Annual Report for Water Quality 2010/11

GWMWater

2010 - 2011 Annual Report for Water Quality

The last year is one which the Grampians, the Wimmera and the Mallee will remember for quite some time. It was a year when major flooding occurred in all regions, flooding which caused wide spread damage to many communities and tourist attractions. In many instances, it will take some years to recover from the damage the floods caused to people's property, town amenities and the environment.

GWMWater worked with communities to help restore vital infrastructure and services in the aftermath of the floods. During the restoration works it became apparent that the flood events would provide GWMWater with long lasting and challenging issues to deal with. Whilst the floods had provided a much needed boost to the region's water resources, it came with a large toll. The floods gave rise to immediate and large scale deterioration in the quality of the water contained in the Murray River and several major storages in the Grampians headworks.

Increases in the turbidity and colour concentrations made the water supplied to customers aesthetically unacceptable. To counter the increased turbidity concentrations twelve towns were placed on boil water notification. The notices were issued for precautionary reasons only, and there has been no incidence of pathogens being detected during routine testing. GWMWater also supplied affected towns with alternative drinking water supplies as a measure of ensuring the customers of those towns had continuing access to drinking water.

GWMWater is currently working on a number of initiatives to improve the quality of the water supplied to customers affected by highly turbid water supplies. These projects include short term innovative and cost effective projects such as adding flocculent to town storages to reduce turbidity and colour. The implementation of a filtration system as a trial at Manangatang and other long term project options under consideration will assist in providing water of better quality to customers.

Jeff Rigby

Managing Director

Section 23 of the Safe Drinking Water Act 2003 requires Grampians Wimmera Mallee Water Corporation (GWMWater) to make available for inspection by the public the results of any water quality monitoring program conduced on any drinking water suppled by GWMWater. Customers and members of the public may access drinking water quality data by contacting GWMWater either by telephone on 1300 659 961 *or by the internet at* www.gwmwater.org.au.

Revision	Revision Date	Details	Authorised
1	13 September 2011	Draft for internal review	Greg Whorlow
2	19 September 2011	Water Quality review	Dick Van den Bosch
3	20 September 2011	Executive review	John Martin
4	26 September 2011	Department of Health review	David Sheehan
5	13 October 2011	Managing Director review	Jeff Rigby
6	19 October 2011	Final copy	

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Tables and Figures

1.0 Introduction

Grampians Wimmera Mallee Water Corporation (trading as GWMWater) is a government-owned corporation, created by an order of the Victorian Government under the Water Act 1989. On 1 July 2004, GWMWater assumed the responsibilities of the predecessor organisations Grampians Water and Wimmera Mallee Water. The vision and mission of GWMWater are:

Vision
"Sustainable water for regional growth and vibrant communities."

Mission
"Provide innovative and affordable services through partnerships with stakeholders, customers and the community."

GWMWater provides water supplies to a population of around 52,000 urban customers living in 72[1]urban areas throughout the region. Domestic and stock water supplies are provided to 7,000 rural customers living throughout the region. The region covers an area in excess of 60,000 km^2 with a population density of less than 1 person/km^2.

GWMWater employs approximately 210 people throughout is operational region, with the corporate office being located in Horsham.

1.1 Safe Drinking Water Act 2003

1.1.1 Background

The *Safe Drinking Water Act 2003* (the Act) is the legislative framework for assuring drinking water quality in Victoria.

The Act is based on:

- Adoption of 'catchment to tap' risk management obligations.
- Standards at the customer tap for key water quality criteria.
- Information disclosure obligations for water suppliers.
- Adoption of systemic community consultation processes.

This approach is consistent with regulatory best practice for the management of complex and inter-dependent risks.

1.1.2 Purpose and Outline

The Act:

- Requires water suppliers and water storage managers to prepare and implement Risk Management Plans (RMP) to manage risk in relation to drinking water and some types of non-potable water.

[1] The Annual Report for Water Quality refers to 72 towns due to Haven being classified as a separate water sampling locality, for all other reporting purposes GWMWater manages 71 urban areas throughout the region.

- Provides for the auditing of those plans by approved auditors.
- Requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations.
- Requires water suppliers to disclose to the public information concerning the quality of drinking water.
- Provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors.
- Requires the reporting of known or suspected contamination of drinking water to the Department of Health (DH).

