



**Melbourne
Water**

Sugarloaf Pipeline Project

Preliminary Investigations:

Safe & Acceptable Drinking Water

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Prepared:
Melbourne Water

Note:

The preparation of this report has been based on existing information available at the time of the assessment and designed to identify the broad water quality issues associated with the Sugarloaf Pipeline Project proposal. Detailed refinement, analysis and discussion with critical stakeholders will be required in the future.

1 INTRODUCTION

1.1 SUGARLOAF PIPELINE PROJECT

The Food Bowl Modernisation Project will make 225 GL of new water available that will be recovered by fixing leaks, inefficiencies and evaporation from an ageing irrigation infrastructure. 75 GL of this 225GL will be made available to be transferred to the Melbourne system. Water will be harvested from the Goulburn River near Yea and transferred at a rate of 300 ML/day via a pipeline that would follow the Melba Highway route to Sugarloaf Reservoir to provide a supply of up to 75 GL/annum to Melbourne.

1.2 SAFE & ACCEPTABLE DRINKING WATER

The metropolitan water businesses have obligations pertaining to the safety and acceptability of water to consumers, through a number of legal obligations (statute and common law).

This report is intended to provide preliminary water quality assessment to support a strategic evaluation of the augmentation project. .

2 SOURCE WATER QUALITY ASSESSMENT

This section is a high level review of the Sugarloaf Pipeline Project catchment, and explores the compatibility of water sourced from the Goulburn with water in the Sugarloaf Reservoir.

2.1 CATCHMENT CONDITION & USE

The Goulburn Broken Catchment Management Authority is the waterway manager and caretaker of river health for the Goulburn Basin. Goulburn-Murray Water manages large-scale water storage, delivery and drainage systems, and Goulburn Valley Water provides urban water and wastewater services.

The Goulburn River itself is 570 km long, flowing from upstream of Woods Point to Echuca. The pipeline extraction point is located approximately 60 kms downstream of Eildon Reservoir. Lake Eildon has a capacity of 3,390 GL and supplies more than half of the water used in the Shepparton Irrigation Region. On-water recreation, including houseboats, is an important value of the Lake. Operation of Lake Eildon has reduced winter/spring flows passing Eildon and increased summer/autumn flows so that the flow regime is reversed from the natural regime.

By far, the major land use in the Goulburn Basin is general dryland agriculture, covering over 62% of the area of the basin. There is aquaculture undertaken in the basin that is licensed by the Victorian EPA. Irrigation in the Goulburn and Broken Basins is undertaken in the Shepparton Irrigation District, which is outside the catchment area for the Sugarloaf Pipeline Project.

Around 69% of the Goulburn Basin is used for water supply delivery (irrigation or potable) and around 18% is used for potable water collection. Passive recreation is

popular over 64% of the Goulburn Basin, while fishing is regarded as popular over 35% of the Goulburn Basin. Other recreations (sports and camping) are less widespread, but locally important. Thirty percent of the Goulburn length is used for high value formal tourist use, or has a tourism focus (it should be noted that a further 39% is used informally, incidentally or seasonally).

The Goulburn River has significant heritage value, and the heritage river corridor extends 430 km downstream from Lake Eildon to the confluence with the Murray River near Echuca. The heritage status of the corridor was identified due to a number of environmental and social values (including remnant vegetation, habitat, fish diversity, and cultural heritage values). The Big and Howqua Rivers are also heritage rivers.

Information relating to the condition and use of the catchment of the Sugarloaf Pipeline Project is shown below:

Description	CMA Management units in the catchment					
	Mid Goulburn River	Northern tributaries	Acheron, Rubicon and Taggerty Rivers	Upper Goulburn catchment	Majors Creek and Hughes Creek	King Parrot Creek/Yea River
Number	U1 (u/s Murrindindi Crk)	U5	U6	U7	U2 (small area)	U4 (small area)
Length (km)	Approx. 60	110	100	200	N/A	N/A
Index of stream condition	Very poor	Very good	Very good	Very good (apart from Goulburn R: very poor)	N/A	N/A
High priority reaches	Goulburn River	None in pipeline catchment	Rubicon R., Taggerty R. Acheron R. (u/s Taggerty R.)	Delatite R., Howqua R., Goulburn R., Big R.	None in pipeline catchment	None in pipeline catchment
Declared Water Supply Catchments	None in pipeline catchment	Upper Goulburn Lake Eildon	None in pipeline catchment	Upper Goulburn Lake Eildon	None in pipeline catchment	None in pipeline catchment
Townships & localities (population)	Alexandra (2,080) Eildon (700) Snobs	Mansfield (2,659) Bonnie Doon (557)	Marysville (592) Narbethong	Jamieson (3,723)	N/A	N/A
Wastewater (discharge, reused, ML/a)	Alexandra (159, 127) Eildon (88, 83)	Mansfield (0, 205) Bonnie Doon (0, 15)	Marysville (0, 79)	Upper Delatite (0, 26)	N/A	N/A
Predominant landuse	Grazing improved pasture	Grazing improved pasture	Forestry/Nature conservation	Forestry/ Nature conservation	Grazing improved pasture	Grazing improved pasture
Other significant landuse	Irrigation improved pasture, Small towns	Forestry, Other minimum intervention use (livestock grazing)	Grazing improved pasture	Grazing improved pasture	Forestry	Forestry
Minor landuse	Irrigated cropping	Perennial horticulture, urban use, intensive horticulture	Irrigation improved pasture, Small towns	N/A	N/A	N/A

