INTEGRATED

WATER

CYCLE

MANAGEMENT

STRATEGY

Prepared by
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for

Gunnedah Shire Council

Document Registration

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Glossary[1]

[1] Where possible definitions and abbreviations are from widely available industry sources

ABS Australian Bureau of Statistics
Acidity: The chemical activity of hydrogen ions in soil. Usually expressed in pH units.
ADWF Average volume of sewage arranging at the STP during dry weather (usually in ML/day)
AWWF Average volume of sewage arranging at the STP during wet weather (usually in ML/day)
AHD Australian Height Datum
Al: Aluminium
ANZECC Australian and New Zealand Environment and Conservation Council
ARI Average Recurrence Interval
BPM Best Practice Management
Biological Oxygen Demand (BOD) is a measure of the extent of organic contamination in water.
C Carbon
Ca Calcium
Cation Exchange Capacity. The total quantity of exchangeable cations that the soil can absorb. Includes Ca, Mg, Na, K, H and Al.
Cl Chloride
cm centimetres
Coarse sediment. Gravel coarse sand and 50% of fine sand
Constructed wetland. An artificially created system that includes ponds and shallow vegetated areas
Continuous Deflective Separation (CDS). Compact gross pollutant traps that operate by deflecting stormwater in a centrifugal flow, separating out the litter.
Crusting (surface sealing). The nearly horizontal orientation and packing of dispersed soil particles on in the immediate surface layer of soil. This greatly reduces water penetration, encouraging runoff.
CRC Co-operative Research Centre
CSIRO Commonwealth Scientific and Industrial Research Organisation
DEC NSW Department of Environment and Conservation. A mixed department containing EPA, NPWS, SCA and other authorities
Denitrification. A process of anaerobic respiration whereby microbes use oxidised nitrogen (nitrate) in the absence of oxygen. The nitrogenous gases produced by this process escape to the atmosphere.
Detention time. The time it takes for a 'parcel' of water to flow from the inlet to the outlet of a system
DEUS NSW Department of Energy, Utilities and Sustainability
dS/m decisiemens/metre A measure of electrical conductivity (1 dS/m=1000 microsiemens/cm)
Dispersion. The breakdown of soil particles into constituents such as clay, silt and sand via the process of deflocculation. Dispersion can lead to erosion, high rainfall runoff and turbid waters.
DNR NSW Department of Natural Resources, formerly DIPNR, DLWC, CaLM, WC&IC, SCS, etc
DSS Decision Support System
EP Equivalent person
Erodability. The susceptibility of soil to detachment and transport by water and wind. (The K value in the Universal Soil Loss Equation).
Faecal coliforms. A group of bacteria common in faecal material. Their presence in large numbers indicates contamination
G gram
Gross pollutant trap (GPT). A device to trap debris>5mm from stormwater. Normally it has a trash rack immediately upstream
ha hectare (1 ha=100m*100m)
IWCM Integrated Water Cycle Management
Infiltration basins. Relatively large shallow pond with pervious floors that enable filtration of stormwater into the underlying strata
K Potassium

Kg kilogram
KL Kilolitre (1000 L)
km kilometre
L litre
LEP Local Environment Plan
LGA Local Government Area
Litter basket. A basket installed below an inlet pit to collect rubbish directly entering the stormwater system from roads
Litter boom. A floating device placed in drainage lines to capture floating litter and oil
LWU Local Water Utility
m metre
mg milligrams (1/1000 g)
Mg magnesium
mL millilitres (10^{-3}L)
ML megalitres (10^{6}L)
mm millimetres
Na Sodium
Nitrogen (N) includes organic N plus mineral N forms such as nitrate, ammonia and nitrite.
Oil/ grit separators. Baffled chambers designed to separate both floating oils and coarse sediments from stormwater exiting roads and parking lots.
On site sewage management based on treatment and return of sewage to the environment in a decentralised system
OSD Onsite detention. Typically involves a vault to capture a portion of stormwater and release it a t a rate that does no cause down slope erosion.
P Phosphorus
Percentile The percentage
pH A measure of acidity
POEO Protection of the Environment Operations Act 1997, NSW
Porous pavement. Pavement that allows water to enter the underlying strata rather than runoff.
PRG Project Reference Group
Riparian zone Lands adjacent to streams that are directly influenced by the stream
SAR sodium adsorption ratio. A measure of the ratio of sodium to calcium plus magnesium. It is used in conjunction with salinity data to determine the stability of irrigation water.
Sediment trap. A structure placed within a drainage line to capture coarse sediment
Slaking. The partial breakdown of soil aggregates in water due to clay swelling and soil gas pressure.
Sodic soil. A soil whose structure is degraded due to excess exchangeable sodium. Usually applies to soils where more than 6% of exchangeable cations are sodium.
Stakeholder. Persons, organisations and authorities who have an interest in or are likely to be impacted by an event or project outcome.
STP. Sewage Treatment Plant
t Metric tonne
t/ha tonnes/ha
Trash rack. A series of vertical bars with 40 mm spaces between them. Extends the width of a drainage line and is designed to retain gross pollutants such as PET bottles.
TSS. Total Suspended Solids (usually in mg/L)
WSUD. Water Sensitive Urban Design
WTP. Water Treatment Plan

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1. INTRODUCTION

Gunnedah Shire Council, in conjunction with Department of Energy, Utilities and sustainability, has undertaken an Integrated Water Cycle Management (IWCM) study to aid in the identification and development of strategies to increase sustainable use of water resources. This IWCM study identifies local issues including:

- Security of water supplies
- Raw water quality
- Leakage and blockage of sewers and potable water pipes
- Relatively high use of water on residential allotments
- Heavy use of water in some parks and gardens and in some commercial and industrial premises
- Stormwater management, especially peak flow rates.

The Study was reviewed by The NSW Office of Water and approved subject to several conditions. A copy of the approval and the conditions of approval are shown in appendix 1.

Accordingly Council is now required to submit an IWCM Strategy which addresses IWCM issues needing further resolution plus new issues which have arisen since production of the 2006 Integrated Water Cycle Management (IWCM) Study.

1.1 WHAT IS IWCM?

Integrated water cycle management is a way for Gunnedah Shire Council to manage its water systems to maximise benefits. It involves the integration of Council's three main services – water supply, sewerage and stormwater – so that water is used optimally. It also involves the integration of these three services with other services (e.g. roads and drainage, trade waste collection) and with various external requirements, particularly the NSW Water Reforms (DEUS, 2004).

Integrated water cycle management aims to minimise the potential for poor or ill-informed decisions by ensuring that decision makers are aware of the broader 'context' within which resource based decisions, options and option implementation are to be made. The key goal of IWCM is to

1. provide access to all relevant information
2. improve interactions with other systems
3. ensure information is transparent to stakeholders, and to
4. ensure balanced decisions are made.

The way IWCM achieves these aims is by adopting the following basic principles:

1. Consideration of all water sources (including waste-water) in water planning
2. The sustainable and equitable use of all water sources
3. Consideration of all water users
4. Integration of water use and natural water processes; and
5. A whole of catchment integration of natural resource use and management.

1.2 THE INTEGRATED WATER CYCLE MANAGEMENT PROCESS

The process is in two parts:

Part 1 is the IWCM Evaluation (the IWCM study produced in 2006). This plan gives an overview of the current conditions at both catchment and individual urban area scales. It then undertakes an audit to the data, identifies issues and potential solutions. It undertakes a preliminary TBL assessment and offers recommendations.

Part 2 is the IWCM Strategy which is designed to address issues outstanding from the IWCM Evaluation.

The IWCM Strategy can be simplified or detailed. According to the 2008 DWE Guidelines (DWE, 2008) a Simplified Strategy can be undertaken where significant capital works are not required within 10 years.

A key concern is whether or not a detailed Strategy is required. The information in the Concept Plan (Woodlots and Wetlands, 2006) suggests that while there are some significant issues to address, there was no need for a detailed IWCM Strategy.

The key criterion for needing a detailed strategy is the fact that the evaluation component '***determines that significant capital works are required within the next 10 years'*** (DWE, 2008). A decade is the time span required to determine if the significant expenditure needed triggers the need for a detailed IWCM strategy. Importantly the IWCM process allows for a review after 6 years.

Office of Water has concurred with use of a Simplified Strategy provided the conditions of approval are met. The relevant correspondence is shown in Appendix 2.

1.3 STRUCTURE OF THIS DOCUMENT

This document is designed to address each of the specific issues raised by the Office of Water.

2. DEFINITION OF ISSUES

This is the first item of the Conditions of Approval to be addressed.

A Condition of Approval requires that the issues be described in more detail with clearer links to actions which will solve them, especially where existing commitments have not yet started but are relied upon to solve the issue.

Issue identification is based on a combination of assessment of impacts the existing urban areas have on water resources, plus a comparison between the performance of Council's water supply and sewerage arrangements against state and other agreed benchmarks.

There are several 'levels' of response to issues:

The Business –as-Usual option (BaU) requires details of work, costs and timing, to show how the issues are solved.

The Best Management Practice option (BPM) requires a wider examination of the issue, and relies more on external concepts to provide innovate solutions to local problems.

The section below provides more comment on the issues identified in the 2006 study.

Issues influencing the IWCM within Gunnedah Shire can be considered in three components:

1 Catchment

2 Water resources

3 Urban Area.

2.1 CATCHMENT

Namoi CMA released its Catchment Action Plan Part B-Natural Resources Management Plan in January 2006. This plan identifies a series of impacts as well as management actions to address these issues. A key issue relating to Gunnedah Shire IWCM is that management of water quality and flows within the Namoi River is at a catchment level and therefore outside the control of mid catchment LGAs such as Gunnedah.

Secondly catchment landuse is outside Council's control. Activities such as land clearing, irrigation, over-cultivation, over-stocking and coal mining can all impact on Gunnedah Shire water resources yet the Shire has no control over the activities.

As an organisation with a vital interest in the well being of its constituents, Gunnedah Shire Council should ensure it participates in the decision making and prioritisation processes of the CMA.

The catchment based issues, targets and proposed management activities are summarised below. These focus on the catchment based actions upon which Gunnedah Shire Council could have some impact.

Table 2.1 Catchment based issues, targets and management actions to achieve the targets (Source: Namoi CMA, 2006).

Issues	Targets	CMA Management Actions	Potential areas of Council involvement	Actions required of Council	Cost implications	Council response agree; Yes/ no Reasons Adoption time
Poor management of soil resources including • Over irrigation • Over stocking • Salinisation • Soil sodicity • Soil acidification • Loss of soil structure • Erosion • Soil contamination	Adoption of BPM (Best Management Practices) by rural landholders	Develop/extend BPM in industry based partnerships Provide technical support to adopt BPM	Ensure active participation of appropriately qualified staff at stakeholder meetings. This can be via NROC or by requesting participation in stakeholder discussions. The CMA contact is Simon Taylor, 67645929 Ensure mining and construction industry follow appropriate BPMs	Contact the CMA to initiate partnership arrangements	In-kind contribution of time	

Issues	Targets	CMA Management Actions	Potential areas of Council involvement	Actions required of Council	Cost implications	Council response agree; Yes/ no Reasons Adoption time
Land is not being utilised within its capability	Increase percentage of land being utilised within its capability	Assist property planning Change landuse to suit capability	Encourage CMA activity in Gunnedah Shire. The CMA contact is Simon Taylor, 67645929. The CMA is actively seeking opportunities to partner will Councils, other organisations and individuals to publicise the concept of sustainable farming. Involve CMA in IWCM and application of urban BPMs including environmentally sustainable urban development. Develop LEPs that reflect CMA issues, for example, addressing urban salinity.	Contact the CMA to initiate partnership arrangements	In-kind contribution of time	

Issues	Targets	CMA Management Actions	Potential areas of Council involvement	Actions required of Council	Cost implications	Council response agree; Yes/ no Reasons Adoption time
Water quality commonly does not meet ANZECC guideline criteria for salinity, P and N	Increase the proportion of time that surface waters meet ANZECC criteria	Rehabilitate and protect riparian zones Undertake some structural works Reduce both point and non point pollution Improve river flow	Actively manage council lands adjacent to waterbodies. Ensure Mullibah Lagoon is functioning adequately	Contact the CMA to initiate partnership arrangements. Look for funding opportunities e.g. riparian stabilisation and wetlands management	In-kind contribution of time. May require matching funding	
			Adopt BPM for urban areas. For example use of OSD for commercial developments. (designed to reduce local flooding and downslope scour due to high flow rates) Ensure there is minimal surcharge of wet weather sewage flows.	These actions should be part of Council's Stormwater Management Plan. The need for an OSD policy should be examined for buildings covering more than 6000 msq. The requirement should be written into DCPs for new industrial and commercial developments.	Some administration cost, but likely to be orders of magnitude less than cost of flood damage.	

Issues	Targets	CMA Management Actions	Potential areas of Council involvement	Actions required of Council	Cost implications	Council response agree; Yes/ no Reasons Adoption time
			Develop Maintenance Plan to ensure adequate performance of stormwater assets such as GPTs.	The need for this should be based on the evidence of blockage, surcharging and salinisation in lower portions of Gunnedah, e.g near the high school.	Already informally undertaken. The task should be added to an appropriate maintenance schedule.	
Hydrological stress due to extraction and altered stream flows	Ensure groundwater extraction rate is similar to recharge rate Set salinity targets in line with MDBC salinity audit	Encourage rapid adjustment of groundwater entitlements in order to meet the criteria of the Namoi Groundwater Sharing Plan (DLWC, 2003). Request improved dam discharges to allow for environmental flows, flushing and minimal thermal pollution.	Actively lobby CMA and DNR to accelerate the rate of adoption of the Namoi Groundwater Sharing Plan. Ensure residents understand where town water comes from. (The Namoi CMA is implementing a community based water education plan. Council should cooperate with this). Publicise BPMs such as use of rainwater tanks, garden mulching and avoidance of over-	Contact the CMA to initiate partnership arrangements. Look for funding opportunities to publicise the need to conserve water as part of the National Water Initiative. Encourage adoption of Urban Water Sensitive Design (WUSD) principles, e.g capture and ruse of stormwater on the golf course. Capture and	In-kind contribution of time.	

Issues	Targets	CMA Management Actions	Potential areas of Council involvement	Actions required of Council	Cost implications	Council response agree; Yes/ no Reasons Adoption time
			watering. Limit water supplies to rural residential areas	reuse of roof water for toilet flushing in commercial developments.		

Outcomes

Gunnedah Shire Council has little control over catchment activities outside its boundaries. However it can lobby the CMA to ensure the Groundwater Sharing Plan is implemented in full.

Within shire boundaries Council can ensure stormwater impacts are minimised. For example runoff from rural roads can be dispersed to minimise sediment yield to streams. Stormwater reuse can be encouraged, for example on the golf course.

Council needs to agree to Best Management Practices with respect the stormwater. This includes deciding which of the recommended action in table 2.1 it is prepared to undertake and when the agreed recommendations would be adopted.