1.1.3 Definitions

The Act provides the following definitions for water quality classification:

Drinking Water

Water that is intended for human consumption or for purposes connected with human consumption, such as the preparation of food or the making of ice for consumption or for the preservation of unpackaged food, whether or not the water is used for other purposes.

Regulated Water

Water that is not drinking water but is supplied to the public in circumstances where it may be mistaken as being drinking water.

1.1.4 Safe Drinking Water Regulations 2005

The Safe Drinking Water Regulations 2005 (the Regulations) commenced operation on 19 July 2005.

The objective of the Regulations is to give effect to key aspects of the Act. In particular the Regulations:

- Specifies the major elements to be incorporated in risk management plans.
- Specifies standards for the quality of drinking water supplied to customers of water suppliers.
- Specifies criteria for accreditation of analysts and for approval of auditors.
- Specifies information disclosure requirements in relation to annual reports for drinking water quality.

1.2 Australian Drinking Water Guidelines 2004

The Australian Drinking Water Guidelines 2004 (ADWG) provide a framework for management of drinking water supplies that is designed to assure safety at point of use. The ADWG has been developed after consideration of the best available scientific evidence.

The ADWG provide an authoritative reference of what comprises safe, good quality water, how it can be achieved and how it can be assured. The ADWG is concerned with both health and aesthetic quality.

The ADWG are not mandatory standards, however, they are consistent with the *Safe Drinking Water Act 2003* and provide a basis for determining the quality of water to be supplied to consumers in all parts of Australia. These determinations need to consider the diverse array of regional or local factors, and take into account economic, political and cultural issues, including customer expectations and willingness and ability to pay.

The ADWG are intended for use by the Australian community and all agencies with responsibilities associated with the supply of drinking water, including catchment and water resource managers, drinking water suppliers, water regulators and health authorities.

1.3 Characterisation of the System

The GWMWater operational area is shown in Figure 1. Key components of the water supply system include:

- Headworks system, comprising the area in and around the Grampians Ranges and the Wimmera River. The main storages are Lake Bellfield, Taylors Lake, Lake Wartook and Rocklands Reservoir. Total catchment area is 400,000 hectares with a maximum reservoir operating capacity of 522,000 megalitres.
- GWMWater provides water to the majority of towns through two extensive pipeline systems.

  1. The Wimmera Mallee Pipeline (WMP) system, as follows:
     - Supply systems 1 to 4 and 6 which originate from the Grampians headworks and consists of approximately 7,300 kilometres of pipeline, and
     - Supply system 5 which draws water from the Murray River and consists of approximately 1,800 kilometres of pipeline.
  2. The Northern Mallee Pipeline (NMP) system consisting of 3,200 kilometres of pipeline, also draws water from the Murray River.
- A total of 1,221 kilometres of reticulation pipeline servicing the 72urban water supplies.
- As at 30 June 2011, the water supplies to 36 towns were classified as drinking water. The township of Natimuk was re-classified from regulated water to drinking water by notice in the Victorian Government Gazette No. S 229 which was published on 21 June 2010. GWMWater officially informed customers that their water supply was of drinking water standard on 1 July 2010.
- Of these 36 towns, 21 receive fully treated water. The treated water is supplied by 13 water treatment plants owned and operated by GWMWater, and a further 4 plants operated under a BOOT agreement. These BOOT plants are located at Halls Gap, Ararat, Great Western and Stawell and are operated by AquaTower, an independent private sector owner and operator.
- The remaining 15 urban water supplies that are classified as drinking water are serviced with disinfection systems only.
- GWMWater also supplies regulated water to 36towns, as listed in Table 1.2.

The regulated water supplies are harvested from a range of sources including surface water and groundwater. The water is not put through any form of treatment and consequently is not fit for drinking or food preparation.

Customers in towns with a regulated water supply are advised of the water quality through:

- notices on their water bills;
- regular newsletters; and
- delivery of 'Living with an Untreated Water Supply' pamphlet.

Customers seeking water quality data for the regulated water supplies can obtain this information by phoning 1300 659 961 or by visiting www.gwmwater.org.au.

A community consultation model has been developed to facilitate the planning for water quality improvements in towns with a non-potable water supply. The model features the establishment of a Community Reference Group in each town where improvements are to be considered. The Community Reference Group represents the views of the local community and ultimately makes a recommendation to GWMWater regarding the future water quality in the town on behalf of the local community.

