above factors and the likely loss of life, Molong Creek Dam should be rated as a "HIGH C" Consequence Category Dam for Incremental Flood Consequence Category (FCC).
- The Sunny Day Dambreak case for Molong Creek Dam has a lesser degree of flooding than the DCF Dambreak case but the affected PAR is about 150 more. Consequently the dam should be rated as a "High A" Consequence Category Dam for the Sunny Day Dambreak case.

Council staff has advised that Council undertakes routine safety checks in accordance with the recommendation of the Dambreak Studies. This includes visual assessments three times a week.

3.4.2 Consequence Category of Borenore Creek Dam

- The residences affected by the dambreak floods in the study area are mainly in the town of Molong and are estimated to be as shown in Table 9.

Table 9: Dambreak Flood Consequences

Case	Inundated Houses	PAR
Sunny Day Dambreak	0	0
Dam Crest Flood (DCF)	100	260
DCF Dambreak	110	Incremental PAR 26
Probable Maximum Flood (PMF)	185	481
PMF Dambreak	185	Incremental PAR 0

Source: Molong and Borenore Dambreak Study (2003)

- The criterion for safe wading is that the product of flood depth and flow velocity should be less than 0.4. Considering the high flow velocity and the relatively large incremental flood depths, the criterion for safe wading is not met for the cases considered. It is therefore likely that people caught in the flood would be swept away and could be drowned. The likely loss of life is therefore possible.
- According to the latest ANCOLD Guidelines on Consequences Assessment and in view of the above factors and the likely loss of life, Borenore Creek Dam should be rated as a "HIGH C" Consequence Category Dam for Incremental (FCC).
- The Sunny Day Dambreak case has a lesser degree of flooding and the flood is limited to the creek channel only. Consequently the Borenore Creek Dam should be rated as a "LOW" Consequence Category Dam for the Sunny Day Dambreak case.

3.4.3 Hazard Rating for Lake Canobolas Dam

A summary of the 2000 Lake Canobolas Dam Dambreak study report is below:

- The surcharge at Molong Dam due to Lake Canobolas Dam failure is in the range of 1.5 to 5.6 m. If Molong Dam can withstand this range of surcharge, the flooding at Molong Town due to Lake Canobolas Dam failure is of minor consequence as the flooding is mainly attributed to the tributary inflows. But it should be noted that the incremental flooding through Molong, due to Lake Canobolas dambreak will range from 0.2 m for Sunny Day Dambreak case to 2.7 m for PMF Dambreak case. Although the present dambreak simulation results indicated that some houses in the Molong Town might be flooded, no attempt has been made to access the inundation conditions as the

hydrology of the downstream area needs to be refined and confirmed. It is also outside the scope of this present work.

- The criterion for safe wading is that the product of flood depth and flow velocity should be less than 0.4. Considering the high flow velocity and the relatively large incremental flood depths, the criterion for safe wading is not met for the cases considered. It is therefore likely that people caught in the flood would be swept away and could be drowned. The likely loss of life is therefore 2 to 3 people (the likely number of people at Somerton Park.
- According to the latest ANCOLD Guidelines on Consequences Assessment and in view of the above factors and the likely loss of life, Lake Canobolas Dam should be rated as a "HIGH C" HAZARD Dam for IFHC.
- Regarding the spillway assessment, it would appear that the dam does not satisfy the Acceptable Flood Capacity Guidelines. However, the appropriate Probable Maximum Precipitation (PMP) Design Flood should be estimated prior to making a final statement on Lake Canobolas Dam's spillway capacity.
- The Sunny Day Dambreak case has a lesser degree of flooding but is still above the safe criteria and should be rated as "HIGH C" HAZARD Dam for the Sunny Day Dambreak case.

Council staff has advised that the dambreak areas don't have alarm systems.

Council staff has advised that there are no updated dambreak studies.

Potential issue: Are dam safety systems and emergency plans adequate for the three dams mentioned above?

3.5 Climate Change

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

Main towns and villages are listed in section 2.3, as well as population data and Cabonne LGA population.

In 2001 there were 5,070 dwellings with an average occupancy rate of 2.47 people per dwelling. Council staff has advised that occupancy rate is steady since 2001.

Data gaps:

- **Holiday and rental accommodation stock**
- **Growth predictions in housing stock (infill and new development areas)**
- **Number and type of commercial buildings**

Cabonne LGA has demonstrated a consistent growth with the population increasing by 399 over a ten year period. Over the same period the number of dwellings increased by 499, with most growth taking place within the towns and rural areas closest to Orange. This ratio of people to dwellings is indicative of a national trend towards smaller household size. Factors influencing this are a decline in the number of children in the average family, marital breakdown, teenagers leaving home and an ageing population. It is anticipated that with the expanding mining and viticulture industries the population of Cabonne will continue to expand (CSC MP 07/08).

Table 10: Age Demographics Cabonne LGA

Age Demographics	2001 Census (Source 1)	2006 (Source 2)
0 – 4	799	795
5 – 14	1,948	1,931
15 – 24	1,278	1,237
25 – 54	4,559	4,726
55 – 64	1,444	1,686
65 plus	1,860	2,021
Total	**11,888**	**12,396**

Source 1: CSC MP (07/08). Source 2: BCO Land Use Strategy (2008)

Table 11: Projected Changes in Age Structure, 2001 - 2031

Statistical Local Area	Median Age		Aged 0-14 years		Aged 65+ years	
	2001	2031	2001	2031	2001	2031
Cabonne Part A (eastern part of Cabonne)	39	49	23%	16%	11%	27%
Cabonne Part B (eastern part of Cabonne)	37	48	24%	16%	9%	27%
Cabonne Part C (western half of Cabonne)	39	53	22%	14%	17%	33%

Source: BCO Land Use Strategy (2008)

"Employment possibilities are limited within Cabonne with many young people needing to leave the LGA to find work. Despite this exodus, unemployment rates within Cabonne tend to be lower than that of most of the regional centres in close proximity" (CSC MP, 07/08). The proportions of total employment in Cabonne Shire are presented in Table 12.

Table 12: Employment by Industry, 2001.

Industry	Number	%
Agriculture, forestry, fishing	1,504	40.1
Mining	21	0.6
Manufacturing	438	11.7
Electricity, gas, water supply	13	0.3
Construction	173	4.6
Wholesale trade	116	3.1
Retail trade	237	7.4
Accommodation, cafes, restaurants	179	3.7
Transport and storage	111	3
Communication services	26	0.7
Finance and insurance	28	0.7
Property, business services	120	3.2
Government administration defence	112	3
Education	249	6.6
Health, community services	298	7.9
Cultural, recreational services	38	1
Personal other services	57	1.5
Not classified	8	0.2
Not stated	23	0.6
Total	**3,751**	

Source: BCO Land Use Strategy, 2006.

Table 13: Housing Stock

Private dwellings	Number
Separate house	4,341
Semi-detached, row or terrace house, Townhouse etc	20
Flat, unit or apartment	58
Other dwellings	93
Not stated	4

Data gap: Infill and new development predictions

4.2 Water Service Infrastructure

This is addressed in Technical Note 3 – Demand Projection.

4.3 Water Service Customers

According to the 2008 draft CSC Drought Management Plan (DMP), Molong and Delgany Estate (Mullion Creek) are served with potable water supplied by CSC. Cumnock and Yeoval have non-potable schemes. The town of Canowindra and villages of Eugowra, Manildra, Cudal and Cargo are served by Central Tablelands Water (Draft CSC DMP, 2008).

The upper one-fifth of the Molong Creek Catchment is orchards and some forests. Most of the catchment is used for grazing (Molong FPM Study, 1999).

The aged care units in Molong have been completed. There are some 40 units in this complex, however the net increase in demand on Councils water supply is not considered to be significant.

The Yeoval Hospital and retirement units rely on rainwater tanks and must truck water in during dry times. Provision of potable water in Yeoval and Cumnock is a long-term goal for Council.

CSC staff has advised that Council has a licence to extract water from the river for recreational purpose at Canowindra Showground Reserve Trust. The licence allowed Council to extract 130 ML of potable water from July 2005 to June 2006. Council has a General purpose licence for 147 ML/y. However, there has been zero allocation over the past 2 years due to the drought.

According to CSC web site, current land developments in Cabonne Shire include:

- MOLONG:
  - Molong Heights Estate (Residential) - Stage 1 16 lots, 50% completed
  - CSC has received a development application (DA) for the East Molong rural residential 'one c' zone. This DA is for the creation of 82 rural residential allotments of 4000 m^2 which would increase the water demand in Molong by 334 ML. This development might also increase the load in the sewerage system. The applicant proposing the East Molong Residential subdivision has been advised that the development would not be connected to the Molong Town water supply. Consideration would be given to access to raw water supply from Molong Dam.

- Molong Industrial Area (Industrial) - In March 2008, Council approved a Development Application for a 7 lot industrial subdivision

- CANOWINDRA:
  - Longs Corner Estate (Residential) - Stage 1 - 15 lots only 2 left for sale
  - Canowindra Industrial (Industrial) - Stage 1 - 15 lots completed only 3 lots remaining
- MANILDRA: Residential - Under design
- EUGOWRA: Industrial - Under design

Council staff has advised that this new developments will not impact on sewer infrastructure.

Data gap: Current and future developments water demand

Potential issue: Impact of land developments in CSC's water

4.4 Water Service Management

Council staff has advised that there is an active land care group in Councils water supply catchments, which is the Little River Land Care (Yeoval). This group have undertaken significant projects in the Yeoval district addressing salinity. Salinity is a major problem in this area. Yeoval's supplementary water supply consists of a number of bores located in and around Yeoval, water from these bores have a high saline count.

4.5 LWU Best- Practice Management Status

DWE has six criteria for best-practice management of water and wastewater services. CSC owns and operates the water supply and sewerage services in Cabonne. The status of each of these practices in the CSC is detailed in Table 14.

Table 14: CSC Best-Practise Management Status

Criteria	Status
Integrated Water Cycle Management	In progress (this document)
Strategic Business Plan (SBP) and Financial Plan	▪ CSC SBP for water supply schemes has been written and submitted to DWE for comment ▪ CSC SBP for sewerage schemes will be written after comment received for water supplies document
Pricing	▪ CSC Development Servicing Plan for Water Supply and Sewerage – 2008. Report for Council to approve public exhibition is next step ▪ Compliance with pricing guidelines - unknown
Water Conservation (Demand Management Plan)	Plan is written and with DWE for comment

Criteria	Status
Drought Management Plan	Draft CSC Drought Management Plan (Water Supplies) – 2008. Plan is being amended with DWE comments.
Annual Performance Reporting	▪ CSC TBL Annual Sewerage Report 2005/06 ▪ CSC TBL Annual Water Supply Report 2005/06

Data gap: Pricing compliance is unknown

Potential issue: If pricing does not comply with guidelines, this needs to be addressed

5 Sewerage Scheme

CSC owns and operates sewerage schemes at Molong, Canowindra and Eugowra. These schemes are separately described below.

5.1 Molong Sewerage Scheme

5.1.1 Introduction

The 2006 BCO Land Use Strategy report states:

"The Molong scheme was constructed in 1979 and consists of three pumping stations, some 25 km of underground mains, and a treatment plant located on the Wellington Road. Here, the sewerage is treated biologically with an extended aeration "activated sludge" process. The product is discharged from a circular treatment channel into a large effluent pond for further polishing before it flows into the Molong Creek" (BCO Land Use Strategy, 2006).

The type, age and condition of the major components of the Molong sewerage scheme are summarised in Table 15.

Table 15: Type, Age and Condition of Assets

Component	Year Commissioned	Condition (1 – 5) 1 = New 5 = Due for Replacement
Treatment plant (2000 EP Pasveer Channel IDEA plant)	1980	2
Thistle Street Pump Station	1980	2
Betts Street Pump Station	1980	2
King Street Pump Station	1995	2

Component	Year Commissioned	Condition (1 – 5) 1 = New 5 = Due for Replacement
Rising Main 1(D/S Thistle Street)	1980	3
Rising Main 2 (D/S Betts Street)	1980	3
Rising Main 3 (D/S King Street)	1995	2

Source: CSC SS data (2008)

5.1.2 Sewerage Reticulation System

Molong reticulation system consists of some 25 km of underground mains. The age and condition of Molong reticulation system's assets is provided in Table 15 above.