2.2 WATER RESOURCES

Water quality in streams

Figures 2.11, 2.12, 2.13 and 2.17 in the IWCM Concept Study (Woodlots and Wetlands, 2006), all indicate surface water rarely meets ANZECC guidelines. Similarly the Interim Water Quality Objectives for various end uses are not always met as figure 2.17 in Woodlots and Wetlands, (2006), shows. Issues include: Elevated salinity, Phosphorus, Nitrogen, Total Suspended Solids and algal blooms.

Elevated salinity is due to a combination of natural salinisation plus accelerated movement of salt as it is flushed from the soil during irrigation. Dryland salinity has increased following clearing of deep rooted perennial vegetation.

Elevated Phosphorus and Nitrogen concentrations appear to be largely due to erosion and inefficient use of fertiliser. The Nitrogen and Phosphorus is lost from the farms and eventually reaches surface waters.

Total suspended solids load arises from two major sources. There are substantial areas of sheet and rill erosion in the region, and some of this material reaches surface waters. Secondly there is erosion of stream banks and bases. A high proportion of this material is directly added to surface waters.

Erosion of stream banks is facilitated by the elevated sodium content in the water. The sodium encourages dispersion of the soil particles, and the fine particles are easier to transport.

Algal blooms occur in response to a wide range of environmental parameters including warm weather, sunlight and an excess of Phosphorus.

Outcomes

Gunnedah Shire Council has little control over water quality in the surface waters. However Gunnedah can reduce its impact by ensuring council owned lands are adequately vegetated and that excessive irrigation does not occur.

Water quality in aquifers

Section 2.2.1 of Woodlots and Wetlands (2006), discusses groundwater quality for each of the urban centres. The results are summarised below in tables 2.2 to 2.5. ADWG in the tables refers to the Australian Drinking Water guidelines (2004). Table 2.6 discusses instances where ADWG thresholds are exceeded.

Table 2.2. Groundwater quality used as the Gunnedah water supply. (Source GSC)

Test	Units	ADWG	Result 17/9/00	Result 12/9/00	Result 18/9/01	Result 22/11/02	Result 18/2/03	Result 28/1/04	Result 11/5/04	Result 16/2/05	Result 1/6/05	Result 14/3/06	Result 12/12/06	Result 18/4/07	Result 16/1/08	Result 17/2/09
Lab Ref No.												2600852	2604110	2701364	2800284	2900656
Aluminium	mg/L	0.2000		0.050			0.050	0.070	0.010	0.030	0.020	0.010	0.010	0.010	0.010	0.100
Antimony	mg/L	0.0030	0.001			0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.0070	0.001			0.001	1.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Barium	mg/L	0.7000	0.040			0.040	0.116	0.036	0.029	0.016	0.024	0.019	0.018	0.021	0.020	0.100
Boron	mg/L	4.0000	0.100			0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Cadmium	mg/L	0.0020	0.0005			0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0010
Calcium	mg/L	9999		42			141	42	35	27	34	38	31	37	34	41
Chloride	mg/L	250		35			**338**	45	35	21	39	41	24	28	25	39
Chromium	mg/L	0.0500	0.009			0.006	0.031	0.011	0.010	0.007	0.012	0.008	0.011	0.009	0.005	0.010
Copper	mg/L	2.0000	0.220	0.050	0.020	0.021	0.043	0.022	0.027	0.027	0.017	0.012	0.018	0.024	0.007	0.100
Cyanide	mg/L	0.0800					0.010	0.010								
Fluoride	mg/L	1.5000	0.150	0.100	0.100	0.150	0.160	0.100	0.150	0.180	0.170	0.180	0.180	0.160	0.190	0.140
Iodine	mg/L	0.1000					0.030	0.020	0.020	0.020	0.020	0.022	0.020	0.020	0.020	0.020
Iron	mg/L	0.3000		0.050			0.090	0.050	0.050	0.010	0.010	0.010	0.040	0.090	0.010	0.100
Lead	mg/L	0.0100	0.002		0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005
Magnesium	mg/L	9999		21			79	23	19	14	18	20	15	19	15	19
Manganese	mg/L	0.1000	0.010	0.010	0.010	0.005	0.005	0.005	0.006	0.005	0.005	0.005	0.005	0.015	0.005	0.010
Molybdenum	mg/L	0.0500	0.005			0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.010
Nickel	mg/L	0.0200	0.010			0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Nitrate	mg/L	50.0	9.6	1.6	8.0	9.8	31.0	9.5	5.0	4.5	9.7	5.5	5.1	3.9	3.8	5.0
Nitrite	mg/L	3.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
pH		6.5-8.5	7.3	7.5	7.4	7.0	7.0	7.0	7.2	7.1	7.2	7.1	7.0	7.5	7.3	7.2
Selenium	mg/L	0.0100	0.002			0.002	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005
Sodium	mg/L	180	44	29		53	109	34	35	25	29	31	23	27	24	28
Sulphate	mg/L	500	53	38		60	139	47	34	23	42	35	27	32	28	37
TDS	mg/L	500	362		294	416	**877**	278	238	193	233	244	204	238	206	260
Total Hardness	mg/L	200		190			**679**	197	167	126	161	176	141	171	146	180
True Colour	H U	15		3				1	1	1	1	1	1	1	1	1
Turbidity	NTU	5.0	0.1	0.2	0.1	0.1	1.5	0.6	4.8	0.1	0.1	0.1	0.3	0.6	0.3	0.4
Zinc	mg/L	3.00		0.05			0.01	0.10	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.10

Table 2.3. Groundwater quality used as the Curlewis water supply. (Source GSC)

Test	Units	ADWG	Result 18/9/01	Result 22/11/02	Result 18/02/03	Result 11/11/03	Result 28/1/04	Result 11/5/04	Result 16/2/05	Result 11/5/05	Result 14/3/06	Result 12/12/06	Result 18/4/07	Result 16/1/08	Result 17/2/09
Lab Ref No											2600853	2604111	2701365	2800285	2900657
Aluminium	mg/L	0.2000			0.030	0.030	0.080	0.010	0.030	0.020	0.020	0.0100	0.010	0.020	0.010
Antimony	mg/L	0.0030	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0010	0.001	0.001	0.001
Arsenic	mg/L	0.0070	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.0010	0.001	0.001	0.003
Barium	mg/L	0.70	0.14	0.16	0.15	0.11	0.18	0.14	0.09	0.14	0.10	0.17	0.09	0.14	0.10
Boron	mg/L	4.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cadmium	mg/L	0.0020	0.001	0.001	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.0005	0.001	0.001	0.001
Calcium	mg/L	9999			124	86	145	123	70	124	94	137	83	95	123
Chloride	mg/L	250			**686**	**465**	**884**	**685**	**362**	**764**	**463**	**767**	**406**	**476**	**688**
Chromium	mg/L	0.0500	0.005	0.008	0.027	0.006	0.011	0.012	0.013	0.008	0.011	0.0150	0.013	0.007	0.010
Copper	mg/L	2.0000	0.020	0.010	0.017	0.007	0.011	0.008	0.006	0.018	0.010	0.0270	0.018	0.005	0.100
Cyanide	mg/L	0.0800			0.010	0.010	0.010								
Fluoride	mg/L	1.5000	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.1	0.100	0.100	0.100
Iodine	mg/L	0.1000			0.043	0.029	0.027	0.025	0.030	0.044	0.036	0.0530	0.032	0.038	0.032
Iron	mg/L	0.3000			0.010	0.010	0.010	0.010	0.010	0.020	0.020	0.0600	0.010	0.010	0.100
Lead	mg/L	0.0100	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.0020	0.002	0.002	0.005
Magnesium	mg/L	9999			82	51	96	83	45	80	53	89	54	46	73
Manganese	mg/L	0.1000	0.010	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.0050	0.005	0.005	0.010
Molybdenum	mg/L	0.0500	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.0050	0.005	0.005	0.010
Nickel	mg/L	0.0200	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.0100	0.010	0.010	0.010
Nitrate	mg/L	50.0	0.1	0.1	8.4	5.6	11.6	5.2	2.9	3.3	3.4	4.8	2.3	1.6	1.0
Nitrite	mg/L	3.0	6.0	7.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
pH		6.5-8.5	7.6	7.2	7.4	7.6	7.9	7.8	7.6	7.9	7.8	7.5	8.3	8.0	8.0
Selenium	mg/L	0.0100	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.0020	0.002	0.002	0.005
Sodium	mg/L	180	**226**	**291**	**240**	178	**291**	**279**	163	**285**	**192**	**265**	**192**	**201**	**246**
Sulphate	mg/L	500	85	93	100	64	116	101	48	92	64	101	55	67	85
TDS	mg/L	500	**1263**	**1292**	**1227**	**916**	**1502**	**1259**	**784**	**1319**	**950**	**1413**	**886**	**962**	**1280**
Total Hardness	mg/L	200			**646**	**422**	**759**	**847**	**359**	**638**	**451**	**710**	**429**	**429**	**609**
True Colour	H U	15				1	1	1	1	1	1	1	1	1	1
Turbidity	NTU	5.0	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.1
Zinc	mg/L	3.00			0.02	0.06	0.10	0.01	0.02	0.02	0.01	0.02	0.01	0.03	0.10

Table 2.4. Groundwater quality used as the Mullaley water supply. (Source GSC)

Test	Units	ADWG	Result 11/11/03	Result 28/1/04	Result 16/2/05	Result 1/6/05	Result 14/3/06	Result 12/12/06	Result 18/4/07	Result 16/1/08	Result 23/3/09
Lab Ref No							2600855	2604113	2701366	2800286	2901161
Aluminium	mg/L	0.20	0.04	0.09	0.03	0.01	0.01	0.01	0.01	0.01	0.01
Antimony	mg/L	0.0030	0.0010	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.0070	0.0010	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Barium	mg/L	0.7000	0.0840	0.087	0.083	0.096	0.077	0.076	0.074	0.092	0.072
Boron	mg/L	4.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cadmium	mg/L	0.0020	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Calcium	mg/L	9999	38	40	40	40	39	40	40	41	37
Chloride	mg/L	250	114	110	107	107	98	94	97	86	98
Chromium	mg/L	0.0500	0.0170	0.0250	0.0270	0.0360	0.025	0.032	0.027	0.014	0.005
Copper	mg/L	2.0000	0.0090	0.0050	0.0060	0.0050	0.005	0.008	0.015	0.006	0.013
Fluoride	mg/L	1.50	0.11	0.10	0.13	0.11	0.11	0.12	0.11	0.12	0.1
Iodine	mg/L	0.1000	0.0330	0.0360	0.0330	0.0360	0.038	0.039	0.033	0.039	0.03
Iron	mg/L	0.3000	0.0100	0.0100	0.0200	0.0200	0.02	0.04	0.01	0.01	0.01
Lead	mg/L	0.0100	0.0020	0.0020	0.0020	0.0020	0.002	0.002	0.002	0.002	0.002
Magnesium	mg/L	9999.00	46.35	51.60	51.68	45.55	46.81	47.8	47.74	40.51	41.85
Manganese	mg/L	0.1000	0.0050	0.0050	0.0050	0.0050	0.005	0.005	0.005	0.005	0.005
Molybdenum	mg/L	0.0500	0.0050	0.0050	0.0050	0.0050	0.005	0.005	0.005	0.005	0.005
Nickel	mg/L	0.0200	0.0100	0.0100	0.0100	0.0100	0.01	0.01	0.01	0.01	0.01
Nitrate	mg/L	50.0	3.3	3.1	3.2	3.3	2.9	2.9	2.8	3.5	4
Nitrite	mg/L	3.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
pH		6.5-8.5	7.7000	7.8000	8.2000	8.3000	8.1	7.7	8.5	8.3	8.2
Selenium	mg/L	0.0100	0.0020	0.0020	0.0020	0.0020	0.002	0.002	0.002	0.002	0.002
Sodium	mg/L	180	135	145	142	147	161	142	153	149	132
Sulphate	mg/L	500	14	13	13	13	11	10	10	10	10
TDS	mg/L	500	**602**	**596**	**591**	**590**	**584**	**582**	**582**	**576**	**574**
Total Hardness	mg/L	200	**285**	**312**	**314**	**288**	**290**	**297**	**297**	**269**	**265**
True Colour	H U	15	1	1	1	1	1	1	1	1	1
Turbidity	NTU	5.0	0.2	0.1	0.2	0.3	0.2	0.3	0.2	0.3	0.1
Zinc	mg/L	3.00	0.07	0.09	0.02	0.01	0.01	0.01	0.01	0.02	0.01

Table 2.5. Groundwater quality used as the Tambar Springs water supply. (Source GSC)

Test	Units	ADWG	Result 11/11/03	Result 28/1/04	Result 11/5/04	Result 1/6/05	Result 14/3/06	Result 12/12/06	Result 18/4/07	Result 16/1/08	Result 23/3/09
Lab Ref No							2600854	2604112	2701367	2800287	2901162
Aluminium	mg/L	0.200	0.040	0.08	0.04	0.01	0.01	0.01	0.01	0.01	0.01
Antimony	mg/L	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.007	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Barium	mg/L	0.700	0.101	0.103	0.098	0.114	0.099	0.095	0.098	0.124	0.096
Boron	mg/L	4.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cadmium	mg/L	0.0020	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Calcium	mg/L	9999	49	51	53	51	55	52	54	54	50
Chloride	mg/L	250	71	62	57	64	69	62	67	65	64
Chromium	mg/L	0.050	0.014	0.019	0.021	0.028	0.022	0.025	0.019	0.01	0.005
Copper	mg/L	2.000	0.168	0.039	0.016	0.112	0.064	0.054	0.188	0.042	0.005
Fluoride	mg/L	1.50	0.12	0.12	0.11	0.13	0.13	0.12	0.15	0.14	0.11
Iodine	mg/L	0.100	0.034	0.035	0.032	0.037	0.038	0.040	0.036	0.037	0.030
Iron	mg/L	0.30	**2.30**	0.03	0.06	0.14	0.03	0.19	0.09	0.09	0.01
Lead	mg/L	0.010	**0.040**	0.003	0.007	**0.018**	0.004	0.009	0.005	0.006	0.002
Magnesium	mg/L	9999	38	40	38	38	41	38	41	34	35
Manganese	mg/L	0.100	0.005	0.005	0.005	0.005	0.012	0.005	0.006	0.005	0.01
Molybdenum	mg/L	0.0500	0.0050	0.0050	0.0050	0.0050	0.005	0.005	0.009	0.005	0.005
Nickel	mg/L	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate	mg/L	50	1	1	1	1	1	1	1	1	1
Nitrite	mg/L	3.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
pH		6.5-8.5	7.5	7.8	7.8	7.8	7.7	7.5	8.3	7.8	7.5
Selenium	mg/L	0.0100	0.0020	0.0020	0.0020	0.0020	0.002	0.002	0.002	0.002	0.002
Sodium	mg/L	180	71	76	79	79	81	71	80	77	67
Sulphate	mg/L	500	8	8	8	8	8	7	7	7	7
TDS	mg/L	500	446	434	437	439	454	442	453	437	444
Total Hardness	mg/L	200	**278**	**291**	**289**	**284**	**307**	**288**	**303**	**276**	**269**
True Colour	H U	15	1	1	1	1	1	1	1	1	1
Turbidity	NTU	5.0	**13.9**	0.3	0.5	1.2	0.3	1.5	0.9	0.9	0.1
Zinc	mg/L	3.00	1.51	0.23	0.06	0.66	0.16	0.08	0.44	0.13	0.07

Table 2.6. Instances where groundwater attributes that exceed ADWG (2004) criteria.