1.3.1 Source of water

GWMWater sources water from a range of surface water catchments, rivers and groundwater aquifers across the region. Table 1.1 and Table 1.2 provide a summary of the source waters by water supply for both drinking water and regulated water.

Figure 1– GWMWater's Operational Area

Table 1.1– Water Source for Drinking Water Supplies

Water Supply	Source Water	Storage	Treatment Plant	Population
Ararat	Surface water (Lake Fyans, Mt Cole Reservoir, Langi Ghiran Reservoir)	Copes Hill and Olivers Gully earthen storages	Ararat WTP	7,200
Beulah	Grampians Headworks (WMP)	2 x lined steel tanks	Beulah chlorinator	230
Birchip	Grampians Headworks (WMP)	1 x lined earthen storages	Birchip WTP	800
Brim	Grampians Headworks (WMP)	2 x lined steel tanks	Brim chloraminator	100
Charlton	Grampians Headworks (WMP)	1 x lined earthen storages	Charlton WTP	1,100
Dimboola	Grampians Headworks (WMP)	2 x lined earthen storages	Dimboola WTP	1,560
Donald	Grampians Headworks (WMP)	2 x lined earthen storages	Donald chlorinator	1,380
Edenhope	Groundwater (bores)	Nil	Edenhope WTP	780
Great Western	Surface water (Lake Fyans)	Verrings Basin earthen storage	Great Western WTP	150
Halls Gap	Surface water (Lake Bellfield, Dairy Creek)	Lake Bellfield and Dairy Creek earthen storages	Halls Gap WTP	260
Haven#	Surface and bore water (Lake Wartook and Laharum Bores)	1 x lined earthen storage	Mt Zero WTP	-
Hopetoun	Grampians Headworks (WMP)	2 x lined earthen storages	Hopetoun WTP	670
Horsham	Surface and bore water (Lake Wartook and Laharum Bores)	1 x earthen storage	Mt Zero WTP	13,290
Jung	Grampians Headworks (WMP)	2 x lined steel tanks	Jung chlorinator	90
Lake Bolac	Surface water (Mt William Creek, Stony Creek, Masons Creek) & Groundwater (bores)	2 x earthen storages at Willaura and Mt. Pleasant	Willaura WTP	240
Lalbert	Surface water (Murray River via Northern Mallee Pipeline)	2 x lined steel tanks	Lalbert chlorinator	100
Manangatang	Surface water (Murray River via Northern Mallee Pipeline)	2 x lined steel tanks	Manangatang chlorinator	310
Minyip	Grampians Headworks (WMP)	2 x lined steel tanks	Minyip chlorinator	480

Table 1. 1– Water Source for Drinking Water Supplies

Water Supply	Source Water	Storage	Treatment Plant	Population
Murtoa	Grampians Headworks (WMP)	1 x lined earthen storages	Murtoa WTP	840
Natimuk	Surface and bore water (Lake Wartook and Laharum Bores)	1 x lined steel tanks	Mt Zero WTP	480
Nullawil	Surface water (Murray River via Northern Mallee Pipeline)	2 x lined steel tanks	Nullawil chlorinator	100
Ouyen	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages	Ouyen WTP	1,250
Pomonal	Surface water (Lake Bellfield, Dairy Creek)	1 x concrete tank	Halls Gap WTP	150
Quambatook	Surface water (Goulburn & Loddon Rivers) via Normanville Pipeline	2 x lined steel tanks	Quambatook chlorinator	280
Rainbow	Grampians Headworks (WMP)	2 x lined earthen storages	Rainbow WTP	560
Rupanyup	Grampians Headworks (WMP)	2 x lined steel tanks	Rupanyup chlorinator	410
Sea Lake	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages	Sea Lake chlorinator	690
St Arnaud	Grampians Headworks (WMP)	Volcano, lined 20 ML capacity St. Arnaud, earthen storage of 1,000 ML capacity	St Arnaud WTP	2,640
Stawell	Surface water (Lake Fyans, Lake Bellfield, Fyans Creek)	3 x earthen storages totalling Big Hill Tower, comprising a concrete tank of 163 kL and steel tank of 500 kL capacity	Stawell WTP	6,270
Ultima	Surface water (Murray River via Northern Mallee Pipeline)	2 x lined steel tanks	Ultima chlorinator	190
Underbool	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages	Underbool WTP	233
Walpeup	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages	Walpeup chlorinator	150
Warracknabeal	Grampians Headworks (WMP)	2 x lined earthen storages	Warracknabeal WTP	2,490
Willaura	Surface water (Mt William Creek, Stony Creek, Mason's Creek) & Groundwater (bores	2 x earthen storages at Willaura and Mt. Pleasant	Willaura WTP	300
Woomelang	Grampians Headworks (WMP)	2 x lined steel tanks	Woomelang chlorinator	220
Wycheproof	Grampians Headworks (WMP)	2 x earthen storages totalling 412 ML capacity	Wycheproof chlorinator	730