The 2008 CSC capital works program for Molong Sewer showed that Council allows $5 K every year for new mains, $20 K every year for reticulation main replacement and $10 K in 2017/18 and 2027/28 for rising and pressure mains replacement. The capital works program for Molong sewerage is provided in Appendix D.

A map of the sewerage reticulation system for Molong is in Appendix E.

5.1.3 Pumping Stations

Molong sewerage scheme consists of 3 pumping stations. Location, age and condition of Molong pump stations are provided in Table 15. A schematic diagram showing the location of the pump stations is shown in Figure 6.

The 2008 CSC capital works program for Molong Sewer shows that Council allows $10 K every year for replacement of pumps at Molong's pump stations.

5.2 Sewage Treatment Plant

5.2.1.1 STP Description

Current treatment process in Molong sewerage scheme is described below:

"Sewerage is delivered to the treatment plant via a rising main from the Thistle Street pump station and is discharged directly into the Pasveer channel without pre-dosing. Aeration within the channel is achieved using surface mixers and the contents are intermittently settled followed by sludge withdrawal to earthen sludge lagoons and clarified effluent directed to the oxidation pond. Discharge from the pond is directed to Molong Creek" (CSC SS data, 2008).
A schematic of the Molong water and sewerage systems is shown in Figure 6.

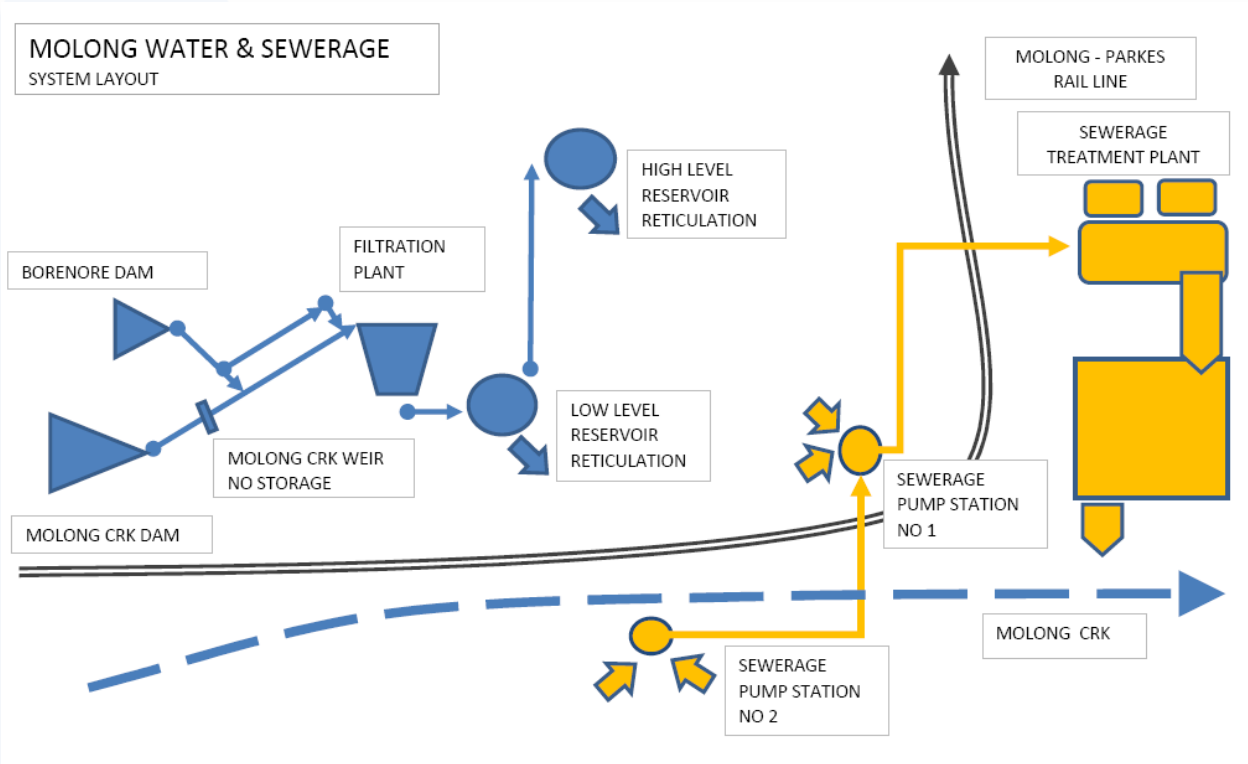

Figure 6: Molong Water and Sewerage System Layout

Treatment units' capacities are presented in Table 16.

Table 16: Molong STP Capacity

Treatment Unit	Total Capacity
Inlet Works	Unknown
IDEA Tank	2000 EP
Sludge Lagoons	Unknown
Oxidation Pond	Unknown

Source: CSC SS data (2008)

The 2008 capital works program for Molong STP allows $500 K for duplicate activated sludge channel in 2022/23.

Data gap: Existing treatment plant process unit (s) capacity (ies) and process abilities. This is needed to identify present and future issues regarding ability of the plant to meet existing and future (30 years) levels of service including DECC licences requirements

5.2.1.2 Effluent Management

According to information provided by Council staff, clarified effluent from the sludge lagoons is directed to the oxidation pond. Discharge from the pond is directly to Molong Creek. Molong Creek discharges into the Bell River and thence to the Macquarie River.

Council staff has advised that there is no reuse scheme in Molong, however there are some potential recycling markets in the area. CSC aims to meet future higher standards of effluent discharge into Molong Creek. Council is looking at re-use scheme to reuse at Molong Showground and golf course.

Potential issue: Meeting higher standards for effluent reuse – issue identified by Council staff

CSC planned capital works program for Molong sewer that addresses effluent treatment issues are as follows:

- $100 K in 2012/13 – new nutrient removal system
- $50 K in 2012/13 – new effluent disinfectant system
- $100 K in 2012/13, 2009/10 and 2012/11 – new algae control system

5.2.1.3 Performance Requirements

The 2006 CSC DECC (EPA) licence does not have 'load limits' or pollution reduction programs. The limit of effluent volume that can be discharged is 500 kL/d. There are no category 3 dischargers applied for Molong's effluent discharge. DECC discharge licence conditions are shown in Table 17.

Table 17: DECC (EPA) Standards for Effluent Treatment.

	Current Licence Conditions	
	Molong Sewage Treatment Plant	Licence Compliances in 2007/08 (%)
Parameter	100th Percentile	
pH (mg/L)	6.5 – 8.5	100
BOD (mg/L)	30	100
Suspended solids (mg/L)	30	100
Total N (mg/L)	15	100
Total P (mg/L)	10	100
Faecal Coliforms (cl/100mL)	600	60
Oil and grease (mg/L)	10	100

Source: CSC SS data (2008)

Statement of Compliance noted that all conditions of the licence were NOT complied with and that the limit condition "L3" Faecal Coliforms limit of 600 CFU/100mL was breached. The very irregular and spikes in the readings suggests an irregularity that may be unrelated to the treatment process. Bird numbers on the ponds is thought to be a possible factor and will be monitored in the future. Effluent disinfection is seen to be another short term treatment to manage the Faecal Coliform limit. It is noted that funds have been made available in the current budget for effluent disinfection (see section 5.2.1.1).

Council staff has advised that Molong STP does not have to comply with sensitive water quality requirements.

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 18.

Table 18: DECC Licence Non-Compliances

Annual Return Information	Licence Condition Number	Type of non-Compliance	No. of Incidents
01 April 2007 to 31 March 2008	L3	Exceeded Faecal Coliforms limit of 600 CFU/100ml.for 5 monthly samples being 760, 1100, 650, 1100, & 1300.	5
01 April 2006 to 31 March 2007	L3	Exceeded pH limit on 5/12/06 (8.7); Total phosphorus limit on 6/2/07 (11.0 mg/l); Total Nitrogen limit on 8/8/06 (19.27); faecal coliform limit twice on 4/4/06 & 4/7/06 (2700 & 650 cfu/100ml); and TSS limit twice on 4/4/06 & 7/11/06 (136 & 378mg/L).	7
01 April 2005 to 31 March 2006	L3	Limit exceeded on different occasions for pH, Total Nitrogen, Suspended Solids, Total Phosphorus and Faecal Coliforms	6
01 April 2004 to 31 March 2005	L3.1	Exceed faecal coliform limit	2
	L3.1	Exceed total phosphorous limit	2
	L4.1	Exceed discharge volume limit	11
01 April 2003 to 31 March 2004	L3.1	Faecal Coliforms limit exceeded on 12 May 2003.	1
	L3.1	Total Nitrogen Limit exceeded on 9 March 2004.	1
	L3.1	Total Phosphorous Limit exceeded on 11 November 2003.	1
	L3.1	Total Suspended Solids limit exceeded on 10 February 2004.	1
	L4.1	Volumetric discharge limit exceeded on 13 August 2003.	1
	M2.1	Faecal Coliform analysis omitted for April 2003.	1

Potential Issue: Molong STP licence non-compliance:

- **2007/08 – Faecal Coliforms**
- **2006/07 – pH, P, N, Faecal Coliforms and SS**
- **2005/06 – pH, N, SS, P and Faecal Coliforms**
- **2004/05 – Faecal Coliforms, P and exceed discharge volume limit**
- **2003/04 – Faecal Coliforms, N, P, SS, exceed volumetric discharge limits and Faecal Coliforms analysis omitted for April 2003.**

5.2.1.4 Hydraulic Loading

Data provided by Council staff states that the nature of sewage effluent generated in Molong is essentially residential and that the treatment plant in Molong has an annual throughput of 130 - 140 ML.

Table 19 shows the current Molong sewerage scheme hydraulic loading.

Table 19: Hydraulic Loading

Loading Type	2008
ADWF (L/s)	3.7
PWWF (kL/d)	919

Source: CSC SS data (2008)

5.3 Canowindra Sewerage Scheme

5.3.1 Introduction

The 2006 BCO Land Use Strategy report states:

"The original scheme at Canowindra was commissioned in 1968. Additions to the scheme were undertaken in recent years to allow the sewerage of South Canowindra and outlying parts of North Canowindra. The scheme consists of four pumping stations, some 17 kilometres of main, a treatment plant located west of the town, two large storage ponds and an effluent irrigation system which supplies treated recycled water to the Canowindra Oval and the Canowindra Golf Course. At the plant, sewerage is treated through with primary settlement and "trickling" filter facilitates before final polishing in oxidation and maturation ponds. The effluent is then stored in ponds before chlorination and disposal onto the playing fields. When irrigation is not required and the storages are full, the effluent is discharged to the Belubula River" (BCO Land Use Strategy, 2006).

The type, age and condition of the major components of the Canowindra sewerage scheme are summarised in Table 20.

Table 20: Type, Age and Condition of Assets

Component	Year Commissioned	Condition (1 – 5) 1 = New 5 = Due for Replacement
Treatment plant (Trickling Filter)	1969	4
Anzac Avenue Pump Station	1969	3
East Street Pump Station	1969	3
Moyne Pump Station	1971	3
Raising Main 1 (D/S Anzac Avenue)	1969	3
Rising Main 2 (D/S East Street)	1969	3
Rising Main 3 (D/S Moyne)	1971	3
Treatment Plant Upgrade	2000	1
Irrigation System (effluent re-use)	2000	2
South Canowindra Pump Station	2000	2
Rising Main 4 (D/S South Canowindra)	2000	1

Source: CSC SS data (2008)

5.3.2 Sewerage Reticulation System

Canowindra reticulation system consists of some 17 km of underground mains. The age and condition of Canowindra reticulation system's assets is provided in Table 20 above.