Urban centre	Table number	Issues	Council objectives
Gunnedah	2.2	Exceeded Hardness, TDS and Cl compared with ADWG in 2003. Thought to be errors in data collection or entry[2]. None since.	To provide each urban centre with water that meets ADWG for as high a proportion of time as practical. An efficient disinfection system may be required. To ensure residents know and understand what is happening to their water supplies To encourage use of rainwater tanks throughout the shire, but, especially in Curlewis, Mullaley and Tambar Springs
Curlewis	2.3	Values of Cl, Na TDS and Total Hardness virtually always exceed ADWG.	
Mullaley	2.4	TDS and Total Hardness always exceed ADWG criteria. (However the exceedence is relatively minor).	
Tambar Springs	2.5	Total Hardness exceeds ADWG criteria. Lead concentration exceeds ADWG in 1 sample in 2001 and 1 in 2005. These samples also had higher concentrations of Iron, Zinc and Copper. The turbidity was also elevated. It has not been an issue since 2005.	

Outcomes and recommended responses

Gunnedah Shire Council has little control over water quality in the aquifers. However, the quality of this water is critical to the existence of the urban centres in the Shire. Council needs to actively lobby the CMA to ensure water quality is maintained.

Council should also consider keeping residents informed regarding potable water quality issues. It should consider improved chlorination (the oxidation assists in precipitating trace metals as well as killing microflora), and the use of rainwater tanks to reduce reliance on bores for drinking water in isolated areas.

Gunnedah

Most recent exceedences occurred in 2003 and are considered to be errors with sample collection and/or data entry. Monitoring should continue but no additional actions are needed at present.

Curlewis

Curlewis' water supply consistently exceeds the ADWG thresholds. Council commissioned Woodlots and Wetlands (2010) to undertake a preliminary assessment. On the basis of this assessment Council will undertake a detailed assessment of options to address the issue later in 2010.

[2] Data should be checked prior to retention or use in annual reports.

Mullaley
Whilst the water quality in Mullaley usually exceeds the ADWG (2004) for TDS and Total Hardness, the exceedence is not large. Additionally the guidelines for these attributes are based on attributes other than health. Finally most residences in this village have rainwater tanks and rely on them for drinking water.

Therefore whilst it is acknowledged that the water quality does not meet ADWG (2004) for TDS and Total Hardness, there is little health based need or community pressure to address this issue.

Tambar Springs
Tambar Springs water supply exceeded various ADWG (2004) thresholds in a 2001 sample and in a 2005 sample. These samples also had higher concentrations of Iron, Zinc and Copper. The turbidity was also elevated. There has been no recording a similar result in the past 5 years. This suggests that the elevated contamination results were isolated incidents.

Water volume in streams

Keepit Dam is operated to satisfy irrigation demand. Consequently flows during the irrigation season are typically elevated above natural flows and are maintained at these levels for months each summer.

The impacts of prolonged, unseasonal high flows is not discussed in detail in the Catchment Action Plan, but it can include drowning of native riparian species such as River Red Gum (*E camaldulensis*), increased bank erosion and increased presence of European Carp. The release of large qualities of cold water can also inhibit breeding of native aquatic fauna.

Outcomes

Gunnedah Shire Council has no control over water volumes in the Namoi River. However the river is an important resource for recreation and tourism. Council should actively participate in CMA stakeholder groups, especially those that are concerned with continued health of the river.

Water volume in aquifers

According to the Namoi Groundwater Sharing Plan (2003) the extraction rate from the aquifer is more than double the recharge rate. Table 2.7 shows the allocated volume and the estimated recharge rates. The table also shows the reduction in allocation to sustainable rates for different zones. Near Gunnedah (zone 4), Curlewis (zone 3) and Mullaley (zone 2) around 70% reduction in extraction rate is required to match allocation and recharge rate. Council's water abstraction is small compared with the total removal rate. However improved demand management within urban areas would demonstrate its commitment to sustainable use of the region's water resources.

Over-extraction lowers the water table, and this facilitates incursion of surrounding groundwater. This water can be saline or even contain trace metal contaminants. There is an obvious imperative to ensure potable supplies do not deteriorate any further.

Table 2.7. Estimated water store recharge, licence allocation, volumes of water on town water licenses and the % reduction in access licence volume (DLWC, 2003).

Zone	Estimate recharge to each zone and proposed extraction limits. (ML/year)	Domestic and stock right (ML/year)	Water requirements based on access licenses (ML/year)	Town water access licenses and allocation volumes (ML/year)	Reduction in agricultural access license volume as given in the Namoi Groundwater Sharing Plan
1	2100	39	8510	1650 (Quirindi) and 66 (Willow Tree)	87%
2	7200	359	23801	59 (Mullaley)	70%
3	17300	470	56017	199 (Curlewis)	69%
4	27500	667	82590	3900 (Gunnedah) 760 (Boggabri)	73%
5	16000	262	36042		45%
6	14000	272	11448		0%
7	3700	89	6321		41%
8	16000	166	48204	56 (Caroona)	67%
9	11400	187	11342	42 (Tambar Springs), 55 (Premer)	0%
10	4500	36	1420		0%
11	2200	210	8740		75%
12	2000	73	7487		73%
Lower Namoi	86000	3304	172187	3500 Narrabri, 900 Wee Waa, 7 Rowena.	51%
Total	209900	6134	474109		

Annual water use within urban areas is markedly lower than the allocated volumes: Even during 2003, in the middle of the drought, water use in Gunnedah was only 81% of the allocated volume. Table 2.8 shows the water allocation to the towns compared with the anticipated sustainable yield for this specific catchment zone. The allocation varies from 1 to 14% of the recharge volume. This suggests extraction of groundwater for urban use has limited effect on resource sustainability. However equity suggests both urban and non-urban stakeholders should be concerned with sustainable use of natural resources.

Table 2.8 also shows the area of crops that cannot be irrigated because the water is allocated to the urban centres (Note that 560 ML/y of effluent from Gunnedah is utilised for irrigation). The

urban centres have a net water utilisation equivalent to some 728 ha of cropping. There are over 100,000 ha of cropping in the area, so the impact of the urban water removal is less than 1% of the cropping area.

Table 2.8. Relationship between estimated recharge and volume of water utilised within urban centres. The number of ha of irrigation that is forgone is also shown (Source: Namoi Groundwater Sharing Plan, DLWC, 2003).

Urban centre	Estimated annual recharge for the relevant zone (ML/y)	Town water allocation (ML/y)	% of recharge allocated for urban use	No. of ha of cropping forgone (assume 5 ML/ha of irrigation)
Gunnedah	27500	3900	14	780 ha (net is 668 ha as 560 ML/y of effluent is used for irrigated agriculture. It is assumed that this 560 ML water would otherwise be taken from groundwater resources.)
Curlewis	17300	199	1	40 ha
Mullaley	7200	59	1	12 ha
Tambar Springs	11400	42	1	8 ha

Town water allocations are 'secure' under the Namoi Groundwater Sharing Plan (NSW Government, 2003). However this simply means the towns can extract up to a specific volume/year **if** it is present in the aquifer. It does not guarantee that the water will be present to enable extraction or that the water is safe to drink.

One measure of ground water supply security is change in depth to the watertable over time. Table 2.9 provides static water table depth for urban water supply bores in the shire. Eight out of 11 of the bores supplying Gunnedah township and both the Curlewis bores have lower water levels.

Figure 2.1 shows the water levels in the bores used to supply Gunnedah township with water. There is considerable variation over time, however the average depth to water has increased by 0.33m over the past 8 years.

While supplies are likely to remain adequate, there is still a need for the urban community to play its role in sustainable extraction of groundwater.

Outcomes

Gunnedah Shire Council has no control over groundwater yet it is totally dependant on a secure supply of groundwater. Active participation in stakeholder meetings with the CMA, State Water and the Office of Water is essential to ensure Council's concerns are noted and acted upon.

Assuming the Namoi Groundwater Sharing Plan is continued, there will always be sufficient water available for the urban areas of Gunnedah Shire. Water quality is likely to remain an issue unless extraction near council bores can be reduced.

The Demand Management Plan should assist Council in reducing water consumption without negatively impacting on its revenue base. This Plan has been adopted by Council.

Table 2.9. Static water levels (m) below ground surface levels. G refers to Gunnedah bores, C refers to Curlewis bores, TS refers to Tambar Springs bores. The last line shows the change in static water depth. Positive numbers mean an increase in depth to the static water.

Date	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	C1	C2	TS1	TS2
11/12/2002	8.887		11.49	11.21	0	10.442	11.96	16.17	16.05		9.47		26.1	15	NA
11/02/2003	9	10.5	11.75	11.8	12.15	11.73	14.01	21.04	20.01		9.9	23.7	26.1		9.8
17/03/2003	9.1	10.3	11.4	10.7	11.3	11.5	11.6	13.2	13.6		9.7	22	22.2		9.8
1/07/2003	9	9	10.87	10.91	10.92	10.65	10.66	13.6	13.2		9.72	23.1	23.65		9.8
15/09/2003	8.9	10.7	11	10.86	11	10.6	10.5	12.12	12.06		9.67	24.2	25.07		9.8
29/03/2004	8.95	9.9	11.1	11.23	11.6	11.1	10.85	13.3	13.3		9.95	20.6	20.6		9.227
24/0920/04	8.65	9.82	11	11.14	11.33	10.87	10.73	12.8	12.44		9.875	26.7	28.1		9.1
16/03/2005	8.95	10.5	11.8	11.85	12.25	11.6	12.2	19.3	19		10	20.5	21.1		9.39
6/09/2005	8.8	9.8	11.47	11.85	12.25	11.4	10.57	11.95	11.8		9.75	21.8	24		9.39
6/03/2006	9.7	11	12.4	12.1	12.5	12	11.55	15	15.1		9.8	27.23	28.6		9.4
29/09/2006	9.81	11	12.05	12.6	13	12.4	11.4	13.5	13.6		13.6	24.9	26.5		8.5
15/12/2006	9.79	11										29.5			
6/02/2007	10.25	0	13.04	13.4	14.15	13.6	15.12	22.3	21.1		10.52	28.4	29.13		
21/03/2007	10	11.7	12.2	12.46	12.8	12.6	12.33	14.72	15		11.75	23.67	23.9		
12/09/2007	9.2	10.4	11.8	11.7	11.9	11.7	13.3	13.3	13.1	13.3	10.5	19.2	19.4		
2/03/2008	9.56	10.7	12.65	13.4	13.72	12.84	12.1	14.5	14.73	14.5	10.4	19.6	19.65		7.9
8/10/2008	9.1	10.4	12.1	12.3	12.8	12.5	11.2	12.8	12.8		10.2	18.2	18.3		
13/07/2009	9.68	9.81	12.1	12	12.4	12	11.1	12.84	12.8		9.74	16.2	22.33		7.55
30/03/2010	9.64	10.4	11.92	12.12	12.52	12.1	12.23	15.28	15.2		10.5	17.58	17		7.8
Change since earliest shown reading	+0.77	-0.10	+0.43	+0.91	+0.37	+2.9	+0.27	-0.89	+0.85	-0.80	+1.03	-6.12	-9.1		-2m

Figure 2.1. Static water level (m) in 11 Gunnedah bores expressed as level (m) relative to land surface.

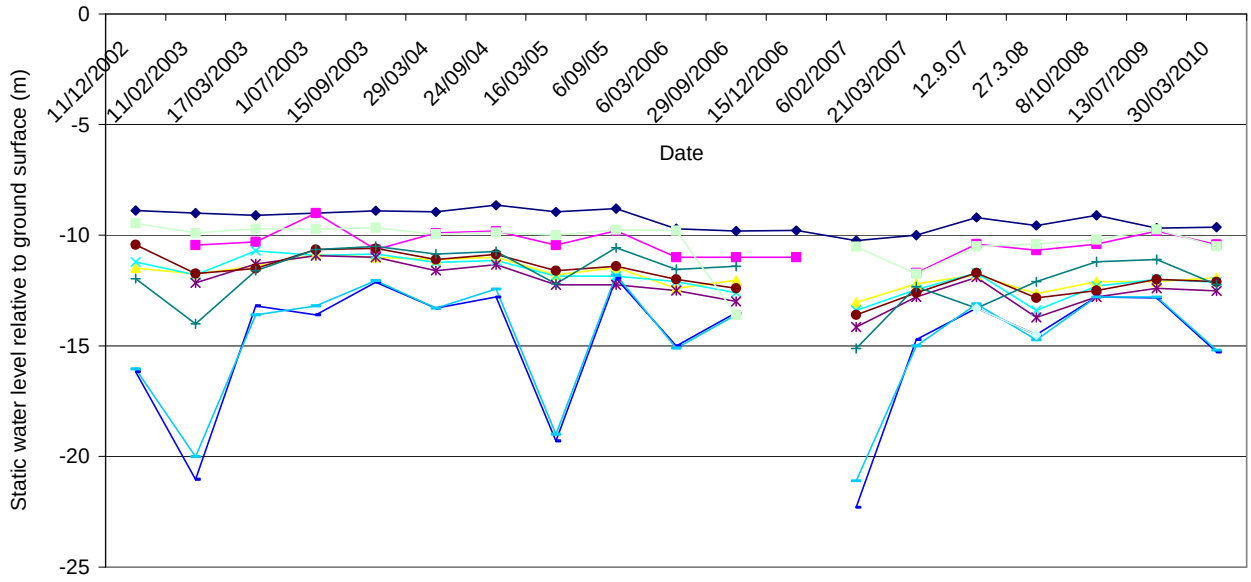

Table 2.10 shows water supply security actions recommended to Council. These have not yet been adopted.

Table 2.10. Recommendations to address the issue of groundwater supply security

Actions recommended to Council	Cost implications	Council response agree; Yes/ no Reasons	Adoption time
Seek and actively participate as a stakeholder in meetings concerned with the Namoi Groundwater Sharing Plan	Administrative time and resources. Possibly Council would be represented by an elected Councillor.		
Implement the Demand Management Plan	There could be a reduction in revenue if the volume of water supplied by Council to rate payers is reduced. However this could be off set by increases in charge/ kL of water supplied. The net effect would aim to be cost neutral.		
Consider results of Namoi Groundwater Study. Adopt/ advocate components that maintain water supply security.	May require adjustment of water supply and licensing		

Council has received a grant of $410K with Liverpool Plains Shire from the Federal Government under the Strengthening Basin Communities program to study the social and economic impacts of climate change and declining water availability across the shires. This should provide some options for possible declining bore levels. The current regional groundwater study should also assist.

2.3 URBAN AREAS

Contaminant loads

The median flow in the Namoi River at Gunnedah since 1990 is 347 ML/day, while the median Nitrogen and Phosphorous concentrations are 0.60 and 0.095 mg/L respectively. So the annual load 'passing' Gunnedah is approximately 76 T of Nitrogen and 12 T of Phosphorus.