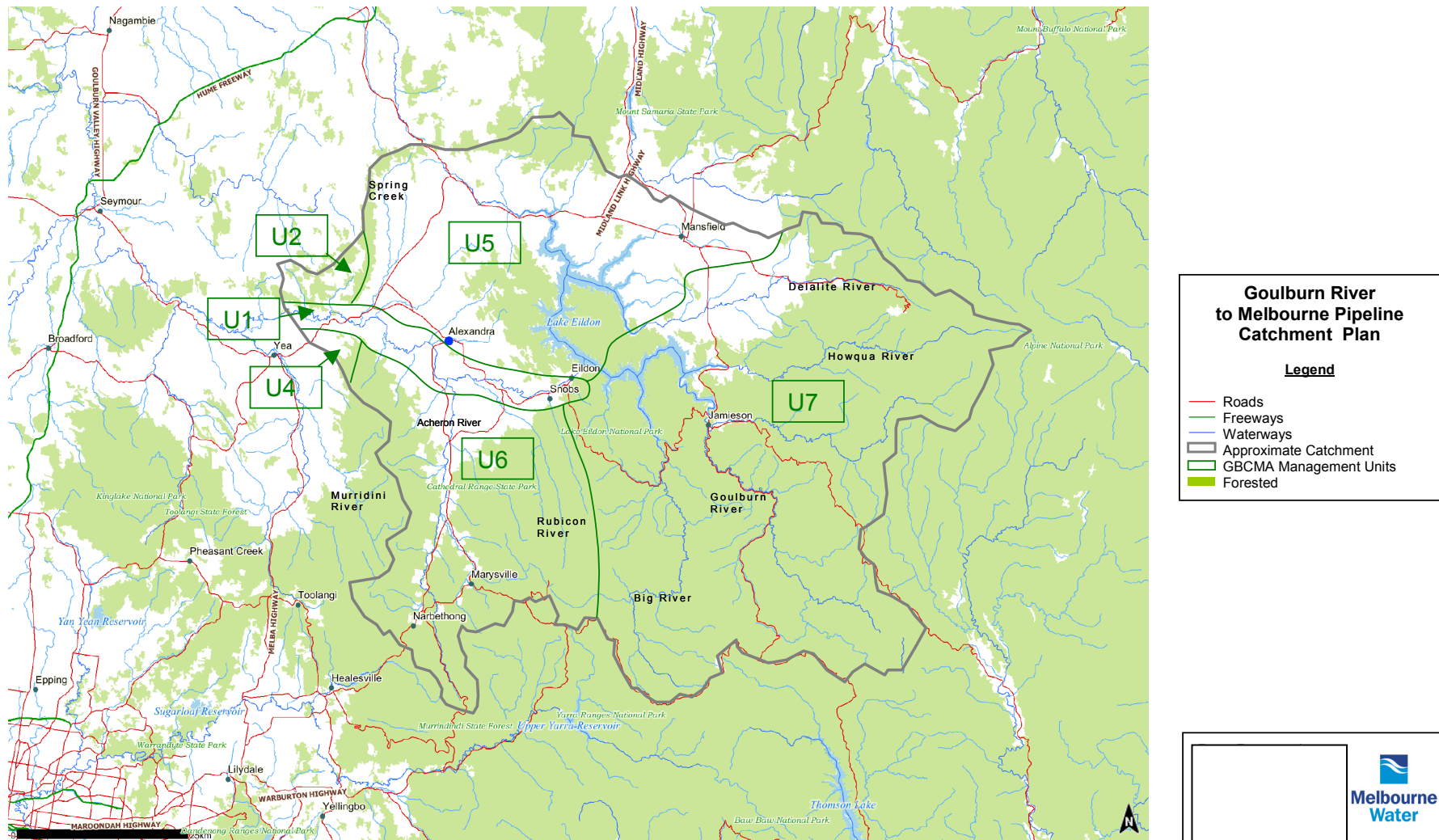


Figure 1. Catchment Plan for the Sugarloaf Pipeline Project (approximate only).

The landuses and activities in the catchment for the Sugarloaf Pipeline Project are not significantly different to those that exist in the Yarra River catchment to Sugarloaf Reservoir. Similar landuses and activities include:

- Significant forestry
- Significant dryland agriculture
- Perennial horticulture
- Irrigated cropping
- Urban settlements and small sewage treatment plants

In general, these risks are well managed through conventional filtration and disinfection regimes.

Melbourne Water and Goulburn Valley Water have adopted similar water treatment processes for the Yarra River at Winneke Water Treatment Plant and the Goulburn River at Alexandra Water Treatment Plant. The similarity in adopted treatment approaches is consistent with a similar risk profile of both water catchments.

In summary, while the nature and variability of the level of risk has not been quantified, the preliminary assessment of catchment use and condition is that it is similar to the existing Yarra River to Sugarloaf Reservoir Catchment where these risks have been successfully managed for many years.

2.2 AVAILABLE WATER QUALITY DATA

Extensive water quality information has been collected for the Goulburn Basin. In total, over 13,000 sites have been used to collect hydrologic and water quality data. A preliminary review of the available data has indicated significant water quality data is available for the catchment of the Sugarloaf Pipeline Project.



Figure 2. Water monitoring sites in the Northern Goulburn catchment.

For the purposes of the preliminary assessment, data collected at Eildon and Seymour has been summarised below:

Parameter	Goulburn River @ Seymour				Goulburn River @ Eildon			
	Data Range	5%ile	Average	95%ile	Date Range	5%ile	Average	95%ile
Alkalinity (mg/l CaCO ₃)	1977-1990	14	17	24	1996-2007	13	17	20
Electrical Conductivity (uS/cm)	1976-1990	51	104	217	1975-2005	44	60	72
Colour (Pt/Co)	1977-1990	10	55	160	1990-2007	5	14	30
pH	1976-1990	6.1	7.1	8.0	1975-2007	6.0	6.7	7.4
Total Nitrogen (mg/L)	1977-1990	0.3	0.6	1.6	1990-2007	0.2	0.3	0.4
Total Phosphorus (mg/L)	1978-1990	0.01	0.03	0.08	1990-2007	0.01	0.01	0.02
Turbidity (NTU)	1976-1990	0.6	12	41	1975-2007	1	5	22

Data sourced from Department of Sustainability and Environment Data Warehouse.

The water quality data for the Goulburn River is generally typical of inland Victorian streams open to agricultural activity that are often utilised for water supplies. A trend analysis of pH, nutrients, turbidity and electrical conductance has demonstrated relatively stable water quality in the region.

2.3 SUGARLOAF RESERVOIR AS A RECEIVING WATER BODY

Sugarloaf Reservoir is a concrete faced rockfill embankment, supplemented by two saddle dams, forming an offstream storage 33 km north-east of Melbourne. It is Melbourne's 4th largest reservoir completed in 1981 with a capacity of 96,000 ML.