The 2008 CSC capital works program for Canowindra Sewer shows that Council allocates $5 K every year for new mains; $20 K every year for mains replacement, and $10 K every ten years starting from 2017/18 for rising and pressure mains replacement. The capital works program for Canowindra sewerage is provided in Appendix D.

A map of the sewerage reticulation system for Canowindra is in Appendix E.

5.3.3 Pumping Stations

Canowindra sewerage scheme consists of 4 pumping stations. Location, age and condition of Canowindra pump stations are provided in Table 20. A schematic diagram showing the location of the pump stations is shown in Figure 7.

The 2008 CSC capital works program for Canowindra Sewer showed that Council allowed $10 K every year for replacement of pumps at Canowindra's pump stations. $20 K in 2008/09 for pump stations (overhaul controls, access structures and cranes) and $10 K every five years starting from 2012/13. $50 K in 2012/13, and then every five years for effluent irrigation systems (overhaul controls, pipework, filters and sprinkles).

5.3.4 Sewage Treatment Plant

5.3.4.1 STP Description

Current treatment process in Canowindra sewerage scheme is described below:

"Sewage is delivered to the treatment plant via a rising main from the Anzac Avenue Pump Station and is discharged into a grit channel and thence to the primary settlement tanks. Sludge is taken off intermittently and directed to the sludge digester for thickening. The thickened material is pumped to the sludge lagoon or to the drying beds when conditions allow. The digested supernatant is returned to head of the works. The clarified liquid from the primary sedimentation tanks passes through the trickling filter and on to the humus tank, from which overflows gravitate to the oxidation pond and then to the maturation pond. Effluent is then discharged to the lagoon feeding the Belubula River or pumped to the effluent storage dams before being disinfected and pumped to the effluent disposal area (Golf Course & Playing Fields) where the product is further treated with sand filtration" (CSC SS data, 2008).

A schematic of the Canowindra water and sewerage systems is shown in Figure 7.

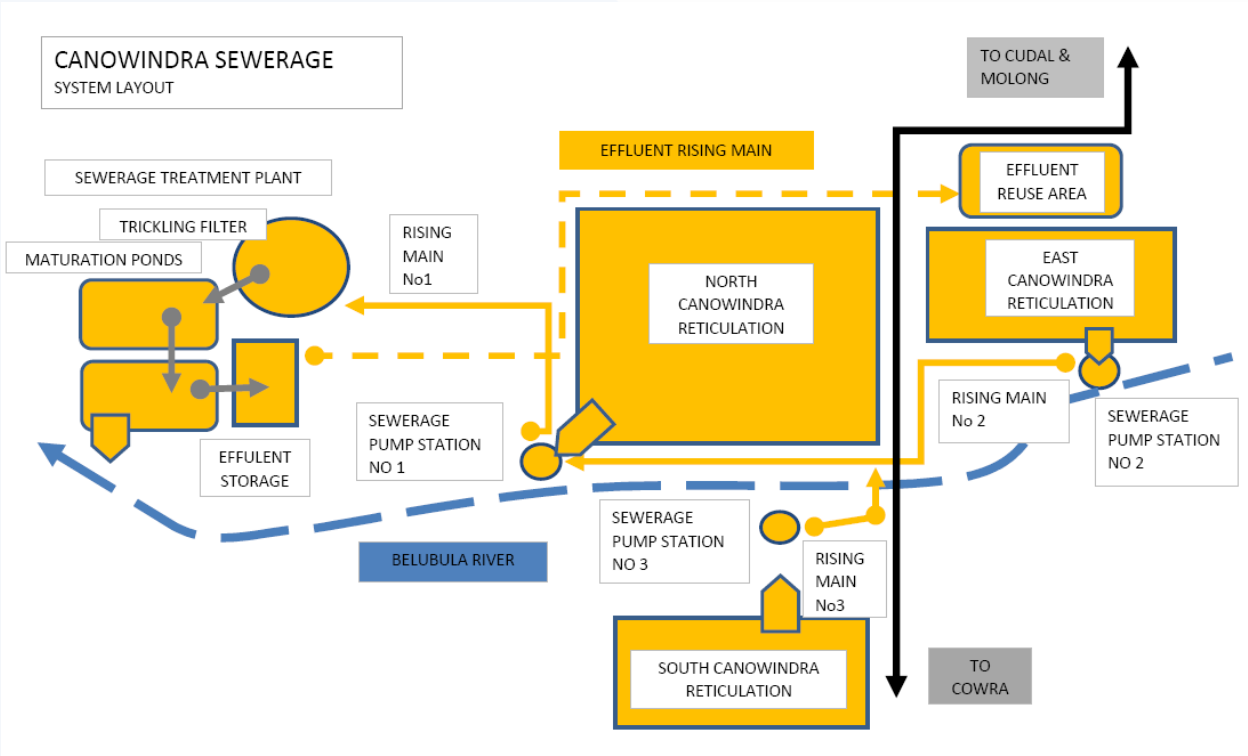

Figure 7: Canowindra Water and Sewerage Systems Layout

Treatment units' capacities are presented in Table 21.

Table 21: Canowindra STP Capacity

Treatment Unit	Total Capacity
Inlet Works	Unknown
Settlement Tanks	2500 EP
Sludge digester	Unknown
Sludge lagoon	Unknown

Treatment Unit	Total Capacity
Drying beds	Unknown
Oxidation Pond	Unknown
Maturation Pond	Unknown

Source: CSC SS data (2008)

Data gap: Existing treatment plant process unit (s) capacity (ies) and process abilities. This is needed to identify present and future issues regarding ability of the plant to meet existing and future (30 years) levels of service including DECC licences requirements

The 2008 capital works program for Canowindra STP includes $100 K for trickling filters upgrade in 2017/18.

5.3.4.2 Effluent Management

Effluent from the Canowindra STP licence includes use of recycled water at the sports ground and golf club. A licence is also held for an adjacent land owner at the STP site for watering of lawns and gardens in the area around his house. The through put volume of the STP would not allow any increase in off site use

According to information provided by Council staff, effluent from the maturation pond is discharged to the lagoon feeding the Belubula River or pumped to the effluent storage ponds before being disinfected for re-use at the golf course and Canowindra oval playing fields and/ or to the "Cadman" property for re-use. Discharge from the pond is directly to Molong Creek. Molong Creek discharges into the Bell River and thence to the Macquarie River.

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

Data gap: Volumes and quality of effluent reuse

5.3.4.3 Performance Requirements

The 2006 CSC DECC (EPA) licence does not have 'load limits' or pollution reduction programs. The limit of effluent volume that can be discharged from Canowindra scheme is as below:

- Point 2 – downstream of humus tank 750 kL/d
- Point 4 – discharge to "Cadman" property 20 kL/d

There are no category 3 dischargers applied for Canowindra's effluent discharge. Discharge licence conditions for each point are shown in Table 22.

Table 22: DECC (EPA) Standards for Effluent Treatment

	Current Licence Conditions	
	Canowindra Sewage Treatment Works	Licence Compliances in 2005/06 (%)
Parameter	100th Percentile	
	POINT 1	
pH (mg/L)	6.5 – 8.5	-
BOD (mg/L)	30	80
Suspended solids (mg/L)	30	0 (100 % in 2004/05)
Total N (mg/L)	15	100
Total P (mg/L)	10	100
Faecal Coliforms (cl/100mL)		-
Oil and grease (mg/L)	10	100
	POINT 3	
Total N (mg/L)	15	-
Total P (mg/L)	10	-
BOD (mg/L)	30	-
	POINT 5	
Total N (mg/L)	15	-
Total P (mg/L)	10	-
BOD (mg/L)	30	-

Source: CSC SS data (2008)

The 2005/6 annual report for the Canowindra STP reported breaches of the licence in Suspended Solids. Council staff has advised that sampling is only undertaken when discharge to the river system occurs. This has not happened in recent years consequently there are no recent results to compare the 2005/6 results.

Council has begun investigation into addressing effluent quality discharged to the river system. The problem may be resolved by eliminating discharge to the river from the maturation ponds and restricting effluent discharge to the river from the storage dams. Trial samples from the storage dams will be analysed to determine the effluent quality at this point.

CSC planned capital works program for Canowindra sewer that addresses effluent treatment issues are as follows:

- $100 K in 2017/18 – new nutrient removal system
- $50 K in 2017/18 – new effluent disinfectant system
- $100 K in 2017/18, 2009/10 and 2012/11 – new algae control system

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 25.

Table 23: DECC Licence Non-Compliances

Annual Return Information	Licence Condition Number	Type of Non-Compliance	No. of Incidents
01 May 2007 to 30April 2008	M2.1	Insufficient samples and analysis for Monitoring Points 3, 5, 6 and 7.	1
01 May 2006 to 30April 2007	Complied		
01 May 2005 to 30 April 2006	L3.1	BOD limit exceeded on 1 occasions	1
	L3.1	Total Suspended Solids & pH limit both exceeded on 2 occasions	4
	L4.1	Volumetric discharge limit exceeded on 2 occasion	2
01 May 2004 to 30 April 2005	L3.1	pH limit exceeded on one occasion.	1
	L3.1	Total nitrogen limit exceeded.	1
	L3.1	Total suspended solids limit exceeded	1
01 May 2003 to 30 April 2004	L3.1	Exceeded pH limit exceeded on 4 occasions (20 May /15 July /9 Sept /11 Nov 2003), and exceed TSS limit on 2 occasions (9 Sept/ 11 Nov 2003).	1
	L4.1	Exceeded volumetric discharge limit by 2kl on 1 day.	1

Data gap: Does CSC have sensitive water quality requirements for Canowindra?

Potential Issue: Canowindra STP non-compliance:

- **2007/08 – Insufficient samples for Monitoring Points 3, 5, 6 and 7**
- **2005/06 – BODSS, pH and exceed volumetric discharge limit**
- **2004/05 – pH, N and SS**
- **2003/04 – pH, SS and exceed volumetric discharge limit**

5.3.4.4 Hydraulic Loading

Data provided by Council staff states that the nature of sewage effluent generated in Canowindra is essentially residential and that the treatment plant in Canowindra has an annual throughput of 140 - 150 ML.

Table 24shows the current Molong sewerage scheme hydraulic loading.

Table 24: Hydraulic Loading

Loading Type	2008
ADWF (L/s)	5
PWWF (ML/d)	1.5

Source: CSC SS data (2008)

5.4 Eugowra Sewerage Scheme

5.4.1 Introduction

The 2006 BCO Land Use Strategy report states:

"The Eugowra scheme was completed in 1999 and consists of three pumping stations, gravity and rising mains and a treatment plant on the Gooloogong Road. It was constructed to "modified" gravity standards to enable the small community to afford a scheme and consists of smaller diameter pipe and flatter grades than those found in the larger towns. Treatment of the effluent depends upon oxidation in ponds and excess treated effluent is to be directed to an irrigated paddock adjacent to the site" (BCO Land Use Strategy, 2006).

The type, age and condition of the major components of the Eugowra sewerage scheme are summarised in Table 22.

Table 25: Type, Age and Condition of Assets

Component	Year Commissioned	Condition (1 – 5) 1 = New 5 = Due for Replacement
Treatment plant (oxidation Ponds)	2000	2
Parkes Street Pump Station	2000	2
Mandagery Creek Pump Station	2000	2
Namima Street Pump Station	2000	2
Rising Main 1 (D/S Parkes St)	2000	2

Component	Year Commissioned	Condition (1 – 5) 1 = New 5 = Due for Replacement
Rising Main 2 (D/S Mandagery Ck.)	2000	2
Rising Main 3 (D/S Mandagery Ck.)	2000	2

Source: CSC SS data (2008)

5.4.2 Sewerage Reticulation System

The age and condition of Eugowra reticulation system's assets is provided in Table 25 above.

The 2008 CSC capital works program for Eugowra Sewer shows that Council allows $2 K every year for new mains. $10 K every ten years starting from 2017/18 for mains replacement, and $5 K every ten years for rising and pressure mains replacement. The capital works program for Eugowra sewerage is provided in Appendix D.