The Gunnedah effluent reuse scheme diverts some 560 ML/year containing 4 T of Nitrogen and 1.7 T of Phosphorus from being added to the Namoi River. This is equivalent to an additional 5% of the Nitrogen load and 14% of the Phosphorus loads that is not being added to the Namoi River.

Table 2.11 shows the estimated mass of Nitrogen and Phosphorus in town stormwater. The town is estimated to add the equivalent of 4% of Nitrogen and 5% of the current nutrient loads to the Namoi River.

Table 2.11. Estimated mass of Nitrogen and Phosphorus in town stormwater assuming 30% runoff coefficient in the urban area.

Town area (ha)	Rainfall (mm/y)	Rainfall coeff	Runoff (ML/y)	N (mg/L)	P (mg/L)	N (T/y)	P (T/Y)
700	663	0.3	1392	2	0.4	2.8	0.56

The results above demonstrate the importance of recycling of effluent to reducing contaminant load in the Namoi River. The results also indicate the potential contribution of the town stormwater. Systems such as swales and wetlands that retain runoff allowing contaminant removal will assist in reducing contaminant loads. Options to reuse stormwater and reduce stormwater yield could also be considered.

Council has installed GPTs in several key locations. These will assist is reducing the gross pollution load.

Outcomes

Sewage effluent is not returned to the river except when a major sewer overflow event occurs. While these overflows occur more frequently than in similar LWUs, as table 3.8 shows, the volume involved is small compared with the total load.

Diversion of effluent to irrigated cropping plays a significant role in reducing impacts of Gunnedah on quality in the Namoi River.

Conversely the urban runoff is adding substantial loads to the river. Council has already installed GPTs at Ornic St, Wentworth St and Marquis St. These will assist in removing debris such as PET bottles, leaves and small branches from the stormwater. Council should also consider introduction

of BPMs to reduce total loads in the runoff. Components could include golf course irrigation, rainwater tanks and encouraging maximum grass cover. These options are tabulated in below.

3. URBAN PERFORMANCE ASSESSMENT

The principal issues identified in the Strategic Business Plan for Water Services are shown in table 3.1.

3.1 Water supply

Table 3.1. Issues identified in the Strategic Business Plan for Water Services (LGA/SA 2002/03).

Issue	Response as at July 2010
Reduce the number of mainbreaks	No change since 2000
Upgrade selected water services	Some upgrade and installation of new reservoir
Reduce annual water consumption/ allotment	Reduction following drought and introduction of tiered pricing from 420 kL/property in 2000 to 290 in 2007/08. But still higher 2008/09 median of 170 kL/property
Implement new pricing structure	Implemented
Develop asset management system and to value assets.	Undertaken

The additional issues identified in the current document that were not commented upon in the 2002/03 business plan are:

1 Security of groundwater supplies

2 Quality of groundwater especially in areas where ADWG criteria are not being met

3 Urban salinity

4 Aging infrastructure

5 Adequacy of pressure to new subdivision in more elevated portions of Gunnedah

6 Water use is high despite the drought

7 Water loss as a % of volume pumped

Potential solutions to each of these issues are discussed below.

2008-09 TBL Performance results and issues

The 2008-09 TBL Performance sheets filled in by Council and then added to by The Office of Water provide a summary of the water and sewerage systems performance.

The key performance results are:

Full compliance with the Best-Practice Management guidelines requirements for:

- Complete current Strategic Business Plan & Financial Plan
- Pricing-Full Cost Recovery without significant cross subsidies
- Complying non-residential charges
- DSP with Commercial Developer Charges
- Sound water conservation implemented
- Sound drought management implemented
- Complete performance reporting (by Sept 15 each year)
- Integrated water cycle management strategy

Table 3.5 below summaries the performance. Key features are commented upon in table 3.6. The features commented upon are those which have important implications for Gunnedah Shire Council and the health of its residence and environment.

Gunnedah Shire Council — **TBL Water Supply Performance** — **2008-09**

WATER SUPPLY SYSTEM - Gunnedah Shire Council serves a population of 10,300 (4,530 connected properties). Water is drawn from 17 bores (26 ML/d) and the Namoi River to supply Gunnedah, Curlewis, Mullaley and Tambar Springs. The Gunnedah Shire Council system comprises, 10 service reservoirs (19 ML) and 21 pumping stations, 52 km of transfer and trunk mains and 144 km of reticulation. The water supply is good quality untreated groundwater.

PERFORMANCE - Gunnedah Shire Council achieved 100% compliance with Best Practice requirements. The typical residential bill was $437 which was close to the statewide median of $430 (Indicator 14). The economic real rate of return was 2.8% which was greater than the statewide median (Indicator 43). The operating cost (OMA) per property was $240 which was much less than the statewide median of $330 (Indicator 49). Water quality complaints were less than the statewide median of 3 (Indicator 25). Current replacement cost of system assets was $50M ($12,330 per assessment including $1,030 per assessment for bulk supply), cash and investments were $4.2M, debt was nil and revenue was $2.6M (excluding capital works grants).

COMPLIANCE WITH BEST- PRACTICE MANAGEMENT GUIDELINES REQUIREMENTS

(1) Complete Current Strategic Business Plan & Financial Plan	YES	(3) Sound water conservation implemented	YES
(2) (2a) Pricing - Full Cost Recovery, without significant cross subsidies	Yes	(4) Sound drought management implemented	YES
(2b) & (2c) Pricing - Complying Residential Charges	Yes	(5) Complete performance reporting (by 15 September)	YES
(2c) Pricing - Complying non-Residential Charges	Yes	(6) Integrated water cycle management strategy	YES
(2d) Pricing - DSP with Commercial Developer Charges	Yes	COMPLIANCE WITH ALL REQUIREMENTS	100%

TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

	NWI	No.			LWU RESULT		RANKING 3,001 to 10,000	RANKING All LWUs	STATEWIDE MEDIAN
							Note 1	Note 2	Note 3
					Col 1		Col 2	Col 3	Col 4
UTILITY – CHARACTERISTICS	C1	1	**Population served: 10600**						
	C4	2	**Number of connected properties: 4530**	Number of assessments: 4440					
	C2	3	**Residential connected properties** (% of total)		90	%			92
		4	**New residences connected to water supply** (%)		0.5	%	5	4	0.9
	A3	5	**Properties served per kilometre of water main**	Prop/km	29				32
		6	**Rainfall** (% of average annual rainfall)		115	%	2	2	115
	W11	7	**Total urban water supplied at master meters** (ML)		2,270	ML			6,300
		8	**Peak week to average consumption** (%)		184	%	2	3	145
		9	**Renewals expenditure** (% of current replacement cost of system assets)			%			0.5
		10	**Employees per 1000 properties**	per 1,000 prop	1.1		1	1	1.4
SOCIAL – CHARGES & BILLS - 2009-10	P1		**Residential tariff structure:**	inclining block; independent of land value					
		12	**Residential water usage charge (c/kL) for usage <400 c/kL (Note 5)**		90	c/kL	4	4	150
		13	**Residential access charge per assessment** ($)	$	183		3	3	120
	P3	14	**Typical residential bill per assessment** ($)	$	437		2	2	430
		15	**Typical developer charge per equivalent tenement** ($)	$	4,280		3	3	4,600
SOCIAL – HEALTH		18	**Urban population without reticulated water supply** (%)		2.3	%	3	3	0.8
	H6	18a	**Risk based drinking water quality plan?**		No				
		19	**Physical water quality compliance** (%)		100	%	1	1	100
		19a	**Chemical water quality compliance** (%)		100	%	1	1	100
	H4	19b	**Number of zones with chemical compliance**		4 of 4				
		20	**Microbiological (E. coli) water quality compliance** (%)		96	%	5	5	100
	H3	20a	**% population with microbiological compliance**		14	%	5	5	100
SOCIAL – SERVICE LEVELS	C9	25	**Water quality complaints per 1000 properties**	per 1,000 prop	0		2	2	3
	C10	26	**Water service complaints per 1000 properties**	per 1,000 prop	8		3	3	6
	C17	27	**Average frequency of unplanned interruptions per 1000 properties**	per 1,000 prop	3		1	1	33
	C15	28	**Average duration of interruption** (min)	min	120		1	2	167
	A8	30	**Number of water main breaks per 100 km of water main**	per 100km	15		3	4	10
		31	**Drought water restrictions** (% of time)		100	%	3	3	55
		32	**Total days lost** (%)		4.7	%	5	5	2.2
ENVIRONMENTAL – NATURAL RESOURCE MANAGEMENT	W12	33	**Average annual residential water supplied per property** (kL)		282	kL	4	4	175
		33a	**Average annual residential water supplied - COASTAL** (kL/property)			kL			150
		33b	**Average annual residential water supplied - INLAND** (kL/property)		282	kL	3	3	245
	A10	34	**Real losses** (leakage) (L/service connection/day)	L/connectn/d	140		5	5	60
		35	**Energy consumption per Megalitre** (kiloWatt hours)	kWh	441		3	3	640
		36	**Renewable energy consumption** (% of total energy consumption)			%			0
	E12	36a	**Net greenhouse gas emissions - WS & Sge** (net tonnes CO2 - equivalents per 1000 properties)						340
ECONOMIC – FINANCE	F5	40	**Revenue per property** - water ($)	$	580		2	3	574
	F4	41	**Residential revenue from usage charges** (% of residential bills)		65	%	2	3	73
	F17	43	**Economic real rate of return** - Water (%)		2.8	%	1	1	0.3
		44	**Return on assets** - Water (%)		2.9	%	1	1	-0.1
	F22	45	**Net Debt to equity** - Water (%)		0	%	1	2	0.0
	F23	46	**Interest cover** - Water		>100		1	1	0.7
		47	**Loan payment per property** - Water ($)	$	7		3	3	52
	F24	47b	**Net profit after tax** - WS & Sge ($'000)	$'000	740		1	1	0
ECONOMIC – EFFICIENCY		48	**Operating cost (OMA) per 100km of main** ($'000)	$'000	705		2	2	1,070
	F11	49	**Operating cost (OMA) per property** ($) (Note 6)	$/prop	240		1	1	330
		50	**Operating cost (OMA) per kilolitre** (cents)	c/kL	45		1	1	111
		51	**Management cost per property** ($)	$/prop	69		1	1	127
		52	**Treatment cost per property** ($)	$/prop					35
		53	**Pumping cost per property** ($)	$/prop	64		5	4	29
		54	**Energy cost per property** ($)	$/prop	36		5	4	13
		55	**Water main cost per property** ($)	$/prop	104		4	4	51
	F14	56	**Capital Expenditure per property** ($)	$/prop	289		2	2	266

NOTES :

1. The ranking compared with LWUs with 3,001 to 10,000 connected properties (Col 2) is on a % of LWUs basis - relevant for comparing performance with similar sized LWUs - see attachment.
2. The ranking compared with all LWUs (Col 3) is on a % of LWUs basis - relevant for comparing performance with all other LWUs - see attachment.
3. The Statewide Median (Col 4) is on a % of connected properties basis. It best reveals statewide performance by giving due weight to larger LWUs & reducing the effect of smaller LWUs- see attachment.
4. Annual review of key projections and actions in LWU's Strategic Business Plan (SBP) are required, together with annual updating of LWU's financial plan. The SBP should be updated after 3 years.
5. Non-residential Tariff: Access Charge based on Service Connection Size: 20 to 40 mm:$161, 50mm: $360, Inclining Block; For usage up to 400 kL = 80 c/kL; for usage >400 kL = 130 c/kL.
   Water supplied to non-residential customers was 42% of potable water supplied excluding non-revenue water.
   Non-residential customers provided 16% of the revenue from annual charges and usage charges. Residential tariff for usage >400 kL = 130 c/kL.
6. The operating cost (OMA)/property was $240. Components were: management ($69), operation ($), maintenance ($135), energy ($36) & chemical ($0).
7. Council has a good quality unfiltered groundwater supply.

Table 3.2. The TBL Performance of Gunnedah Shire's Water Supply.

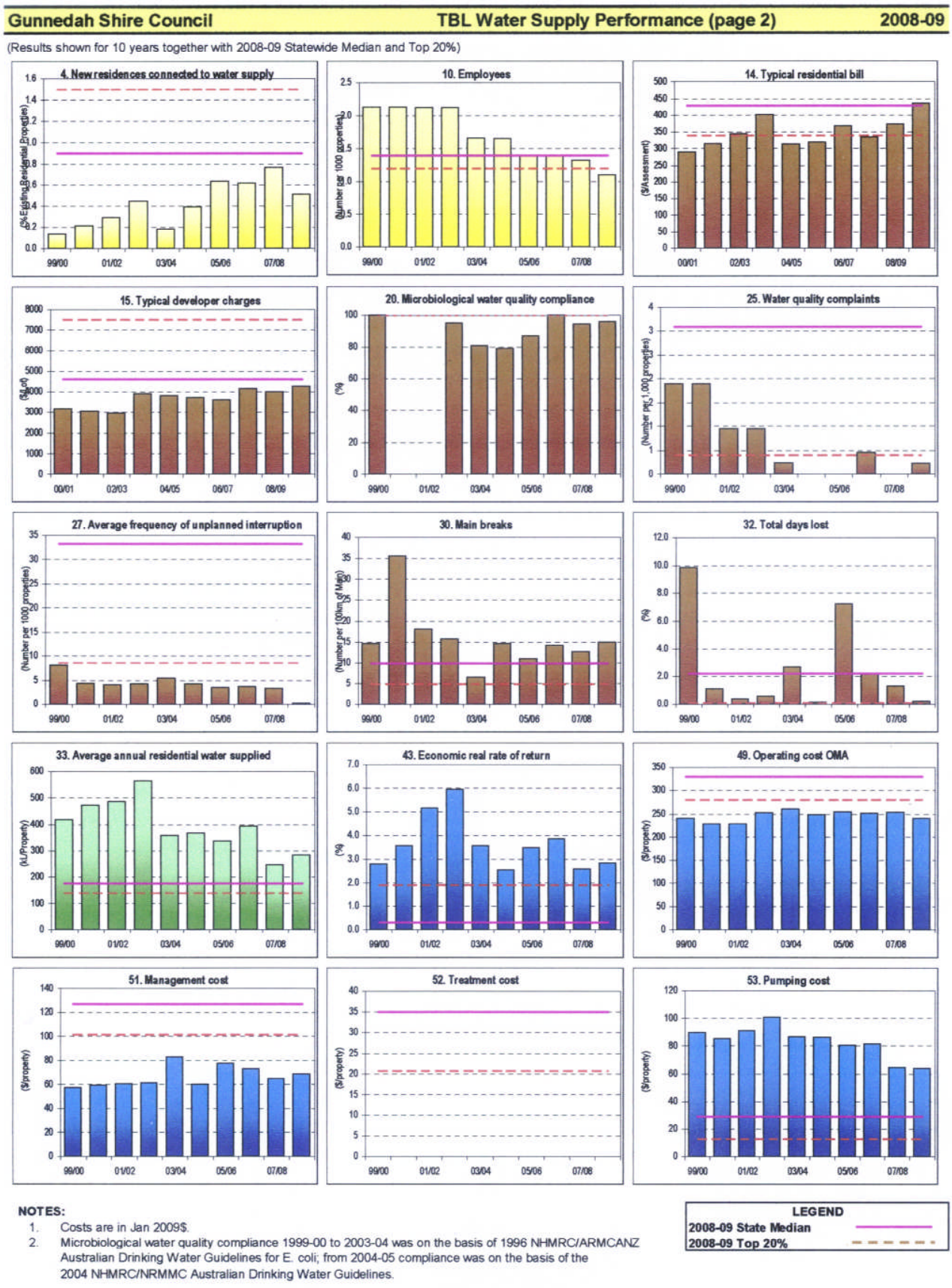

Table 3.3. The TBL Performance of Gunnedah Shire's Water Supply over the past 10 years.