Nutrient concentrations in Sugarloaf Reservoir are typical for a reservoir with a catchment that includes the types of landuses discussed earlier. As would be expected, nutrient levels are generally higher than other Melbourne reservoirs such as Silvan and Cardinia, which are forested catchments. Additional nutrients may also arise from releases from sediments driven by temperature stratification. Despite comparatively elevated nutrients, there have been no serious algal problems in Sugarloaf.

The following table compares water quality data for the Goulburn River at Seymour which can be considered a worse case scenario. The comparison shows that even under a worse case scenario, water quality is comparable to water in Sugarloaf Reservoir. Where water quality parameters for the Goulburn River water were worse (i.e.: alkalinity and total nitrogen), they still fall within accepted limits for drinking water. The comparison indicates the Winneke Treatment Plant at Sugarloaf Reservoir would be sufficient to deal with water from the Goulburn River under this scenario. This is discussed further in the next section.

Parameter	Sugarloaf Reservoir at Surface				Goulburn River vs. Sugarloaf		
	Data Range	5%ile	Average	95%ile	Worse	Same	Better
Alkalinity (mg/l CaCO ₃)	1980-1995	9	12	15	██████		
Electrical Conductivity (uS/cm)	1980-2007	65	97	130		████████████████	
Colour (Pt/Co)	1980-2007	12	30	55		████████████████████	
pH	1980-1995	7	7	7.5		██████████████	
Total Nitrogen (mg/L)	2003-2007	0.2	0.3	0.4	██████		
Total Phosphorus (mg/L)	1980-2007	0.01	0.03	0.07		██████████	
Turbidity (NTU)	1980-2007	1	4	13		████████████████████	

Data sourced from Melbourne Water's water quality database. Goulburn River comparison is conservative (i.e. worst case) and based on Seymour data.

3 WATER TREATMENT REQUIREMENTS

This section is a review of the capability and capacity of the Winneke Water treatment plant to reliably treat Goulburn River water to acceptable standards.

3.1 WINNEKE WATER TREATMENT PLANT

The Winneke Water Treatment Plant is a conventional treatment plant utilising coagulation & flocculation, upflow clarification, rapid granular media filtration, and chlorination.

3.1.1 RAW WATER CAPABILITY

In general the water quality data presented in section 2.2 suggests that the Winneke WTP can adequately treat the water at the current plant throughputs (120GL/year at 560ML/day capacity).

Following is a summary of the treated water quality from the Winneke WTP.

Parameter	Winneke Treated Water Data				
	Data Range	Location	5%ile	Average	95%ile
Alkalinity (mg/L)	1997-2007	Winneke Preston Main (Research)	8	12	20
Conductivity (S/cm)	1999-2007	Winneke CWS Outlet	106	120	140
True Colour (Pt/Co)	1987-1995	Winneke CWS Outlet	2	2.4	5
Apparent Colour (Pt/Co)	1997-2007	Winneke CWS Outlet	1	2	3
Total Nitrogen (mg/L)	1981-1987	Winneke CWS Outlet	0.3	0.5	0.9
Total Phosphorus (mg/L)	1997-2007	Winneke Preston Main (Research)	0.002	0.02	0.08
Turbidity (NTU)	1997-2007	Winneke CWS Outlet	0.05	0.3	0.6

3.1.2 OPPORTUNITIES TO OPTIMISE CAPACITY

There are several options for maximising Melbourne's treatment capacity to allow an additional 75GL/annum - these are presented below.

With the current level of resourcing, Winneke can treat 560ML/day over 9 months of the year (275 days) this results in a potential upper limit of 150 GL/annum. The successful implementation of any option, which would result in a flow output above

560ML/day, would necessitate a flow test trial to ensure the plant hydraulics and treatment techniques (e.g. flocculation time) can sustain the increase in plant flows.

Increase Plant Reliability

With additional resourcing and plant upgrades it's estimated that the plant could operate at a higher reliability. This would result in a plant throughput of up to 170 GL/annum from a combination of both Yarra and Goulburn River sources.

4 FURTHER INVESTIGATIONS

The water quality assessment undertaken in this report is preliminary. In order to comply with the obligations pertaining to the quality of Melbourne's drinking water, further investigations are required.