A map of the sewerage reticulation system for Eugowra is in Appendix E.

5.4.3 Pumping Stations

Eugowra sewerage scheme consists of 3 pumping stations. Location, age and condition of Eugowra pump stations are provided in Table 25.

The 2008 CSC capital works program for Eugowra Sewer shows that Council allows $10 K every five years starting from 2012/13 for replacement of pumps. Council also allows $15 K in 2008/09 and 2022/23 for effluent irrigation pumps.

Data gap: Description on the sewage scheme pumping stations

5.4.4 Sewage Treatment Plant

5.4.4.1 STP Description

Current treatment process in Eugowra sewerage scheme is described below:

"Sewerage is delivered to the treatment plant via a rising main from the Namima Street Pump Station and is discharged directly into Oxidation Pond No. 1, followed by Oxidation pond No.2, the maturation pond and finally to the effluent storage pond. When available, the effluent is pumped on to an agricultural re-use area adjacent to the Treatment plant. Provision is made for collection of any run off from the re use area and piping to a tributary of the Mandagery Creek" (CSC SS data, 2008).

Treatment units' capacities are presented in Table 26.

Table 26: Molong STP Capacity

Treatment Unit	Total Capacity
Inlet Works	Unknown
Oxidation Ponds	550 EP
Maturation pond	Unknown

Source: CSC SS data (2008)

The 2008 CSC capital works program for Eugowra Sewer allocated $50 K for evaporation ponds and $50 K for algae control system in 2032/33.

Data gap: Existing treatment unit (s) capacity (ies) and processes abilities. This is needed to identify present and future issues regarding ability of the plant to meet existing and future (30 years) levels of service including DECC licences requirements

5.4.4.2 Effluent Management

According to information provided by Council staff, all effluent is directed to the effluent storage pond. A large proportion of the effluent is lost to evaporation. When available, the effluent is pumped on to an agricultural re-use area adjacent to the treatment plant. Provision is made for collection of any run off from the re use area and piping to a tributary of the Mandagery Creek. At no time since commissioning has effluent escaped overland to the Mandagery Creek.

The 2008 CSC capital works program for Eugowra Sewer allocated $15 K in 2008/09 and 2022/23for effluent irrigation pump replacement.

Data gaps:

- **Schematic of STP operation and effluent management**
- **Details of the effluent reuse scheme**
- **Potential recycling markets and annual volumes (e.g. new development areas, parks, gardens)**

5.4.4.3 Performance Requirements

The Eugowra STP does not discharge any effluent from the site; therefore there is no DECC (EPA) licence requirement for Eugowra sewerage scheme. There are no category 3 dischargers applied for Eugowra's effluent discharge.

5.4.4.4 Hydraulic Loading

Data provided by Council staff states that the nature of sewage effluent generated in Eugowra is essentially residential and that the treatment plant in Eugowra has an annual throughput of 30 - 35 ML.

Table 27 shows the current Eugowra sewerage scheme hydraulic loading.

Table 27: Hydraulic Loading

Loading Type	2008
ADWF (L/s)	1
PWWF (L/s)	1.6

Source: CSC SS data (2008)

5.5 Sewerage Performance Report

The CSC 2005/06 DWE TBL sewerage performance report figures are shown in Table 28.

Table 28: 2005/06 DWE TBL Performance Report

TBL Performance Indicators	CSC Result	Ranking (500 to 3,000 properties)
Volume of sewage collected (ML)	310	-
Urban properties without reticulated sewerage service (%)	24.2	5
Service complaints per 1000 properties	11	3
Volume of sewage treated per property (kL)	133	5
Percentage effluent reclaimed for recycling	23	4
Compliance with BOD in licence (%)	97	4
Compliance with SS in licence (%)	79	5
Sewer main chokes and collapses per 100km of main	36	4
Sewer overflows to the environment per 100 km of main	-	-
Categories 1, 2 and 3 environmental incidents per 1000 properties	0	-

Note 2: Ranking of 1 indicates that CSC is in the top 20% of LWUs; ranking of 5 indicates it is the bottom 20%

Council staff has advised that recent (2007/8) sample results would suggest that SS is not a continuing issue at the Molong STP, however Council will be approaching DWE Regional Office to discuss long term sewerage treatment operations.

Table 28 shows that the percentage of urban properties without reticulated sewerage service ranked in the lowest 20% in 2005/06 reporting period. This issue is being addressed with the Cabonne Councils Four Towns Sewerage Scheme project. It includes the servicing of Cudal, Manildra, Yeoval and Cumnock to reticulated sewerage. On completion, the scheme will improve Cabonne's industry standing and provide water for those unserviced villages. The four town's sewer reticulation project will connect some 720 residences and is scheduled to be completed June 2010. It is noted that Cargo, a village of some 120 residents is elected NOT to be part of the reticulation program.

According to sections 5.2.1.2 and 5.3.4.2 there are capital works allocated for Molong and Canowindra sewerage schemes to address effluent treatment requirements regarding compliance with SS and BOD.

Data gap: Current DWE TBL performance report

5.6 Assets Summary

Sections 5.1.1, 5.3.1 and 5.4.1 above provide CSC sewerage assets' age and conditions for the three sewerage schemes in the Council area. Each section also contains information regarding proposed capital expenditure to address any existing issue due to asset condition.

5.7 Areas Serviced

Council owns and operates sewerage schemes at Molong, Canowindra and Eugowra. From the 2005/2006 Annual Sewerage Report, the total population served by all Cabonne's schemes was 3663.

According to the 2006 BCO Land Use Strategy report, Council is currently moving towards the sewering of its villages of Cudal, Manildra, Cumnock and Yeoval as a joint venture between those communities and the State Government. The 2007/08 CSC MP states the implementation of sewerage schemes in those towns are part of the ecological sustainable activities been undertaken by Council, as well as the establishment of "on site sewerage system" register and to undertake appropriate inspections. As mentioned on section 5.5, this project is schedule to be completed in June 2010.

Data gap: Current and future services provided (ET per town/village)

5.8 Growth Projections

The 2008 BCO Land Use Strategy report states that between 2001 and 2006, population growth was experienced in Cabonne, with average annual growth rate of 0.9%. In terms of average annual growth, the greatest population growth is predicted to occur in Cabonne Part B (1.7% per annum) and Cabonne Part A (1.1% per annum). In contrast, population decline is predicted for Cabonne Part C (-0.1% per annum).

Growth factors of less than 1% have been used for the servicing and financial models.

Section 4.1 contains further information about population growth in Cabonne LGA.

5.9 Hydraulic Loading

Hydraulic loading for each sewerage scheme is provided in sections 5.2.1.4, 5.3.4.4 and 5.4.4.4 above. Hydraulic loading assessment including the provision of sewerage services to the villages of Cudal, Manildra, Cumnock and Yeoval, need to be performed.

Data gaps:

- **Hydraulic loading assessment including current growth projections**
- **Analysis of the ability of the current sewerage infrastructure to meet future needs including collection and disposal of future loads**

5.10 Likelihood of Sewerage Overflows

Council staff has advised that during 2007/08 there were some sewerage chokes events due to reticulation main blockages. The impact of the overflows was on local vicinity; i.e. branch line with impact on first customer only (tree roots usually). The number of sewerage chokes registered in each village is as follows:

- ❒ Molong 6 overflows (chokes)
- ❒ Canowindra 8 overflows (chokes)
- ❒ Eugowra 0 overflows (chokes)

5.11 Current Developments

Information on CSC current land development is provided in section 4.3.

Data gaps:
- **Information on current development and their impacts on the existing sewerage system**
- **Current and future potential reuse markets**

5.12 Cabonne Sewerage Scheme Main Issues

Data gap: Are there any further sewerage scheme issues not identified in this technical note?

6 Stormwater System

6.1 Description of the System

CSC owns and operates stormwater systems in the towns and villages of Molong, Cumnock, Yeoval, Canowindra, Cargo, Eugowra and Manildra. Maps of these systems are provided in Appendix F.

Stormwater drainage systems in urban areas throughout the shire comprise a series of small network of pipes directed to open channels or kerb and gutter systems directed into open water ways. Predominantly urban stormwater is managed by kerb and gutter systems to open waterways in villages and residential areas.

New subdivisions are required to have inter-alotment drainage piped to waterways.

In 2007 CSC prepared a 5 year plan of works for urban stormwater. Amongst the works specified in this plan there are clear and shape waterways and pipe stormwater in different locations. The program for storm water drainage improvements is funded by the Urban Stormwater Works Service Levy. Details of the program are provided in Table 29.

Table 29: CSC Urban Stormwater Works Service Levy – 2007/08 to 2011/12

Flood location	CSC action planned	Reference
Canowindra	$40 K in 2009/10 – improve existing stormwater channel and outlet at Blatchford and Gaskill Streets	R1
Cargo	$33,4 K in 2009/10 - clear and shape waterway at Park Watercourse	R1
Cudal	$33,4 K in 2010/11 - clear and shape waterway at Boree Creek	R1
Cumnock	$40 K in 2011/12 - clear and shape waterway at Doughboy Creek	R1
Eugowra	$73,4 K in 2008/09 - pipe stormwater - stage one at Evelyn St Parkes to Aurora	R1

Flood location	CSC action planned	Reference
Manildra	$40 K in 2010/11 - pipe stormwater at Whitton St Subdivision	R1
Molong	$73,4 K in 2007/08 - pipe stormwater - stage one and two at Ice works La Gidley St outlet channel	R1
	$25 K in 2009/10 - Borenore Creek Dam Auxiliary Spillway	R2
	$15 K in 2012/13 and $15 k in 2013/14 - Borenore Creek Dam Detailed studies	R2
	$100 K in 2021/22 and $100 K in 2022/23 – Molong Creek Dam Safety Improvements	R2
	$10 K in 2010/11 - Molong Creek Dam Review Flood Study PMF	R2
Yeoval	$ 33,4 K in 2011/12 - clear and shape waterway at Sandy Creek	R1

Reference:

R1 – **Source: CSC Plan of Works – 5 yrs (2007)**
R2 – **Source: CSC Water Capex (2008) in Appendix D**

Data gap: Are the actions appropriate to address the flooding issues identified in section 2.7.1?

6.2 Stormwater Flows

Data gap: Stormwater flows in these systems are unknown

6.3 Stormwater Management Responsibilities

Data gaps:
- **Stormwater management responsibilities are unknown**
- **CSC organisation structure**

6.4 Source of Pollution within Stormwater Catchment

6.4.1 Point Sources of Pollution

6.4.2 Diffused Sources

Data gaps:
- **Source of pollution within stormwater systems**
- **Relationship between urban stormwater work plan and current source of pollution**

6.5 Estimate Pollution Loading from Sources

6.5.1 Pollution Load

Data gap: Stormwater pollution loads

6.5.2 Point Source Estimate

Data gap: Point sources of pollution

6.5.3 Diffuse Source Estimate

Data gap: Diffuse sources of pollution

6.6 Infrastructure Capacity

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

See section 4.3 for information on new development in Cabonne Shire that potentially will affect sewerage loading.