Table 3.4 shows the TBL performance for the water supply system components. It also provides a list of recommended actions. These are yet to be adopted by Council.

Table 3.4. Key components of the TBL Water Supply Performance in 2008-09 (Tables 3.2 and 3.3).

TBL component	Comment	Actions recommended to Council	Council agreement status
Number of new connections is 0.2%.	This is indicative of relatively low current growth. It is consistent with the need for a simplified strategy	BaU	
The population served /km of water main is 29.	This is slightly lower than the state median of 32 and indicates fewer people to cover the cost of system maintenance.	BaU	
Peak water consumption of 184% is substantially higher than the state median of 154%.	This reflects the warm climate and large residential blocks with extensive lawns.	Use Best Management Practice (BPM) based on Drought and Demand Management Plans	
The water usage charge/kL is relatively low ($0.83/kL) for the first 400 kL, with $1.35/kL for>400 kL usage	400 kL/year is a generous 'base' rate.	Continue to monitor consumption. (NOTE: The current average of 282 kL/year is less than 50% of the 600 kL/year threshold suggested by DWE for inland NSW).	
Residential access charge per assessment is high	A high access charge has no impact on usage per connection.	In 2010 access charge is 28% of average bill. Council is aiming to reduce it to 25% in line with BPM.	
Apparent imbalance between contribution from residential and non-residential users.	Non residential users received 42% of the potable water supplied and charged for. However non residential users only contributed 16% of the revenue. (Note: Council's comment is that the data are not	BPM: Council currently does not have sufficient information in its billing system to separate residential and non-residential customers. Council will address this issue by adjusting the	

TBL component	Comment	Actions recommended to Council	Council agreement status
	accurate).	system to clearly identify residential and non-residential users.	
Chemical water quality compliance is 100%	This component only refers to Gunnedah. Other centres including Curlewis, Mullaley and Tambar Springs have water which is non compliant at times. (This issue discussed in detail below).	Council will arrange investigation and detailed assessment of Curlewis water supply in the 2010-2011 financial year	
Microbial (E coli) compliance not 100%	Should be 100%.	This has now been addressed via commissioning of a new chlorination system in Gunnedah. Other urban centres require monitoring and adjustment as necessary.	
Only 14% of population with microbiological compliance	Should be 100%.		
There are 8 water service complaints per 1,000 population (table 3.4). This is higher than the average for similar LWUs. It includes both supply issues and billing complaints.	Council has increased flows via installation of new reservoirs. The billing complaints may be due to changes in billing structure.	BPM including flow monitoring and improved customer service.	
The number of main brakes /100 km of mains are high compared with similar LWUs.	May be related to age of lines and the local reactive soils	BPM: Water main program is in place. This should be continued until the number of breaks is less than that of comparable LWUs.	
Average annual water supplied is higher than average for inland centres	This reflects the drought and large residential blocks with extensive lawns.	BPM based on Drought Management Plan and Demand Management Plan	

TBL component	Comment	Actions recommended to Council	Council agreement status
Real losses (leakage)/connection/day at 140L/property is high. Over 4530 properties this represents a loss of 0.63 ML/day.	The loss represents a loss of income, wasted water and increased risk of salinisation due to saturated ground near leaking pipes. If any of the water is being illicitly used then is represents an unfair cost to the community.	BPM: Council is currently participating in a water loss management program and a reservoir leak investigation which will address water loss problems. Council recently received a report from DPW regarding options to repair the leaking reservoir.	
Pumping costs per property are high	Water needs to be pumped from aquifers. This typically is more expensive than pumping from surface water sources	Ensure new areas have adequately sized pipelines and reservoirs. Council should be active and vocal in supporting the Namoi Groundwater Sharing Plan.	
Energy cost per property is high.	See above	See above	
Comments based on table 3.3			
The number of new connections / year as a % of the total is very low, but has increased slightly since 2000	There is evidence of a slight increase in population	BaU (Council is aware of increased population and the need to connect new dwellings).	
Typical residential bills have increased since 2000 and are now above the state median.	Emphasis should be on water use efficiency. Anticipated increased demand will assist revenue stream.	Maintain current cost structure, but review as demand changes to ensure water services continue to meet profit targets.	
Developer charges are lower than the state median	This is a potentially significant source of revenue for Council if the number of dwellings being constructed continues to rise.	BPM: A review developer charges to ensure no cross subsidy and Council's costs and investment are fully recovered will be completed by Dec 2010. Changes will be implemented from July 2011.	

TBL component	Comment	Actions recommended to Council	Council agreement status
Microbial compliance is below 100%	Council exposes itself to legal risk if it supplies contaminated water.	BPM. Council has installed a new chlorination system in Gunnedah	
Water quality complaint number have fallen in the past decade	This may be due to residents becoming used to water that does not comply with ADWG.	Council has agreed to investigate water quality in Curlewis in the current financial year.	
Main breaks are higher than the state median	Discussed above		
Average annual residential water supplied.	There is a downward trend with a 30% fall in the past decade. This is likely to be due to drought restrictions and a more conservative attitude by residents. It is still higher than the median	BPM, with Council looking to 'balance' a reduction in the volume above which cost/kL increases against lower total volume used.	
Economic Real Rate of Return	This is better than the top 20% of LWUs	BaU	
Operating cost/property	This is better than the top 20% of LWUs	BaU	
Management cost/property	This is better than the top 20% of LWUs	BaU	
Pumping costs/property	High compared with other LWUs. May be related to the to pump groundwater	BPM by identifying reasons for this.	

Key points:

- Compliance with Best Practice Management
- Low capital, operating and maintenance costs, but:
    - Relatively poor water chemical quality in Curlewis
    - Microbial water quality not 100% compliant
    - High water use per property
- High loss via leakage (140L/property/day).

Each of these issues requires attention.

Future expansion issues

Future increase in Gunnedah's population may lead to a need to augment water supply infrastructure.

Augmentation for residential development.

In 2006 Council commissioned GHD to undertake an assessment of augmentation needs for proposed residential development in the east and south precincts of Gunnedah township. The East Gunnedah development area could have approximately 409 single residential lots and 156 rural residential lots. The South Gunnedah development area could have approximately 555 single residential lots.

The GHD (2006) assessment concluded that no augmentations are required to the existing bulk storages or trunk system for either the East or South Gunnedah developments.

However a new 4ML reservoir at the Apex site and a 300 mm trunk main along Stock Road was completed in 2007. The reservoir will improve emergency storage and keep the reservoirs above 20% capacity.

Augmentation for industrial development.

There is no comment in the Department of Commerce (2009) report regarding potable water needs for the proposed industrial developments on the western side of Gunnedah. However the report suggests that the sewage production rate of 17 ET/ha and 2.65 EP/ET be used as a guide to sewage production. At the standard water consumption rate of 240 L/EP/day (NSW Public works, 1984) the additional water requirement based on sewer flow would be 10812 L/ha/day or 3.95 ML/ha/year.

A development proceeding at 7.2 ha of industrial lands/year (Dept Commerce, 2009), would require an additional 77.8 kL/day or 28.4 ML/year. If this development commenced in 2015 and occurred for 5 years as suggested for the slow growth scenario in Dept Commerce, (2009), then the increased non consumption water requirement would be 142 ML/year. Additional flows may be needed for consumption on site.

A 200 mm main around the proposed industrial area is currently 80% completed. The remaining 20% will be undertaken as the subdivision progresses.

Water supply issues and responses

Table 3.5 lists the TBL issues and responses recommended to Council. Note that Council has yet to formally agree to the responses.

Table 3.5. Recommended Council responses to TBL water supply issues.

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
Peak water consumption of 184% is substantially higher than the state median of 154%.	Use Best Management Practice (BPM) based on Drought Management Plan and Demand Management Plan. See next issue	.	Maintain water conservation as a permanent water saving tool. The level should be based on the 2006 Drought Management Plan.	Immediate
The water usage charge/kL is relatively low ($0.83/kL) for the first 400 kL. (NOTE: The charge reflects low supply costs. Council has a positive real rate of return on its water services).	BPM: Note that variations to charge rates may be recommended by Strengthening Basin Communities Program study.		Maintain existing charges to reflect BPM. That is • Access charge 25% of revenue. • Usage charge 75% of revenue. • Second tier charge 1.5 times first tier.	Maintain current strategy and real rate off return
Residential access charge per assessment is high	BPM as per above.		See above	
Apparent imbalance between contribution from residential and non-residential users.	BPM: Adjust Council billing systems to reflect accurate indication of residential and non residential customers.		Model potential impact of balancing contribution to volume utilised.	Next financial year.
Chemical water quality compliance is not 100%	Council to arrange investigation and detailed assessment of Curlewis water supply options in		Council has already allocated money for an investigation/ options report to be undertaken in the current	Commenced

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
	the 2010-2011 financial year.		financial year	
Microbial (E coli) compliance not 100%	BPM. Monitor performance of the recently installed chlorination system in Gunnedah.		Council has installed chlorination at Gunnedah, Curlewis, Tambar Springs and Mullaley. The impact of this over a full year needs to be ascertained. Council has recently completed risk management documentation for the shire villages.	Monitor chlorine concentration daily.
Only 14% of population with microbiological compliance	Should improve with new disinfection system in place.		See above	Council has recently completed risk management documents for Gunnedah Shire villages.
There are 8 water service complaints per 1,000 population This is higher than the average for similar LWUs. Note that complaints include those concerned with billing. However water rates are low compared with those of other similar LWUs.	BPM including ensuring new subdivision have adequate reservoirs. The GHD 2006 report contains details. This includes billing complaints		Council to identify source of complaints in its reporting, separating billing complaints from service complaints.	2010-2011
The number of main brakes /100 km of mains are high compared with similar LWUs.	BPM Council should investigate, looking for any pattern in the		Long term main replacement program in place. Approximately $400K/year	Continuing

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
	breaks. Develop plan to reduce number of breaks.		allocated for main replacement	
Total days lost (%) is high (note data inconsistency). Number refers to work force days lost as sick leave and workers' compensation. 54 days for 6 staff in 08/09, 42 in 09/10	Council should investigate, looking for any pattern.		Identify the reasons for large number of days lost. Develop Worker Wellbeing Plan to reduce losses to average for similar LWUs.	2010-2011
Average annual water supplied per residence is higher than average for inland centres	Council to introduce BPMs based on Drought Management Plan and Demand Management Plan.		Maintain water conservation practices at level 1 of the Drought Management Plan (2006).	Continuing
Real losses (leakage)/connection/day at 140L/property is high. Over 4530 properties this represents a loss of 0.63 ML/day.	BPM: Continue with Water Loss Management program sponsored by the Federal government.		Council to continue supporting this program (it has allocated $30K in 2010/11 for survey works)	2010-2011 financial year
Pumping costs per property are high. High costs are a result of all water being pumped from aquifers.	BPM, including demand management. Ensure new areas have adequately sized pipelines and reservoirs.		Undertake energy audit to establish most economical pumping times	2010-2011 financial year
Energy cost per property	See above		See above	See above

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
is high.				
Comments based on table 3.3				
The number of new connections /year as a % of the total is very low, but has increased slightly since 2000	BaU (Council is aware of increased population and the need to connect new dwellings).		Council has already commissioned studies into sewerage and water. The implementation should be based on need.	
Typical residential bills have increased since 2000 and are now above the state median.	Maintain the current positive economic real rate of return for water services.		Discussed above. Fund investigation to reduce unaccounted for losses Minimise cross subsidies Maintain current access charge Commit to ensuring a continuing the current positive economic real rate of return	Continuing
Developer charges are lower than the state median	BPM: Finalise and adopt recommendations of the current review of developer charges to ensure no cross subsidy and Council's costs and investment are fully		Revise Developer Services Charges as per review Increase developer charges in line with anticipated costs to provide augmented water and sewerage system.	2010-2011

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
	recovered.		Base on BPM	
Microbial compliance is below 100%	BPM to identify and rectify microbial contamination as a matter of urgency.		Adopt recommendations of the Risk Assessment completed in 2010	2010
Water quality complaints have fallen in the past decade	Council has agreed to investigate water quality in Curlewis in the current financial year.		Discussed above	
Main breaks are higher than the state median	Continue with long term replacement program		Long term replacement program is in place	Continuing
Total days lost (%) This refers to number of sick days and time lost through injury.	Currently considered satisfactory		Maintain / reduce current level of staff illness/ Workers Compensation	Continuing
Average annual potable water supplied/residence	BPM, with Council looking to 'balance' a reduction in the volume above which cost/kL increases against lower total volume used.		Discussed above. Council to agree to maintain a positive real rate of return for water services.	Current year
Pumping costs/property. This is due to pumping from aquifers.	BPM		Identify options to reduce costs, for example by adjusting pumping times and ensuring pipe sizes are adequate for new subdivisions.	Continuing

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
			The cost of pumping from bores in recognised.	
Other Issues				
Security of groundwater supply	$400,000 grant from federal government under the Strengthening Basin Communities program to investigate the effects of climate change on water supplies and establish options to address the anticipated impacts. Project partnered with Liverpool Plains Shire Council.		Actively seek participation in CMA deliberations, e.g seek opportunity for Councillor or staff member to be on the CMA board. Actively seek stakeholder role in any consultation regarding actions that could impinge on groundwater quality or quantity.	Current year
Urban salinity	Continue current sewer mains relining program		Currently in 5th year of a 10 year program with $250,000/year allocated	Continuing
Augmentation of water supply to proposed industrial expansion in western precinct	Ensure development proceeds in adjacent allotments rather than randomly over whole precinct. Budget to construct sewerage and		Water main surrounding proposed subdivision now 80% complete. It will be finalised when developer commences work	Depends on developer activity

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
	water conveyance infrastructure as development proceeds.			

Addressing the water supply issues will require Council to choose which options it will adopt. In agreeing to adopt a particular issue Council will need to also agree to adequate funding.

3.2 Sewage

The principal issues identified in the Strategic Business Plan for Sewerage Services are shown in table 3.6.

Table 3.6. Issues identified in the Strategic Business Plan for Sewerage Services (LGA/SA 2002/03).