Data gap: Stormwater infrastructure capacity

6.7 Summary of Findings of the Stormwater Management Plan

Data gap: CSC Stormwater Management Plan

6.8 Flood Study

Floodplain Management Studies were prepared to Molong and Eugowra in 1999. Section 3.3 contains summaries of those studies. According to the 2007/08 CSC MP Council is promoting the ecological sustainability of Cabonne. Activities being undertaken by Council are:

- Finalise Local Environmental Plan / Development Control Plan's for Molong and Eugowra floodplains
- Prepare Canowindra Floodplain Management Plan

Data gap: Status of these activities

6.9 Potential Areas for WSUD

Data gap: Potential areas that could be utilised for water sensitive urban design schemes such as stormwater harvesting

7 References

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Appendix A

Cabonne Shire Maps

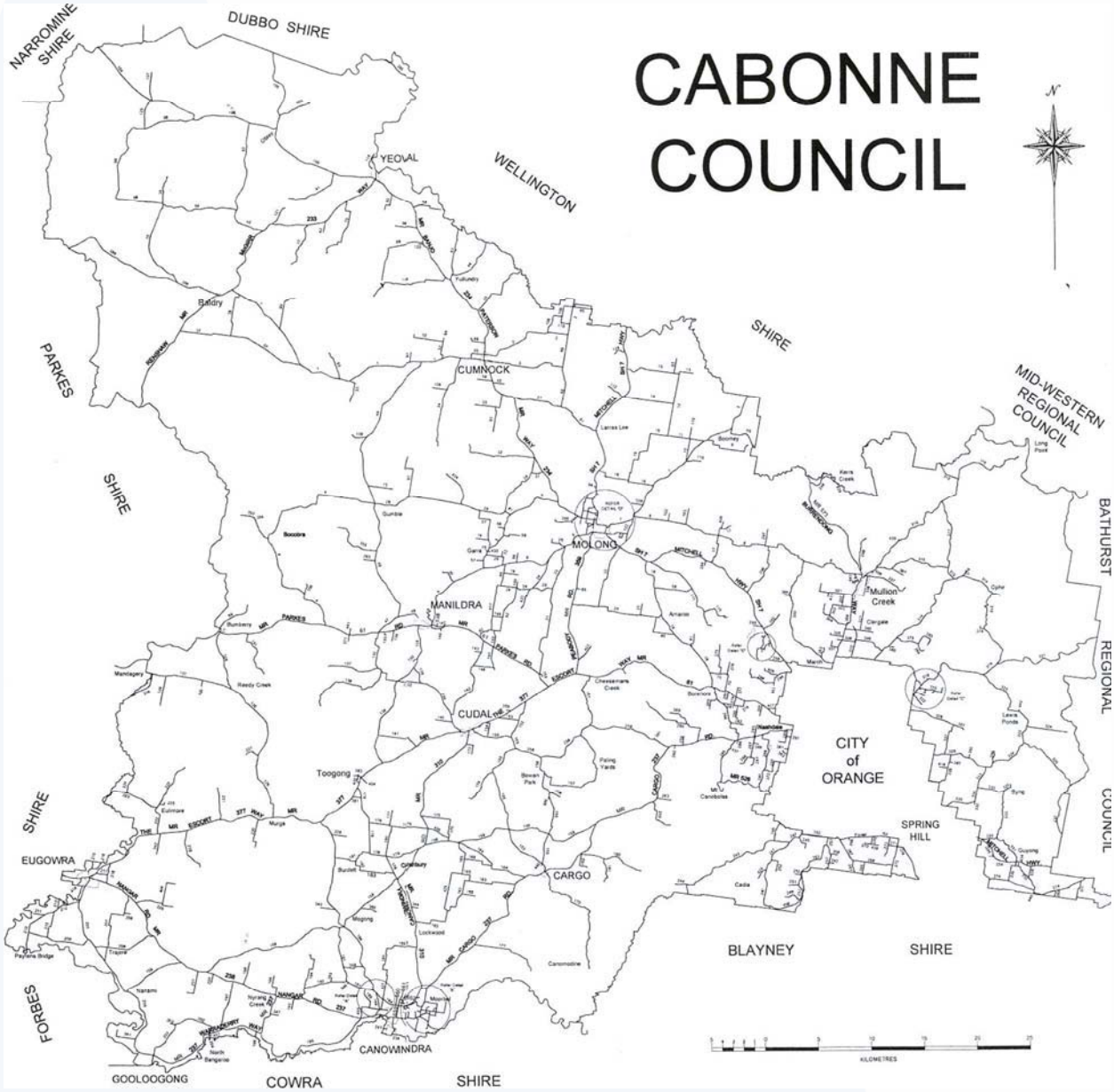


Figure 8: CSC's towns/villages location and Shire boundaries

Appendix B

Cabonne Vegetation Map

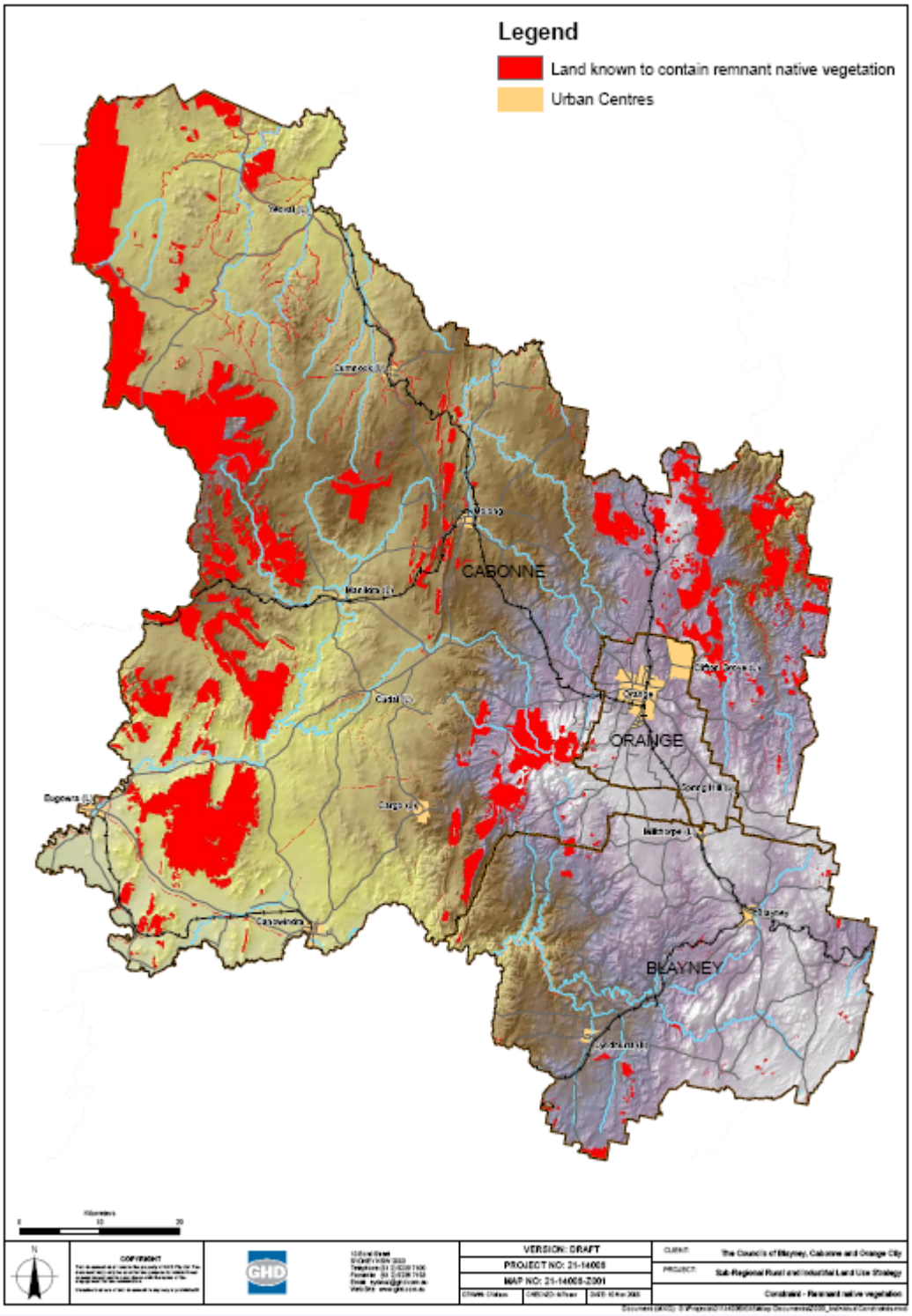


Figure 9: Cabonne Blayney and Orange native vegetation map

Appendix C

Cabonne LEP Maps

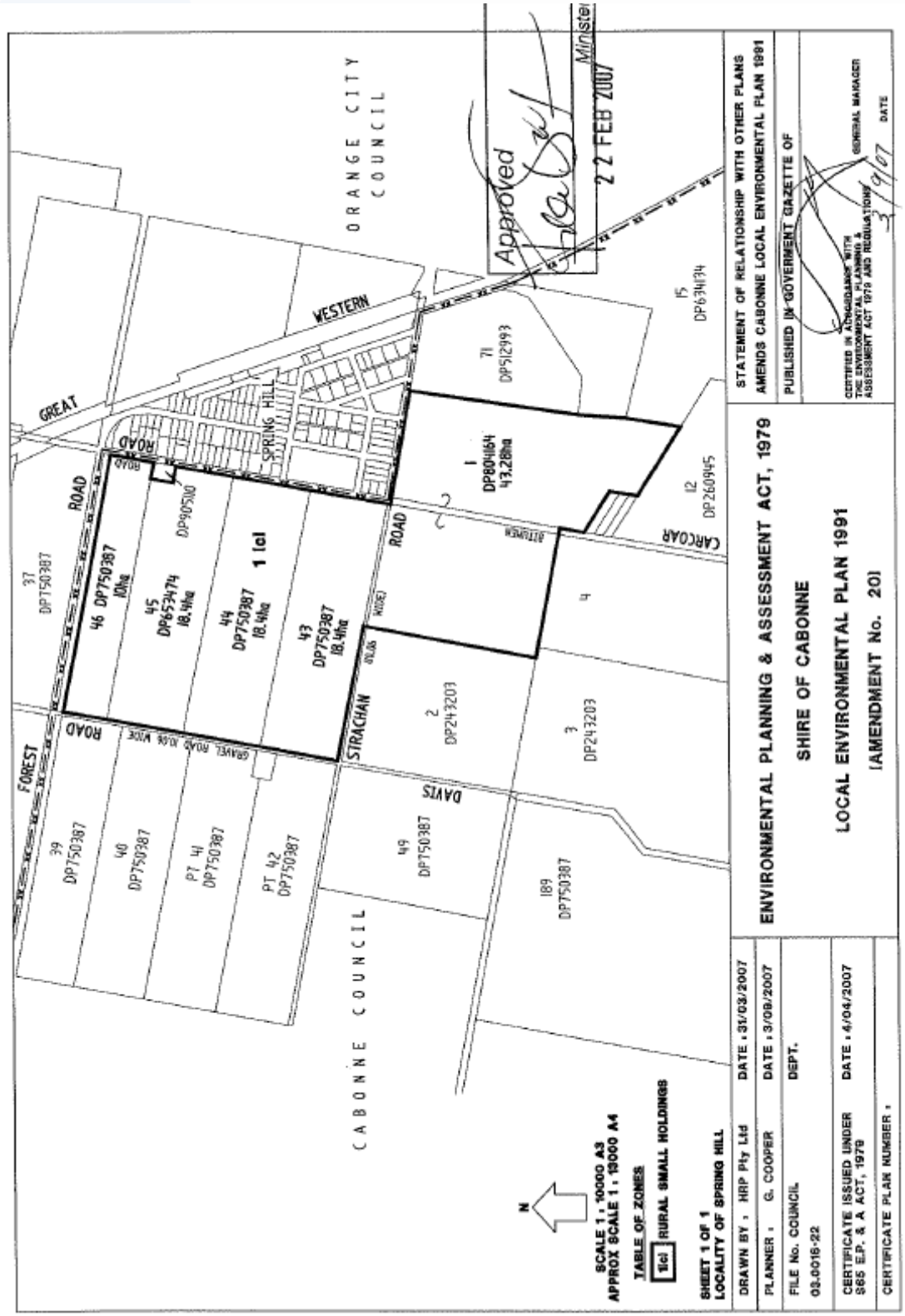


Figure 10: Cabonne LEP 1991, Amendment No 20

Appendix D

Cabonne Water and Sewerage Capital Works Program

Detailed Capital Works Schedule

Capital Works Program for Combined Water Funds ($000)		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29
Description		2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37
New	New Mains - All Areas	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	9	9
New	Mains Replacement (Reticulation) - All Areas	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Replacement	Mains Replacement (Trunk) - Molong	300	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement	Telemetry System Upgrade - All Areas	30	20	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
New	New Reservoir Gidley Street - Molong	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement	Upgrade Pumping System including Pump Replacement - All Areas	0	8	0	0	10	20	8	0	0	30	0	8	20	0	10	0	8	0	0	10	20	8	0	0	30	0	8	0	20
New	Filtration Plant Upgrade including Backwash Facility - Molong	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1000	0	0	0	0	0	0	0	0	0
New	Activated Carbon Plant - Molong	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	Borenore Creek Dam Auxiliary Spillway - Molong	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	Borenore Creek Dam Detailed Studies - Molong	0	0	0	0	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	Borenore Creek Dam Instal Anchors & Upgrade Spillway - Molong	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	Molong Creek Dam Safety Improvements - Molong	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0
New	Molong Creek Dam Review Flood Study PMF - Molong	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	Molong Creek Dam Install Anchors - Molong	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement	Replace Bore Pumps - Yeoval	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20	0	0	0	0	20
Replacement	Bore Rehabilitation - Yeoval	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	10	0	0
New	Rising Main & New Storage Reservoir - Yeoval	0	0	0	0	0	0	0	0	0	520	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	Upgrade Disinfection System - All Areas	0	0	0	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	Upgrade to Potable Supply - Cumnock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	900	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement	High Level Dam Liner - Cumnock	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New	High Level Dam Cover - Cumnock	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement	Replace Concrete Reservoir - Cumnock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Replacement Capital Works Program		330	68	5	25	15	25	23	5	25	35	5	13	25	25	235	5	23	5	25	15	25	13	5	25	35	5	23	5	45
Total New Capital Works Program		899	74	104	79	94	64	49	49	49	569	49	49	49	149	949	49	49	49	49	1049	49	49	49	49	149	49	49	49	49
Grand Total Capital Works		1229	142	109	104	109	89	72	54	74	604	54	62	74	174	1184	54	72	54	74	1064	74	62	54	74	184	54	72	54	94

Draft Cabonne 30 Year Combined Sewerage Capital Works Schedule

Capital Works Program for Molong, Canowindra & Eugowra Sewerage Funds ($000)		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29
Description		2009/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37
	MOLONG																													
New	Mains - Reticulation	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Replacement	Mains - Reticulation	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Replacement	Mains - Rising/Pressure										10										10									
New	Telemetry System	40																			50									
Replacement	Telemetry System	5				5					5					5					5					5				
Replacement	Pumps - Renew	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	10
New	Nutrient Removal System					100																								
New	Effluent Disinfectant System					50																								
New	Algea Control System					100																								
New	Duplicate Activated Sludge Channel															500														
	CANOWINDRA																													
New	Mains - Reticulation	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Replacement	Mains - Reticulation	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Replacement	Mains - Rising/Pressure										10										10									
New	Telemetry System					20										25										25				
Replacement	Telemetry System	5				5					5					5					5					5				
Replacement	Pumps - Renew	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	10
Replacement	Pump Stations - Overhaul controls, access structures & cranes	20				10					10					10					10					10				
Replacement	Effluent Irrigation System - Overhaul controls, pipework, filters & sprinklers					50					10					10					10					10				
New	Trickling Filter Upgrade										100																			
New	Nutrient Removal System										100																			
New	Effluent Disinfectant System										50																			
New	Algea Control System										100																			
New	Activated Sludge System																													
	EUGOWRA																													
New	Mains - Reticulation	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Replacement	Mains - Reticulation										10										10									
Replacement	Mains - Rising/Pressure										5										5									
New	Telemetry System					10										10										10				
Replacement	Telemetry System	5									5										5									
Replacement	Pumps - Renew					10					10					10					10					10				
Replacement	Effluent Irrigation Pump	15														15														
New	Evapouration Ponds																									50				
New	Algea Control System																									50				
Total Replacement Capital Works Program		110	60	60	60	140	60	60	60	60	130	60	60	60	60	115	60	60	60	60	130	60	60	60	60	100	60	60	60	60
Total New Capital Works Program		52	12	12	12	292	12	12	12	12	362	12	12	12	12	547	12	12	12	12	62	12	12	12	12	147	12	12	12	12
Grand Total Capital Works		162	72	72	72	432	72	72	72	72	502	72	72	72	72	662	72	72	72	72	202	72	72	72	72	247	72	72	72	72

Appendix E

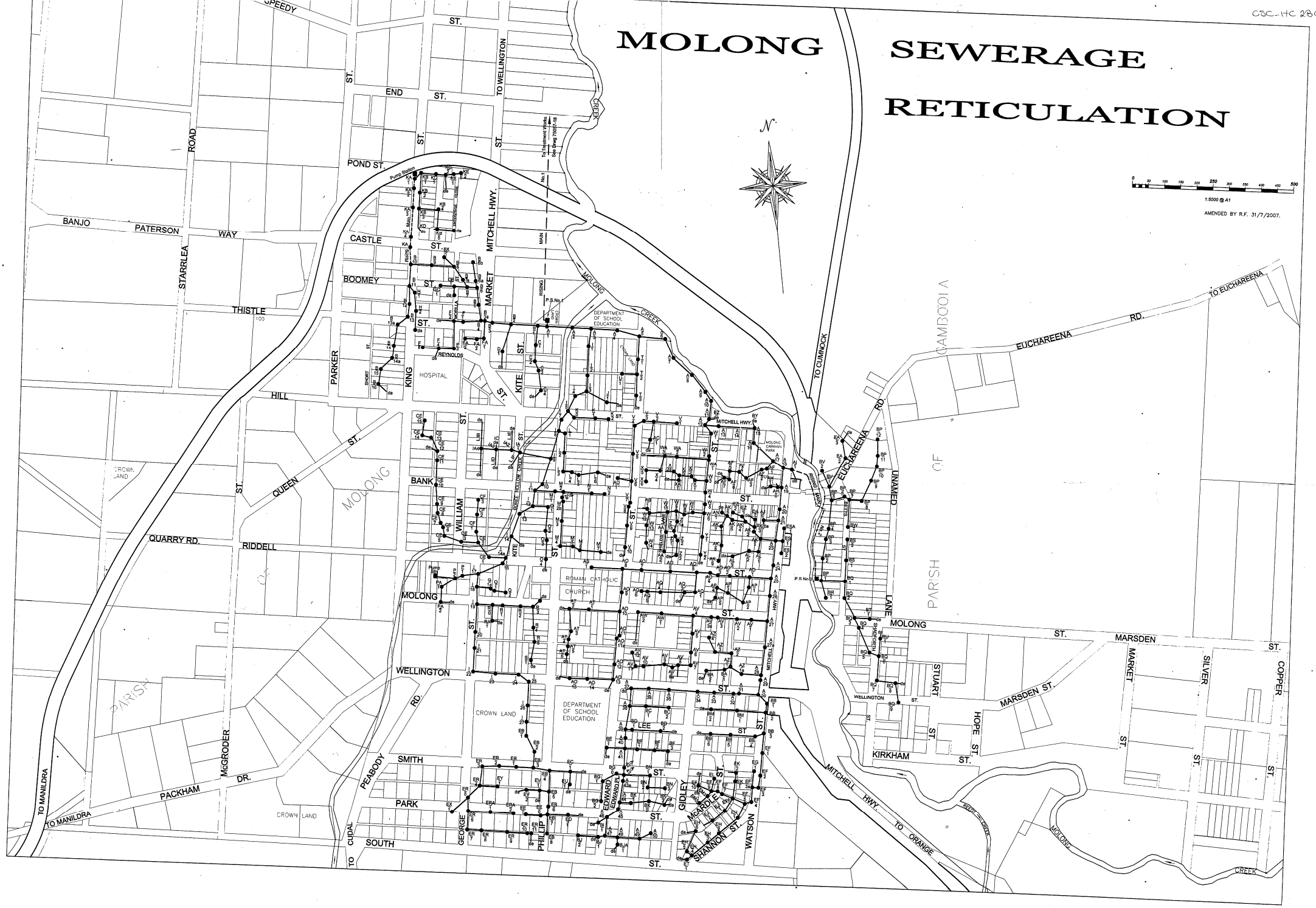
Cabonne Sewerage Systems

CSC-HC 28C

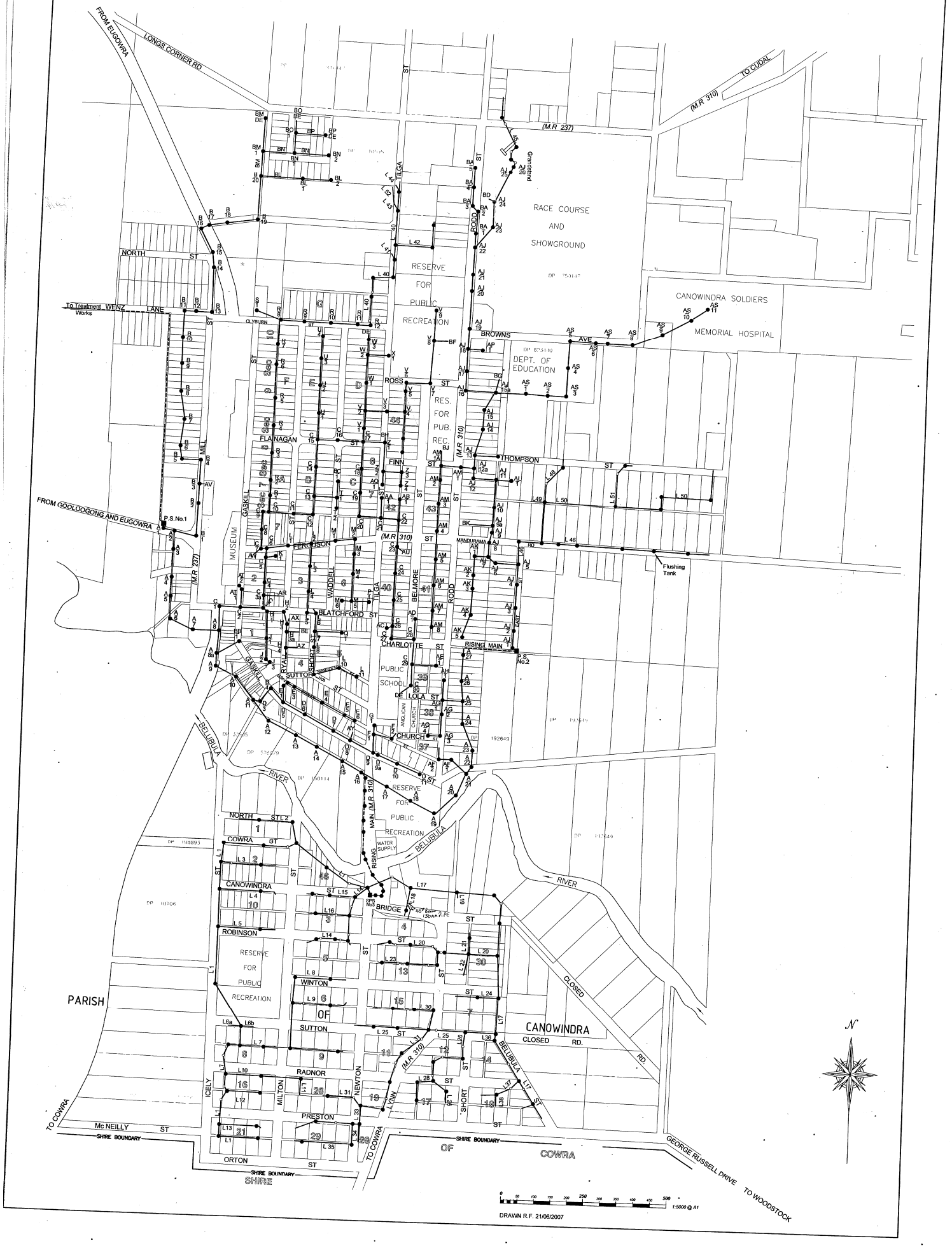
MOLONG SEWERAGE RETICULATION

1:5000 @ A1

AMENDED BY R.F. 31/7/2007.