Issue	Response as at July 2010
Chokes and overflows	Council has commenced a 10 year program to reline leaking sewers. Number still > state median
Extension of sewerage services to industrial area	The rate of extension is based on demand. Significant expansion is not likely before 2015.
Reduce illegal connections	Individual home connections not yet tested
Update plans and policies including trade waste	Council approved policy in principle in July 2009. Policy now in first year of implementation
Development of asset management system and value assets	Required strategic maintenance plan implemented. Review and update asset management plan annually. Plan currently being implemented

The additional issues identified in the current document that were not commented upon in the business plan are:

1 Aging infrastructure

2 Security of the reuse scheme

3 Impacts of infiltration and leaks on the environment

4 Design of new subdivisions to ensure adequacy of services

Potential solutions to each of these issues are discussed below.

Table 3.7. Gunnedah sewerage system flows and reuse percentage for past 3 years of record. (Source: GSC).

Component	Units	2007	2008	2009
Network residential	ML/y	447	450	530
Network non-residential	ML/y	50	50	75
Network infiltration / inflow	ML/y	50	50	50
Total	ML/y	547	550	655
Reuse on cotton crop	ML/y	456	455	546
Lost during 28 days maturation storage	ML/y	91	95	109
Reuse of available effluent	%	100	100	100

The TBL Sewerage report below suggests that only 42% of the sewage inflows are used. However there is no discharge of Gunnedah effluent to any surface water bodies. Effluent is held in maturation ponds for 28 days prior to pumping to Gunnible Form for agricultural reuse.

The difference between rainfall (649 mm/y) and evaporation (1752 mm/y) in Gunnedah is 1103 mm. Assuming there is 5 ha of lagoons, the loss rate would be approximately 55 ML/year. The other 43 ML/y would probably be due to inaccurate metering.

Effluent from Curlewis sewerage system is disposed of via pond evaporation.

Gunnedah Shire Council — TBL Sewerage Performance — 2008-09

SEWERAGE SYSTEM - Gunnedah Council has 2 sewage treatment works providing secondary treatment. The system comprises 12,650 EP treatment capacity (Trickling Filter and Oxidation Pond), 2 pumping stations (6 ML/d), 4 km of rising mains and 92 km of gravity trunk mains and reticulation. Treated effluent is discharged to land.

PERFORMANCE - Residential growth for 2008-09 was 0.3% which is lower than the statewide median. Gunnedah Shire Council achieved 89% compliance with Best Practice requirements. The typical residential bill was $320 which was much less than the statewide median of $470 (Indicator 12). However, the economic real rate of return was negative (Indicator 46). The operating cost per property (OMA) was $181 which was much less than the statewide median of $340 (Indicator 50). Sewage odour complaints were less than the statewide median of 0.4 (Indicator 21). Council did not comply with the SS requirements of the environmental regulator for effluent discharge. The current replacement cost of system assets was $49M ($12,700 per assessment), cash and investments were $4M, debt was nil and revenue was $1.4M (excluding capital works grants).

COMPLIANCE WITH BEST-PRACTICE MANAGEMENT GUIDELINES REQUIREMENTS

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

TRIPLE BOTTOM LINE (TBL) PERFORMANCE INDICATORS

	NWI	No.			LWU RESULT		RANKING 3,001 to 10,000 Note 1	RANKING All LWUs Note 2	STATEWIDE MEDIAN Note 3
					Col 1		Col 2	Col 3	Col 4
UTILITY / CHARACTERISTICS	C5	1	**Population served: 10,600**	Number of assessments: 3,890					
	C8	2	**Number of connected properties:** 4,010						
	C6	3	**Number of residential connected properties:** 3,500						
		4	**New residences connected to sewerage** (%)		0.3	%	4	5	0.8
	A6	5	**Properties served per kilometre of main**	Prop/km	42				40
	W18	6	**Volume of sewage collected** (ML)		660	ML			4,600
		7	**Renewals expenditure** (% of current replacement cost of system assets)		0.0	%	3	3	0.1
		8	**Employees per 1000 properties**	per 1,000 prop	1.5		2	2	1.6
SOCIAL / CHARGES & BILLS - 2009-10	P4		**Description of residential tariff structure:**	access charge/prop; independent of land value (Note 5)					
	P4.1	11	**Residential access charge / assessment** ($)	$	320		1	1	470
	P6	12	**Typical residential bill / assessment** ($)	$	320		1	1	470
		13	**Typical developer charge / equivalent tenement** ($)	$	2,000		4	4	3,900
		14	**Non-residential sewer usage charge** (c/kL)	c/kL	24		5	5	100
HEALTH		16	**Urban properties without reticulated sewerage service** (%)		1.0	%	1	2	3.9
	E3	17	**Percent of sewage treated to a tertiary level** (%)			%			85
	E4	18	**Percent of sewage volume treated that complied** (%)		75	%	4	4	100
	E5	19	**Sewage treatment works compliant at all times**		1 of 2				
SERVICE LEVELS		21	**Odour complaints per 1000 properties**	per 1,000 prop	0.0		1	1	0.4
	C11	22	**Service complaints per 1000 properties**	per 1,000 prop	32		4	4	12
	C16	23a	**Average sewerage interruption** (minutes)		60	min	1	1	116
		25	**Total days lost** (%)		2.2	%	4	4	2.4
ENVIRONMENTAL / NATURAL RESOURCE MANAGEMENT	W19	26	**Volume of sewage collected per property** (kL)		163	kL	5	5	230
	W26	26a	**Total recycled water supplied** (ML)		550	ML	1	1	320
	W27	27	**Recycled water** (% of effluent recycled)		42	%	2	2	10
	E8	28	**Biosolids reuse** (%)			%			100
		30	**Energy consumption per Megalitre** (kiloWatt hours)			kwh			710
		31	**Renewable energy consumption** (% of total energy consumption)			%			0
	E12	32	**Net greenhouse gas emissions - WS & Sge** (net tonnes CO2 equivalents per 1000 properties)						350
ENVIRONMENTAL PERFORMANCE		33	**90 Percentile licence limits for effluent discharge:** BOD 20 mg/L; SS 30 mg/L						
		34	**Compliance with BOD in licence** (%)		100	%	1	1	100
		35	**Compliance with SS in licence** (%)		75	%	4	5	100
	A12	36	**Sewer main breaks and chokes per 100 km of main**	per 100km main	131		4	4	53
	E13	37	**Sewer overflows per 100 km of main**	per 100km main	72		5	5	12
		39	**Non res & trade waste % of total sge volume**		11	%	5	5	16
ECONOMIC / FINANCE	F6	42	**Revenue per property** - Sge ($)	$	350				650
		43	**Revenue from non-residential plus trade waste charges** (% of total revenue)		5	%	5	5	16
		44	**Revenue from trade waste charges** (% of total revenue)			%			1.2
	F18	46	**Economic real rate of return** - Sge (%)		-0.3	%	5	4	1.1
		46a	**Return on assets** - Sge (%)		-0.2	%	4	4	0.5
	F22	47	**Net Debt to equity** - Sge (%)		0	%	2	2	0
	F23	48	**Interest cover** - Sge		0		5	5	2
		48a	**Loan payment per property** - Sge ($)	$					55
	F24	47b	**Net profit after tax** - WS & Sge ($'000)	$'000	740				-173
EFFICIENCY		49	**Operating cost (OMA) per 100 km of main** ($'000)	$'000	760		1	2	1,380
	F12	50	**Operating cost (OMA) per property** ($) Note 8	$	181		1	1	340
		51	**Operating cost (OMA) per kilolitre** (cents)	c/kL	111		1	2	145
		52	**Management cost per property** ($)	$	66		1	2	123
		53	**Treatment cost per property** ($)	$	60		1	1	108
		54	**Pumping cost per property** ($)	$	14		1	1	50
		55	**Energy cost per property** ($)	$	4		1	1	20
		56	**Sewer main cost per property** ($)	$	40		2	3	40
	F15	57	**Capital Expenditure per property** ($)	$	80		5	4	248

NOTES :

1. Council's ranking in Col 2 is based on a comparison of its result in Col 1 with the percentiles for LWUs with 3,001 to 10,000. This is on a % of LWUs basis - see also Note 2.
2. Council's ranking in Col 3 is based on a comparison of its result in Col 1 with the percentiles for all LWUs. This is also on a % of LWUs basis as this is relevant for comparing the performance of an LWU with all other LWUs - see attachment.
3. The Statewide Median (Col 4) is on a % of connected properties basis. It best reveals statewide performance giving due weight to larger LWUs & reducing the effect of smaller LWUs.
4. Annual review of the key projections & actions in LWU's Strategic Business Plan (SBP) are required, together with annual updating of LWU's Financial Plan. The SBP should be updated after 3 years.
5. Non-residential: Access Charge based on square of size of service connection, sewer usage charge - 24c/kL.
6. Non-residential & trade waste volume was 11% of total sewage collected; these customers provided 5% of the revenue from annual charges, usage and trade waste charges.
7. Compliance with Total N in Licence was 100%. Compliance with Total P in Licence was 100%.
8. The operating cost (OMA)/property was $181. Components were: management ($66), operation and maintenance ($103), energy ($4), chemical ($0) and effluent/biosolids ($8).

Table 3.8. The TBL Performance of Gunnedah Shire's Sewerage System.

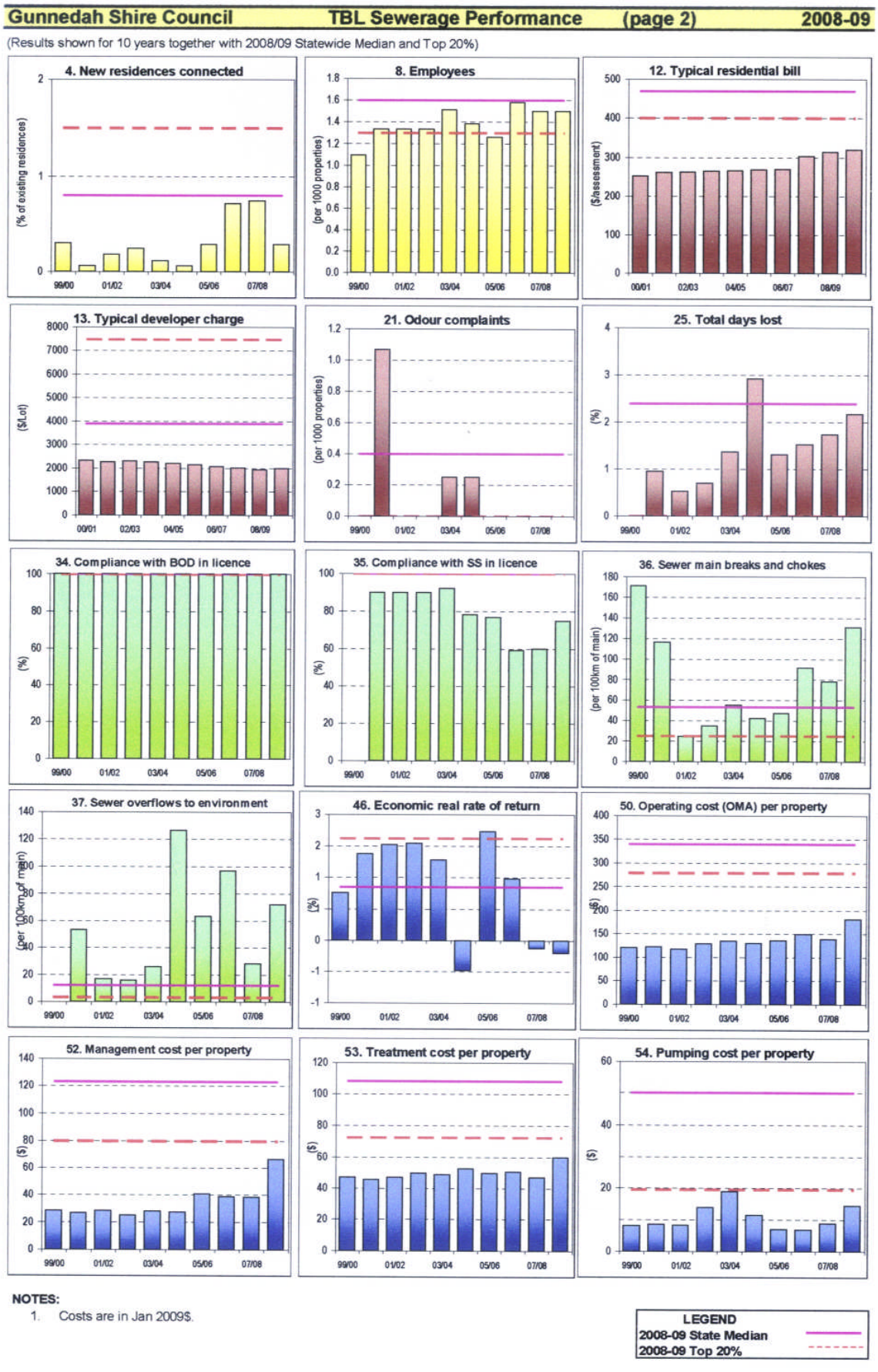

Table 3.9. The TBL Performance of Gunnedah Shire's Sewerage System over the past 10 years.

Table 3.10 shows components of the TBL performance of the sewerage system. It also provides a list of actions recommended to Council. These are yet to be adopted by Council.

Table 3.10. Key components of the TBL Sewerage System Performance in 2008-09 (Tables 3.8 and 3.9).