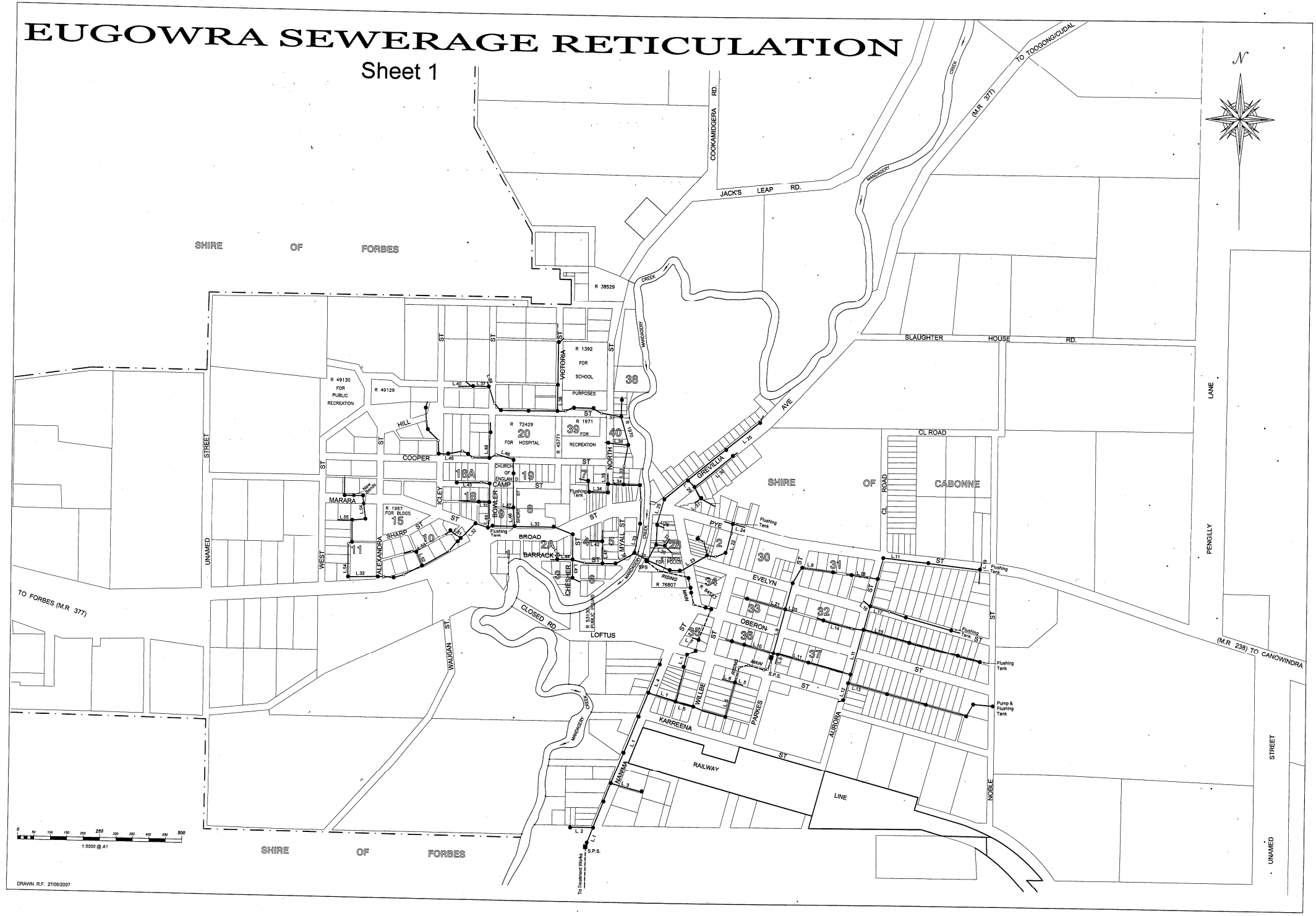
CANOWINDRA SEWERAGE RETICULATION



CSC_HC 28A

EUGOWRA SEWERAGE RETICULATION

Sheet 1



Appendix F

Cabonne Stormwater System

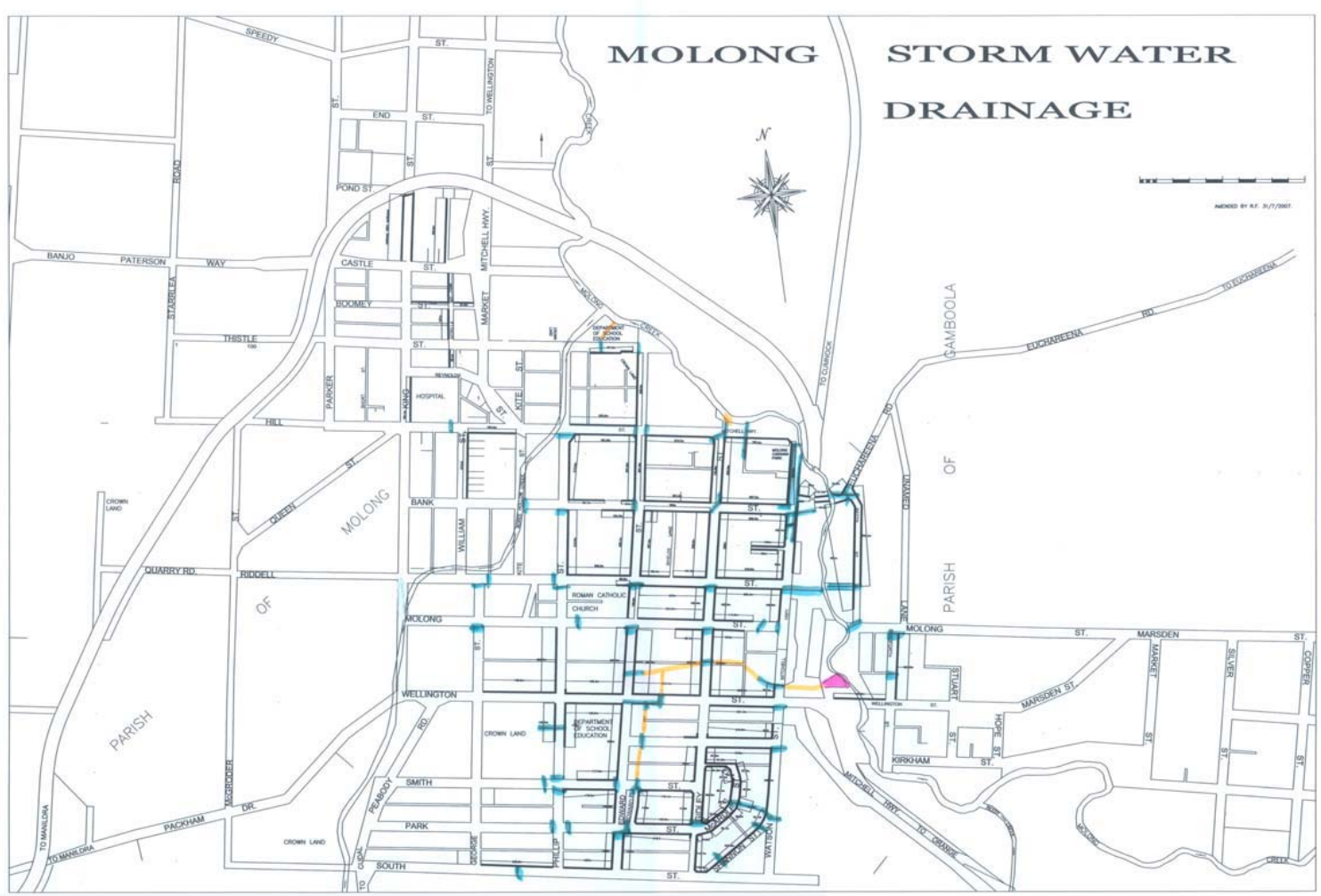


Figure 11: Molong Stormwater System

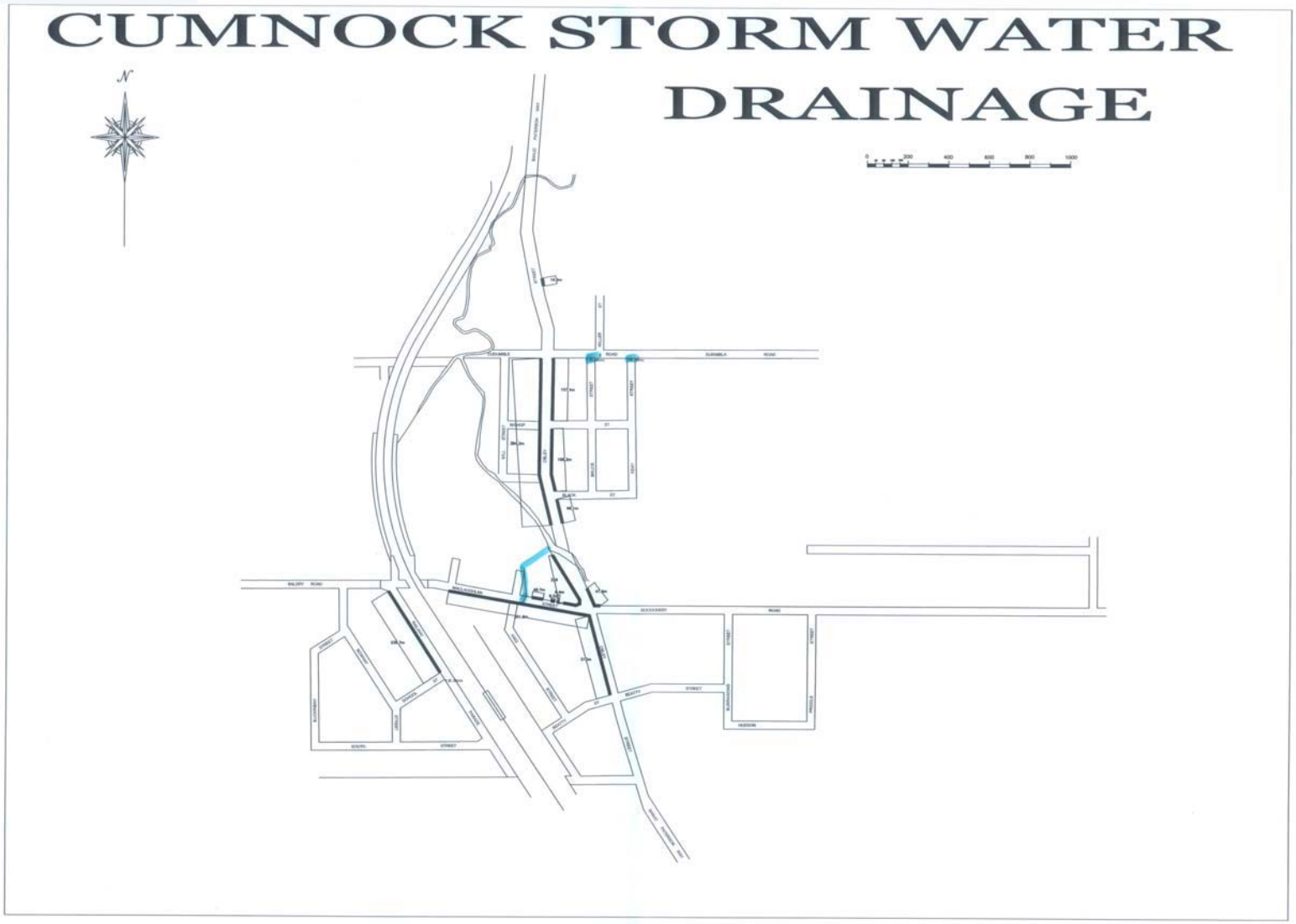


Figure 12: Cumnock Stormwater System

Figure 13: Yeoval Stormwater System

Figure 14: Canowindra Stormwater System