TBL component	Comment	Council action recommended	Council agreement status
Number of new connections is 0.3%. Table 3.9 shows the number of new residences connected has always been <1%/year.	This is indicative of relatively low current growth. It is consistent with the need for a simplified strategy	BaU	
Renewals expenditure is zero	This does not seem to take into account Council's sewer lining program on which $250,000/year has being spend over the past few years.	BaU: Commitment by Council to continue at this rate of sewer rehabilitation until overflow frequency is reduced to state median. Currently in 5th year of a 10 year plan.	
Residential access charge of $320/year. Table 3.9 shows gradual increase over past decade, but still only 80% of the top 20%ile of LWUs.	This is significantly lower than the state median. A new charging schedule commenced in July 2009. It is consistent with BPM and has a planned increase of 20% over 3 years.	BaU. Keep expenditure down, but consistent with maintaining the sewer rehabilitation program at current expenditure.	
Typical developer charge/tenement are low	Developer charges are currently being reviewed	BPM, implementing the new Development Servicing Plan to ensure that is a positive return on investment by Council.	
Non-residential charge per litre of sewage is 24% of state median	This is opportunity to increase returns on the sewerage infrastructure (see above). Also, Council's data needs to more accurately identify residential and non-residential properties.	BPM: Consider increasing rate/kL of sewerage from non-residential properties. A key justification for this is the need to address the high number of chokes and	

TBL component	Comment	Council action recommended	Council agreement status
		main breaks. New charges being phased in over 4 years.	
None of the sewage is tertiary treated	This is rational as the Gunnedah sewage used for irrigating cotton crops: The nutrients are valuable. For the cotton crop. The Curlewis sewerage system is small and relies on evaporation ponds. There is no reason for a tertiary system.	BaU	
Only 1% of urban properties do not have sewerage service.	This is extremely low and indicates a 'mature' system with moderate financial resources.	BaU	
Quality compliance not 100%	Should be 100%, however, algal activity is difficult to manage in the pondage treatment systems used at Gunnedah and Curlewis.	Local BPM.	
Service complaints per 1000 properties is high.	This is due to chokes main breaks and overflows. Council's relining program is assisting but complaints still high.	Council should ensure that the resources being spent on sewer system rehabilitation are directed at localities with the most need. Council to maintain spending until break, choke and overflow frequency is reduced to frequencies similar to those other LWUs.	
Volume of sewerage collected / property (163 kL/year) is low. The 2006 census indicated 2.65 persons/ occupied dwelling, so the production/person is	Suggests conservative use of water. Possibly also relatively high % lost via overtopping. The low volume/property suggests the current STP capacity would be sufficient for more than the estimated system	BPM. Check actual population being serviced and establish the actual number of residents who can be adequately served by	

TBL component	Comment	Council action recommended	Council agreement status
169L/day. This is 70% of the loading allowance of NSW Dept Commerce.	capacity of 12,650 EP.	the current system. Identify the difference between current population and anticipated population who could be served with the current system.	
According to the TBL for sewerage only 42% of effluent is being recycled.	This figure is incorrect as the difference between STP inflow and outflow at Gunnedah is due to pond evaporation/percolation. 100% of the remain water is sent to Gunnible Farm.	BPM. Council should consider a long term rolling contract to supply effluent from Gunnedah. The discrepancy between inflows and outflows at the Gunnedah STP be investigated.	
No biosolids reuse	The volume produced from a 12,650EP STP is relatively small and the regulatory requirements for a biosolids reuse scheme is onerous compared with the potential environmental benefits.	BaU.	
TSS (Total Suspended Solids) concentration does not meet license conditions in 25% of time	Should not be an issue as 100% of Gunnedah effluent is reused and 100% of Curlewis effluent evaporates.	BaU (provided 100% really is being utilised)	
Sewer main breaks and chokes/100 km is high.	Council's relining program is assisting but complaints still high.	Council should ensure that the resources being spent on sewer system rehabilitation are directed at localities with the most need. Check sewer business plan. Council to set a target date for reduction in breaks and chokes down to state median frequency (and allocate resources to	

TBL component	Comment	Council action recommended	Council agreement status
		achieve this result).	
Sewer overflows/ 100 km of main.	This is 6 times the state median	See comment above.	
Non residential plus trade waste as a % of sewage volume is low	This is a function of local industry. Additionally Council's billing system currently does not clearly distinguish between residential and non-residential customers.	BPM adjust billing information so that the different types of rate payers can be identified.	
Revenue/property is low being $350/y compared with a state median of $650/y	Provides potential to increase rate in order to accelerate sewer line rehabilitation.	Increase resources to enable accelerated sewer line rectification. (The large number of complaints by residents provides justification to rate payers).	
The revenue from non residential plus trade waste is low (5%) compared with the volume (11%) produced.	This is a cross subsidy in an area of Council services where there are unusually high number of complaints.	Council's billing data needs updating to separate residential and non residential sources. Council should charge in proportion to volume produced.	
Economic real rate of return is negative	This provides further justification for an increase in charges to enable a reduction in chokes and line breaks	BPM especially in relation to achieving a positive economic real rate of return. Council is reviewing its S64 Plan to address the sewer contribution shortfall.	
Return on assets is negative	Council has introduced a plan to increase charges by 7%/yr for 3 yrs commencing in 2010/11 to address this issue. All the BPM sewer charges commenced in 2009/10 with charges for non-residential users being phased in over 4 yrs. Council is currently in the second year of the phasing in	Adjust pricing to achieve a positive return AND accelerated action to reduce main breaks.	

TBL component	Comment	Council action recommended	Council agreement status
	period. The LTW policy came into effect from 2009/10 with charges also being phased in over 4 years commencing from 2010/11.		
The sewerage system generated $740,000 profit in 2008-09. (NWI F24, No. 47b in table 3.8, above)	Unlike many LWUs, Gunnedah Council achieved a profit. This seems inconsistent with a negative net return on assets. Additionally there are significant issues with customer complaints, main breaks and chokes.	Allocate increased resources to increase sewer rehabilitation activity.	
Operating and maintenance cost/100 km of main and cost/property is 53 to 55% of state median.	The number of customer complaints and the number suggests potential to increase expenditure on reducing customer complaints, main breaks and chokes.	See comment above	
Operating cost/kL of sewage is 77% of state median. Treatment cost/property is low.	Partly reflects the 100% reuse on industrial crop (secondary treatment only needed)	BaU, except for accelerated sewer line rehabilitation.	
Management cost per property is 54% of state median.	Suggests potential to increase expenditure on reducing customer complaints, main breaks and chokes.	Allocate increased resources to increase sewer rehabilitation activity.	
Pumping cost/property is low	Reflects good design and use of gravity	BaU	
Sewer main cost/property is average	Some potential for increase to reduce customer complaints, main breaks and chokes.	Allocate increased resources to increase sewer rehabilitation activity.	
Capital expenditure/property is 1/3 of state median	Minimal capital expenditure, so opportunity to accelerate sewer rehabilitation activity.	See above comment.	

Key points:

- Low capital, operating and maintenance costs. But….

- Relatively high number of complaints, main breaks and chokes compared with similar LWUs. So increase rates to be more in line with other LWUs, spending the additional resources on rehabilitation of sewer mains.
- Set a target date to reduces breaks, chokes and overflows to state median frequency. Allocate resources to achieve this.
- Some numbers seem incorrect, e.g the statement no. 27 in the TBL assessment (table 3.8) that only 42% of effluent is recycled (It is understood that this number is the difference in volume between inflow and outflow at the STP).
- The statement in line 47b in the TBL assessment (table 3.8) that the sewerage system made a profit in 2008/09 is inconsistent with having a negative net rate of return.
- Volume produced property is low compared with the rest of the state (around 70% of nominal 240 L/EP/day). This suggests there is large room for increased population without increasing the STP capacity. However according to the Dept of Commerce report in Aug 2008, Council's flow recording is inaccurate. **This issue needs to be resolved as it has major implications for the potential need to increase the STP capacity.**
- The non residential sector produces 11% of the total sewage volume, but contributes only 5% of the total revenue. Reduction of this cross subsidy would augment the resources available to address complaints, main breaks and chokes. However the accuracy of Council's records is in question.

Future expansion issues

Future increase in Gunnedah Shire's population may lead to a need to augment water and sewerage infrastructure.

Sewage collection system augmentation

The current sewage collection system is very efficient, with only 2 catchments (GHD, 2006). Th GHD report identified the potential for an additional 1016 residential allotments in the south and east sides of Gunnedah. A series of recommendations for improved sewage transfer was identified. The cost estimate is $2.46 m ($2006).

The need for this augmentation obviously depends on the likely increase in Gunnedah population and increased industrial activity in the western portion of the town.

Sewerage treatment scheme augmentation

Sewerage scheme augmentation in Gunnedah township was examined in detail in a 2009 study commissioned by Council (Dept of Commerce, 2009). The study used Census data to establish changes in population, number of dwellings and number of people per occupied dwelling. Between 2001 and 2006 the population of Gunnedah fell by from 11,988 to 11,524 or -0.8% per year. The number of occupied residences fell from 4,549 to 4,355 in the same period. In 2006 the occupancy ratio was 2.65/occupied dwelling. Approximately 13% of Gunnedah dwellings were unoccupied. These results suggest there is no need to allow for a significant increase in population. However, Council has plans to develop an industrial park in the western portion of Gunnedah. Potential developments for this area include a Flight Training academy, an ethanol plant and additional support industries for local coal mines.

The 2009 study examined several scenarios. A rapid pace development would result in over 30 ha of industrial development per year from 2011 to 2014, followed by a moderate development rate of

7 ha/year for the following 5 years. The report estimated that the development would add 529 ET/year for the first 5 years, then 122 ET/year in the second 5 years. Between 2008 and 2018 the residential EP would increase by 5%, but the non residential flows would increase by 4 fold from 1766 in 2008 to 8,791 in 2018.

Concerns over the viability of an ethanol plant and the impact of coal mining are likely to significantly reduce the rate of industrial expansion, and the lower growth rate of 7.2 ha/year commencing in 2015 is likely to be a more realistic scenario. At an estimated sewer flow of 17 ET/ha of industrial development (NSW Public Works, 1984), the 7.2 ha/year increase would generate a flow rate equivalent to an additional 122 ET/year. Assuming 2.65 persons/ET, this is equivalent to 323 EP/year or a 3% population increase/year. Even this rate of increase is unlikely unless there is a major change in mining policy.

The Department of Commerce 2009 report examined the current capacity of different components of the sewage treatment system. The component with the least capacity was the trickling filters. At a design rate for the trickling filters of 200g BOD/m^3/d, and a BOD production of 46g BOD/EP/day (Table 2.4 of Dept Commerce, 2009), the 3160 m^3 of trickling filters have a nominal capacity of 13739 EP[3] (3160 m^3 of trickling filter, with a treatment rate of 0.2 kg BOD/ m^3/day). Table 2.5 of the Dept Commerce 2009 report estimated the 2008 ET load as being 8830 residential and 1766 non-residential EPs, giving a total of 10596 EP. This suggests that a 30% increase in EP could be accommodated within the current trickling filters. Obviously this would change if BOD rich effluent entered the system. This could occur if the proposed ethanol plant was connected to the sewerage system. However effluent from industrial plants is unlikely to be accepted by the STP.

Key recommendations for sewerage system management

1 Set a target date for sewer rehabilitation to achieve state median frequency for breaks, chokes and overflows. Identify the financial resources needed to achieve this aim

2 Increase residential rates to provide resources to achieve the target reduction in breaks, chokes and overflows.

3 Increase non-residential rates to be proportional to the volume produced.

4 Indentify reasons for difference between inflow and outflow at the Gunnedah STP.

5 Determine opportunities for a rolling, long term contact to supply the effluent- Can the 10 year agreement be adjusted to allow re-negotiation after 5 years so that supply has a minimum of 5 year rolling guarantee?

6 Consider expansion of STP capacity as flow volume approaches 90% of nominal capacity (This would be a threshold of 12,365 EP or 2.97 ML/day).

7 Ensure that non residential sewage does not contain excessive contamination that could significantly increase the need for STP augmentation. In practical terms this means that the ethanol plant and similar proposals need to consider treating their own industrial wastewater rather than relying on Gunnedah's STP.

8 Ensure that developer contributions reflect the anticipated cost of augmentation.

[3] The 2008-09 TBL report for Sewerage performance suggests the trickling filters have 12650 EP capacity. The 13739 EP capacity was derived from the Dept Commerce, 2009 report and is based on actual flows and load measurements.

Table 3.11. Council responses to TBL sewerage system issues.

TBL issue	Recommended Council actions	Council agreement status	Measure of intention	Time table for implementation
Frequency of customer service complaints, sewer main breaks and chokes and overflows are all much higher than state median.	Council set target date for achieving state median frequency for customer service complaints, sewer main breaks and chokes and overflows		Establish target date. Determine budget required Put in formal commitment	Immediate
Non-residential contribution to rate income appears to be less than its proportion of total sewage volume produced within Gunnedah.	Collect and verify data Remove cross subsidy via increasing non residential rate		Rearrange data collection so that residential and non-residential sewage flows and charges are kept separate. Council to commit to complete removal of cross subsidy revealed as a result of more accurate data collection	2010 2011 to 2013 gradual increase in rates to remove cross subsidy.
Inflow to STP is over 90 ML greater than outflow. Approximately 55 ML/y could be due to evaporation.	Council to check flow metering. If there is still a discrepancy examine infiltration to groundwater. NOTE: Curlewis		Council to examine inflow and outflow in the light of the Dept of Commerce report/	2010-identify any inconsistencies in data

TBL issue	Recommended Council actions	Council agreement status	Measure of intention	Time table for implementation
	produces insufficient effluent to make reuse viable.			
Effluent reuse contract is relatively short term, yet the issue of sustainable disposal of effluent is permanent. An additional issue is that there is only one recipient of the effluent.	Council has set up a 10 year contract. To be reviewed in 2019.		Enter into negotiations with cotton farm after 5 years (2015), to set up a rolling agreement. Consider option to put water out to long term tender.	2015 commence negotiations.
At least parts of the Gunnedah STP may approach capacity in the next decade	1 Review flows against the Dept Commerce (2009) flow capacity each year. 2 Commit to staged augmentation once 90% of capacity is reached.		Agree to the actions. Item 2 is estimated at >$8m. Council should agree to this PROVIDED there is a demonstrated need.	2010-07-07 Annually when preparing TBL report. Committed to completing integrity study of existing STP and a concept study in 2010/11 ($60K allocated).
Industrial expansion may generate significant volumes of high strength wastewater. Council's conveyance and STP may not have the	Council makes it very clear to new industries that any industrial wastewater must be treated and		Council has set policy regarding industrial wastewater management.	LTW Policy now in place

TBL issue	Recommended Council actions	Council agreement status	Measure of intention	Time table for implementation
capacity to process the volume.	independently disposed of the that industry. Another model involves allowing the industrial wastewater to enter council's system provided the industry pays the full cost of treatment and disposal.		NOTE: If Council decides to accept industrial wastewater it should require full environmental and economic assessment so that the cost is 100% borne by the industry	
Current developer contributions are unlikely to reflect the full anticipated cost of augmentation. This is especially true of industrial sites.	Set development charge rates to ensure 100% cost recovery.		Currently being reviewed.	Implement in 2010-2011, or at least ***before*** industrial development commences to accelerate.

3.1 Stormwater

There is minimal information of stormwater despite Council commissioning an Urban Stormwater Management Plan. This lack of knowledge is a serious issue as information on catchment sizes, runoff coefficients and contaminant concentrations are needed to ensure all structural improvements are adequately sized.

The issues can be itemised as:

1 Almost no data on runoff volumes or contaminant loads, yet initial calculations suggest urban stormwater runoff is adding significant contaminant loads to the Namoi River

2 No On Site Detention (OSD) Policy yet local flooding occurs during moderate rainfall events

3 Subdivisions need to be designed using WSUD principles

4 Urban salinity is a highly significant issue in parts of Gunnedah. Urban stormwater can contribute to this problem

5 Opportunities for stormwater capture and reuse need to be explored (eg the Golf Club)

6 Rainwater tanks need to be more widely used and to be connected to toilets and washing machines as well as to garden taps in Gunnedah. This is considered an important way to reduce peak flows during storms. Their use to provide potable water in urban areas where bore water does not meet ADWG criteria should be actively encouraged. BASIX addresses rainwater tanks for new development, but Council should encourage shire wide adoption.

Potential solutions to each of these issues are discussed below in table 3.12. Note that Council is yet to agree to the recommended responses.

Table 3.12. Council responses to stormwater issues.