Figure 15: Cargo Stormwater System

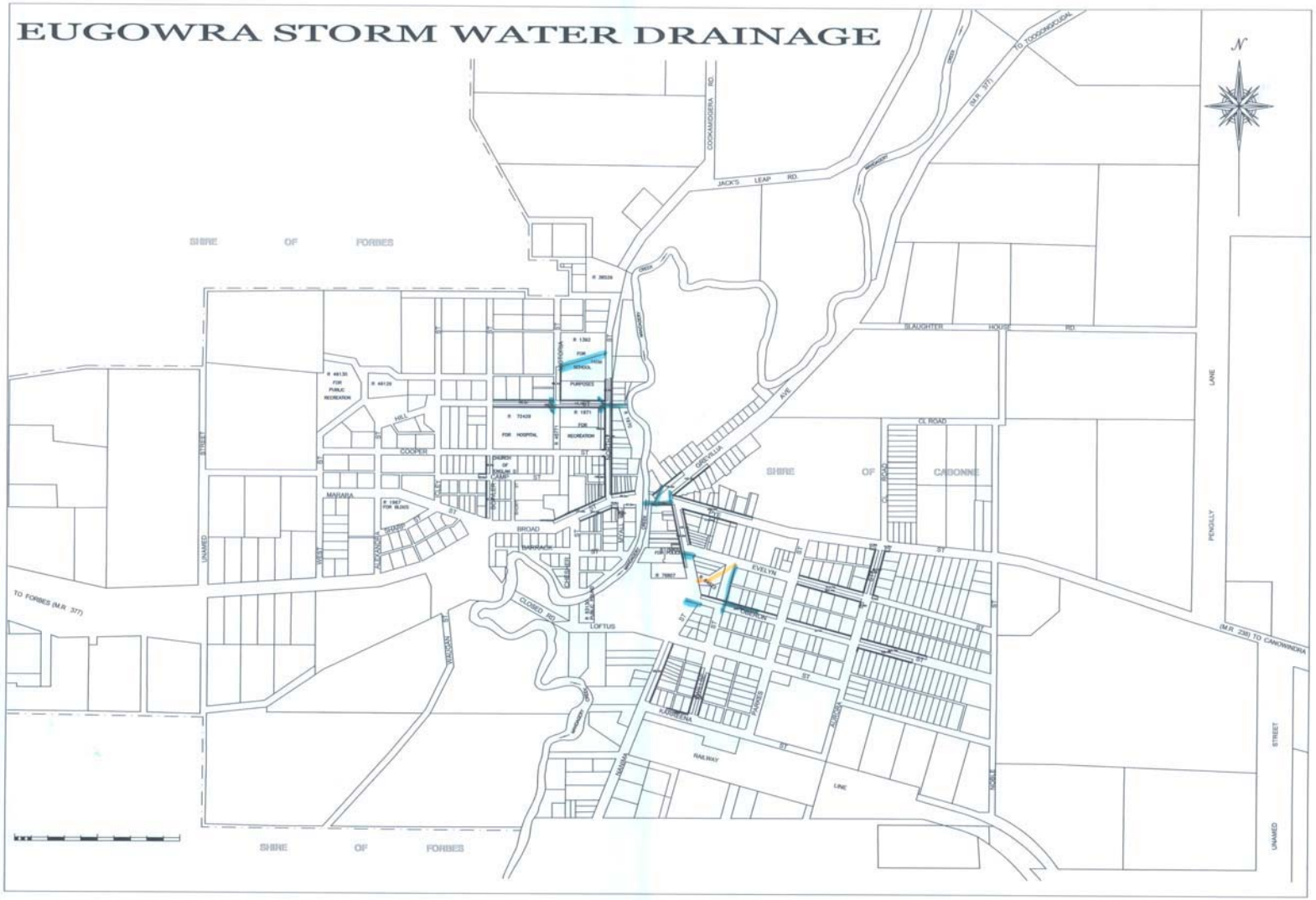


Figure 16: Eugowra Stormwater System

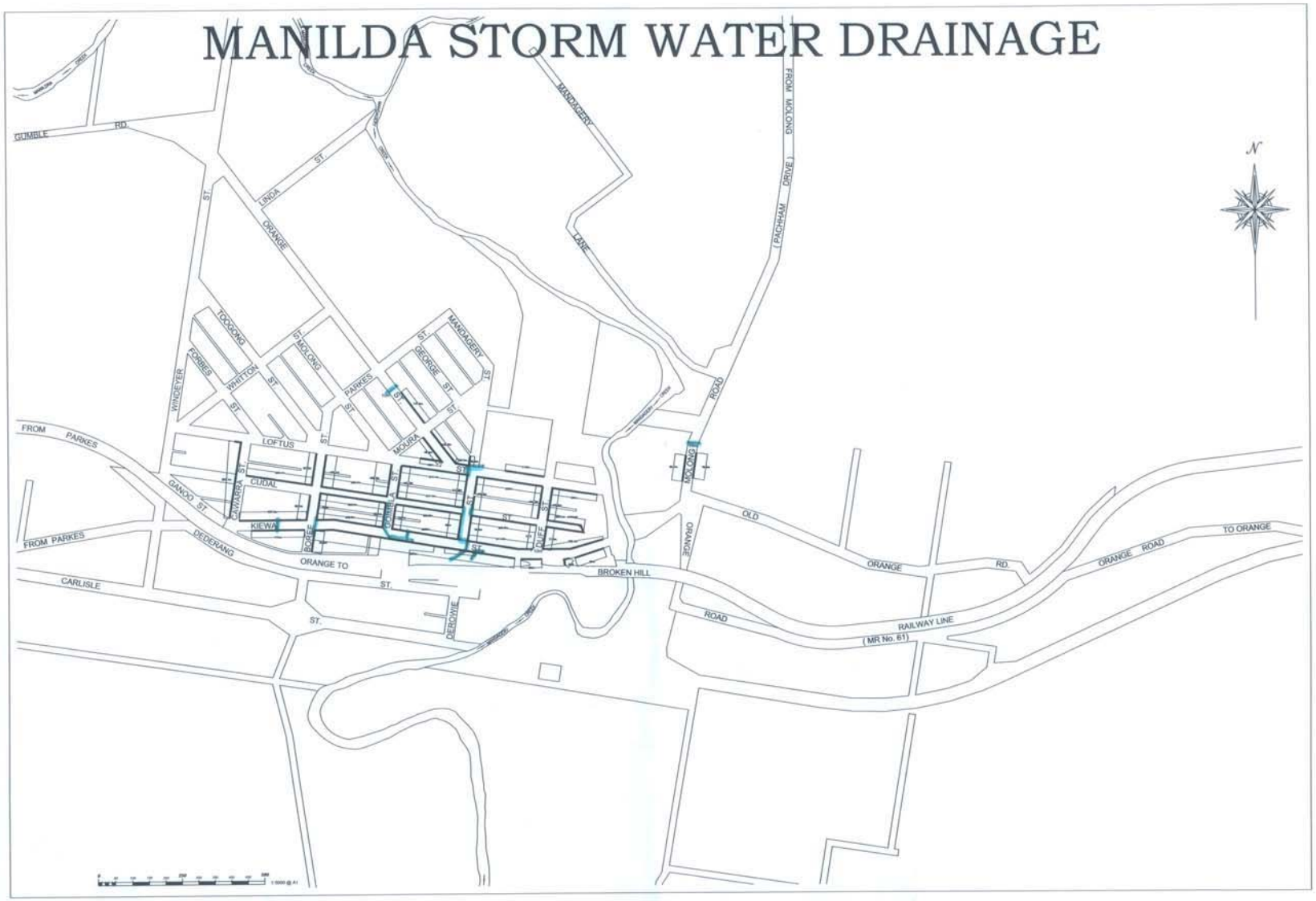


Figure 17: Manildra Stormwater System

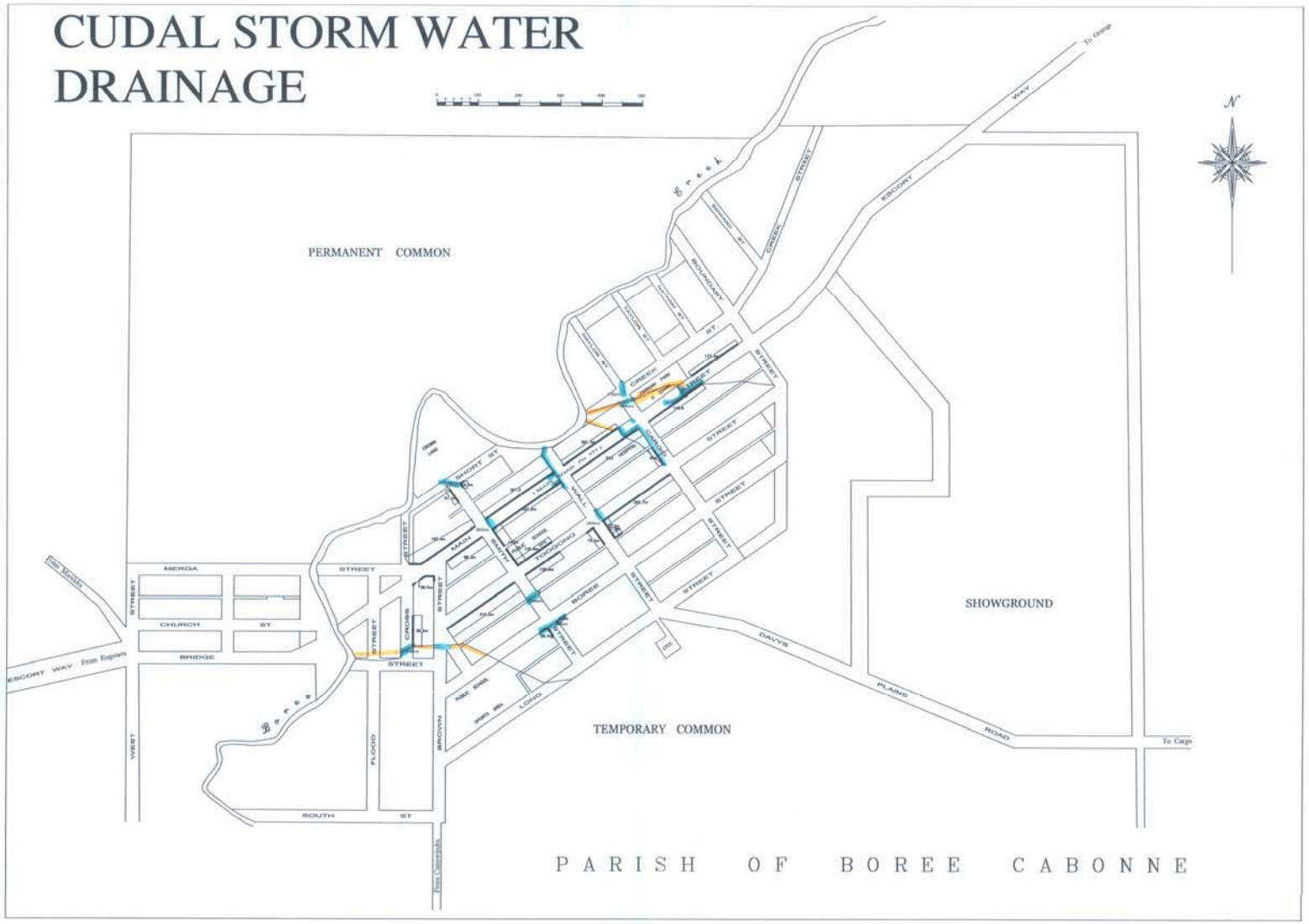


Figure 18: Cudal Stormwater System

Document Control					
Revision	Author	Reviewer	Approved for Issue		
			Name	Signature	Date
2	ARA	AFR	Andrew Fraser	Andrew Fraser	11th November 2008