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
Lack of data on stormwater volumes, contamination or management options,.	Council undertakes a review of stormwater management, including 1. Targets for water quality and reuse, 2. Assessment on impacts on township, and 3. Policies on OSD and WSUD		Put in formal commitment to review stormwater management in Gunnedah Allocate $20,000 for a draft Stormwater Strategy	2011 financial year
No On Site Detention (OSD) Policy yet local flooding occurs during moderate rainfall events	Require development of OSD policy based on development not increasing peak flow above current rates for storms up to 100 Y ARI.		All future major subdivisions are required to provide temporary on-site detention structures	2011
No Water Sensitive Urban Design (WSUD) policies being developed and implemented.	Require development of WSUD policy designed to not increase peak flows and to reduce		Commit $15,000 to establish a WSUD policy.	2012

TBL issue	Recommended Council actions	Council agreement	Measure of intention	Time table for implementation
	contaminant loads compared with conventional urban development (See table 3.13 below)			
Urban salinity is a highly significant issue in parts of Gunnedah	Reduce losses from stormwater, sewer and potable water pipe systems.		CMA is monitoring problem. Council's relining of mains will assist. Drought has also reduced the importance of this issue.	Continuing
Only a small proportion of stormwater is capture and treated or reused.	Undertake an assessment of opportunities to reduce stormwater impacts via combinations of reuse and treatment The Golf Club already captures and reuses some stormwater. Mullabah Lagoon could also be used		Allow $15,000 for a town-wide assessment of opportunities (could be undertaken as an additional task in the proposed Stormwater Strategy for Gunnedah township.	2011
Rainwater tanks are largely limited to small urban centres, yet they can be used to reduce demand on potable water supplies	Encourage rainwater tanks as part of the BASIX program for new homes.		Council adopts a rainwater tank policy	2012

Table 3.13. Best Practice Stormwater Management target reduction compared with conventional development impacts.

Contaminant	Best Practice Stormwater Targets (% reduction compared with conventional urban development)
Total Phosphorus (kg/yr)	65
Total Nitrogen (kg/yr)	45
Total Suspended Solids (kg/yr)	85
Gross Pollutants (kg/yr)	90

A number of drainage problem area have been identified in the Gunnedah Urban Area. These include increased system maintenance needs as a result of infill development and the impact of local flooding events.

It is recommended that Council compete a full strategic stormwater management report which collates historical stormwater records and investigations with hydraulic modelling to provide an overall assessment of the service levels currently offered by the drainage system. A 10 year strategic plan is needed to establish priorities for construction and maintenance of stormwater infrastructure.

4. CLIMATE CHANGE AND URBAN WATER PLANNING

4.1. Impacts on water availability

The predicted impacts of climate change was examined in CSIRO (2007): Water availability in the Namoi. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project. According to this report, the 1997 to 2006 rainfall and runoff are not statistically different to the long-term averages. However an examination of potential trends over the next 20 years predicts that future runoff in the Namoi region is more likely to decrease than increase. The best estimate 2030 climate scenario is a 6 percent reduction in mean annual runoff. Under the best estimate 2030 climate there would be a 5 percent reduction in water availability. General security water use may decrease by 3 percent. High security stock and domestic use in the Namoi may decrease by 1 percent.

Council is currently undertaking a climate change impact study under the Federal Government's Strengthening Basin Communities Program.

4.2. Impacts on agricultural productivity.

In 2007 Namoi CMA staff member Bruce Brown produced an overview of socio economic impacts of climate change. His data was largely derived from a study by ABARE, CSIRO and QDNRW (2007) and is summarised in table 4.1.

Table 4.1. Effect of a low rainfall scenario on productivity of dryland agriculture in inland central NSW (Source: ABARE, CSIRO and QDNRW, 2007).

Scenario	Gross regional production	Wheat	Sheep meat	Wool	Beef
Change in productivity for low rainfall scenario		-4%	-1.8%	-2.1%	-1.8%
Change in economic output for low rainfall scenario	-1.8%	-7%	-2%	-1%	
Change in economic output for low rainfall scenario, but with adaptive management	-0.5%	-3.4%	-1.1%		-0.5%

The report noted however that 48% of the value of Namoi agriculture was generated by irrigation.

4.3. Impacts on Gunnedah Shire Council's activities.

Gunnedah Shire urban areas are reliant on groundwater for potable supplies. A 1 to 3% fall in availability is not large, however the 6% reduction in runoff and a 5% fall in general availability will have two significant effects:

- Firstly, it will increase competition for groundwater supplies.

These are the main water source for the local irrigation industry. Decreased runoff means even less water will percolate to the groundwater system, so the sustainable yield of groundwater will be

less. Whilst individual urban centres have considerable 'buffer' between their current water consumption and their allocation, the volume of this buffer will shrink if much of the development proposed for Gunnedah over the next 20 years actually occurs.

As an example the proposed ethanol plant is likely to require some 400 ML/year of water. The total water allocation to Gunnedah is 3900 ML. In recent years water consumption has been 2200 to 2400 ML. This suggests there is approximately 1600 ML/year that is not currently required. The ethanol plant alone would use some 25% of this 'excess'.

A complicating issue with the ethanol plant could be that the 3900 ML/year allocation is for the urban population use, not for industries. The importance of this issue is dependant on the competition of water supplies and on the extent to which the 400 ML can be productively recycled.

- Secondly, reduced rainfall and runoff will increase demand for urban irrigation of lawns, whilst reducing stormwater peak flows.

Increased demand for irrigation water can by addressed by a combination of drought restrictions as per the Drought Management Plan and by increased usage of rainwater tanks.

Increased substitution of rainwater tank supplies for actions such as garden watering, toilet flushing and laundry will decrease the demand for potable water for domestic usage.

An additional benefit of rainwater tanks is that the volume of stormwater exiting is reduced. A simulation was undertaken based on 4400 dwellings, 10% of which and a 10 kL rainwater tank. The water was used for toilet flushing (100 L/dwelling/day) and irrigating up to 400 msq of garden. It was assumed that 150 msq of roof area drained to the tank. The median allotment area was 874 msq (Woodlots and Wetlands, 2006), 274 msq of which was impervious.

Total annual demand for rainwater was 88660 kL or 201.5 kL/dwelling/year. Table 4.2 shows the impact of having 10% of dwellings having 10 kL tanks.

Table 4.2. Effect on export of stormwater and associated contaminants of having 10% of dwellings with rainwater tanks or of having the runoff reduced by the 6% predicted by climate change models.

Component	Production without 10% tanks	Production with 10% tanks	% reduction	6% flow reduction
Flow (ML/yr)	719	686	4.6	676
Total Suspended Solids (kg/yr)	131000	124000	5.3	132000
Total Phosphorus (kg/yr)	285	271	4.7	275
Total Nitrogen (kg/yr)	2060	1970	4.5	1910
Gross Pollutants (kg/yr)	31800	30700	3.5	30400

The 4.6% reduction in outflow volume resulting from 10% of dwellings having rainwater tanks is less than the 6% reduction in runoff suggested by the climate change models (CSIRO, 2007) for the year 2030.

Obviously the impact on runoff of increasing the number of swellings with rainwater tanks connected to toilets and irrigation systems could outweigh the predicted impact of climate change.

4.4. Conclusions

Climate change MAY have an impact on water availability, especially if Gunnedah's need for water increases substantially. It is prudent to examine the likely ability to supply future water needs before encouraging industries with large scale water demand to establish in the area.

The impact of climate change for the area is predicted as being a 6% reduction in runoff. A similar of reduction in runoff would be achieved if approximately 15% of dwellings in Gunnedah installed 10 kL rainwater tanks.

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APPENDICES

Appendix 1. Letter of Approval of the IWCM Evaluation Study. .

SCANNED
6 - OCT 2009

NSW GOVERNMENT | Office of Water

Reference No:2006-0655

General Manager
Gunnedah Shire Council
PO Box 63
GUNNEDAH NSW 2380

Attn: Mr Robert Campbell

Re: Approval of Integrated Water Cycle Management (IWCM) Report
Gunnedah Concept Study (March 2009)

Dear Mr Campbell

The above IWCM report has been reviewed and is considered satisfactory subject to the attached conditions. The attached conditions cover areas where improvements could be made to more fully comply with the IWCM requirements and they will need to be covered when completing the IWCM Strategy.

This strategic approach for managing the urban water services has set in process the opportunity for a sustainable water service for the local community and industry well into the future. The effort you have put into completing this strategic urban water service planning work is clearly evident.

As the urban water service provider, local water utilities need to ensure long term water security by giving consideration to the likely impacts of climate change on water availability, infrastructure and customer behaviour. To assist with future assessment of climate change I have attached the Climate Change appendix from the IWCM Generic Scope of Works 2008.

Having successfully completed your first IWCM Concept, you are eligible to submit a claim for subsidy, in accordance with the grant offer approved by the Minister for Water on 22 July 2009. Council should send its Certificate of Expenditure and a request for payment to the NSW Office of Water, Sydney, GPO Box 3889, Sydney 2001, attention Mr Ernest Yeung, Grants and Finance Manager, 02 8281 7321.

Yours sincerely

Mike Partlin 1/10/09
A/Executive Director
Urban Water

Department of
Environment, Climate Change and Water NSW

Level 17, 227 Elizabeth Street, Sydney | GPO Box 3889 Sydney NSW 2001 | t 02 8281 7777 | f 02 8281 7799 |
www.dwe.nsw.gov.au

Approval Conditions for:
Gunnedah Integrated Water Cycle Management Concept March 2009

The following conditions are attached to this approval to assist Gunnedah Shire Council give greater consideration to all IWCM issues and sustainable water service options for the shire. These items should be considered when preparing the IWCM Strategy.

- **Definition of Issues**: Issues should be described in more detail with clearer links to actions which will solve them, especially where existing commitments have not yet started but are relied upon to solve the issue. The 'Business as Usual' work to solve issues is presented in general terms without details of work, costs or timing being provided to clearly show how the issues are solved.
- **Water Quality**: It appears that the biggest issue is that the mains water provided does not meet the Australian Drinking Water Guidelines (ADWG) in some cases, raising health risks. Tables 2.16 to 2.19 detail the failures to meet ADWG. Failure to meet ADWG standards needs to be given further consideration as chlorination alone will not solve all the issues found. The use of rainwater tanks to provide an alternate potable water source, as indicated on page 85, in an urban area is not a recommended long term solution. Recommendation 2 in Section 4.3 that 'Council require all new residences to install rainwater tanks at least 5,000 L capacity and to connect the tanks to supply drinking water in centres where ADWG are consistently not been met', is not considered an appropriate recommendation. Council should be providing a potable supply through the reticulated system to these urban centres.
- **Water Loss and Leakage**: The information provided in Table 5.1 on these two issues is unclear. Potable water leakage is considered high and needing reduction, yet water loss is considered normal without actions being required. Better clarification of these two types of lost water needs to be provided.
- **Reliability of the Water Supply**: Table 5.1 indicates that the water supply is reliable. This may be true for volume; however a potable supply also needs to have quality reliability, which in this case is not correct.
- **Cost of Sewerage Service**: Tables 3.10 and 5.1 indicate that costs are low compared with other similar utilities. However there are costs to the customer and environment which are not considered in this finding. Table 3.9 lists these other areas of non financial cost.
- **Issues not covered in the present Strategic Business Plan**: The following is an extract from section 4.4 (following tables 4.5 and 4.6). These issues need to be given additional assessment when commencing the Strategic Study.
  - Water supply:
    1. Security of groundwater supplies
    2. Quality of groundwater especially in areas where ADWG criteria are not being met
    3. Urban salinity
    4. Aging infrastructure
    5. Adequacy of pressure to new subdivision in more elevated portions of Gunnedah
    6. Water use is high despite the drought
    7. Water loss as a % of volume pumped
  - Sewerage:
    1. Aging infrastructure
    2. Security of the reuse scheme
    3. Impacts of infiltration and leaks on the environment
    4. Design of new subdivisions to ensure adequacy of services
    5. Impacts of new industries that will place a large load on the STP

IWCM Generic Scope of Works 2008 Appendix C - Impacts of Climate Change

Appendix C – Climate change and urban water planning

Climate change impacts on town water supplies throughout NSW need to be considered within the IWCM Evaluation. The long term climate forecast is predicting longer, hotter and drier cycles of weather and greater storms.

The following is a list of possible climate change impacts relating to water service planning. The water utility needs to determine whether these impacts are relevant to the water services it is providing and if so, are they likely to affect its ability to maintain desired levels of service to its customers.

External impacts

- reduced annual rainfall and runoff (catchment, urban and roof)
- increased variability in rainfall
- increased maximum temperature
- increased evaporation
- greater competition for existing water sources
- coastal erosion
- increased height and frequency of flooding
- lowered or raised water table
- changed soil moisture contents.

Utility impacts

- changed water access licence conditions (eg less access to low flows)
- greater uncertainty about sustainable yield from existing water sources
- greater damage to underground infrastructure due to ground movement
- increased interest in rainwater tanks, stormwater harvesting and use of recycled water
- reduced sewage volume
- increased sewage retention time in rising mains
- increased raw sewage nutrient and chemical concentrations
- changing related technology and legislation
- greater interest in or need to use low carbon dioxide (green) energy.

Customer Impacts

- increased customer total or seasonal water usage demand
- greater grey water use
- greater external and evaporative cooler water demand
- movement of people and industry from areas of water shortage.

Identifying the major risks to the water utility of climate change impacts and addressing these risks is required as part of the IWCM Evaluation and Strategy.

Appendix 2.

Copy of email correspondence regarding preparation of a simplified IWCM Strategy.

Peter,
Confirming that a Simplified Strategy is OK, subject to addressing the approval conditions for the IWCM Concept.
Please call if any further queries.
Regards,
Ian Burton
P:67019643

From: Ian Burton
Sent: Thursday, May 27, 2010 10:31 AM
To: 'Peter Bacon'
Cc: 'kevinsheridan@infogunnedah.com.au'
Subject: RE: Gunnedah IWCM Strategy

Peter,
I hope to be able to respond to your email in the next day or so.

At this stage, I think a Simplified Strategy is likely to be appropriate, subject to addressing the approval conditions sent to GSC on the IWCM Concept. Also, subject to review of IWCM in Gunnedah Shire in 6 years, at which time the population growth and need for enlargement of the Sewerage Works can be re-assessed.

Regards,
Ian Burton

From: Peter Bacon [mailto:woodlots@optusnet.com.au]
Sent: Thursday, May 27, 2010 9:59 AM
To: Ian Burton
Cc: 'Sheridan - Kevin'
Subject: Gunnedah IWCM Strategy

Hi Ian,
Thank you for the useful comments regarding the IWCM evaluation for Gunnedah.

Gunnedah Shire Council has now asked me to prepare its IWCM Strategy. This strategy will address the comments in the Department's letter approving the Evaluation.

Following discussions with Council, it is evident that no significant capital works are planned in the next 10 years.

Depending on the expansion of the coal and other industries nearby there may be some increase in urban population, however this is by no means certain.
Additionally the most likely issue would be the need to increase the capacity of the STP.

However the STP is designed for 120% of the current population and a 20% increase in the next 10 years is considered unlikely.

I am therefore seeking Departmental concurrence to prepare a simplified strategy. I would greatly appreciate your comments on this proposal.

Regards

Peter Bacon
94842700