Population figures for Haven are not available. The Horsham population figures incorporate Haven.

† Natimuk was re-classified from regulated water to drinking water on 21 June 2010 in the Victorian Government Gazette No. S 229.

Table 1.2- Water Source for Regulated Water Supplies

Water Supply	Water Source(s)	Raw Water Storage	Population
Antwerp	Grampians Headworks (WMP)	1 x earthen storage	30
Apsley	Groundwater (bores)	Elevated steel tank	190
Berriwillock	Grampians Headworks (WMP)	2 x earthen storages	150
Buangor	Surface water (McLeods Creek)	1 x earthen storage	50
Chillingollah	Surface water (Murray River via Northern Mallee Pipeline)	1 x earthen storage	20
Chinkapook	Surface water (Murray River via Northern Mallee Pipeline)	Concrete tank	20
Cowangie	Groundwater (bores)	Elevated tank	30
Culgoa	Grampians Headworks (WMP)	2 x earthen storages	150
Dooen	Grampians Headworks (WMP)	2 x poly tanks	20
Elmhurst	Surface water (Hickmans Creek)	1 x earthen storage	230
Glenorchy	Grampians Headworks (WMP)	2 x earthen storages	100
Goroke	Groundwater (bores)	2 x elevated steel tanks	270
Harrow	Groundwater (bores) & surface water (Glenelg River)	1 x earthen storage	150
Jeparit	Grampians Headworks (WMP)	2 x lined earthen storages	400
Kaniva	Groundwater (bores)	Elevated concrete tank	740
Kiata	Groundwater (bores)	2 x concrete tanks	20
Lascelles	Grampians Headworks (WMP)	2 x earthen storages	50
Lillimur	Groundwater (bores)	Elevated steel tank	30
Marnoo	Grampians Headworks (WMP)	1 x earthen storage	120
Miram	Groundwater (bores)	Elevated steel tank	20

Table 1.2- Water Source for Regulated Water Supplies

Water Supply	Water Source(s)	Raw Water Storage	Population
Moyston	Surface water (Mt William, Stony and Masons Creeks) & groundwater (bores)	1 x earthen storage	150
Murrayville	Groundwater (bores)	Elevated tank	240
Nandaly	Surface water (Murray River via Northern Mallee Pipeline)	Concrete tank	90
Nhill	Groundwater (bores)	Reservoir (concrete roofed, below ground) Elevated tank	1,890
Patchewollock	Surface water (Murray River via Northern Mallee Pipeline)	2 x earthen storages	80
Pimpinio	Grampians Headworks (WMP)	2 x lined earthen storages	70
Serviceton	Groundwater (bores)	Elevated steel tank	50
Speed	Surface water (Murray River via Northern Mallee Pipeline)	Concrete tank	50
Streatham	Groundwater (bores)	1 x earthen storage	100
Tarranyurk	Grampians Headworks (WMP)	1 x earthen storage	20
Tempy	Surface water (Murray River via Northern Mallee Pipeline)	Steel and Concrete tanks	50
Waitchie	Surface water (Murray River via Northern Mallee Pipeline))	Concrete tank	10
Watchem	Grampians Headworks (WMP)	2 x lined steel tank	180
Westmere	Groundwater (bores)	1 x earthen storage	20
Wickliffe	Surface water (Mt William, Stony and Masons Creeks) & groundwater (bores)	1 x earthen storage	120
Yaapeet	Grampians Headworks (WMP)	2 x lined steel tank	30

2.0 Quality Management System

2.1 Water Treatment

GWMWater owns and operates 13 water treatment plants.

Processes utilised at these plants are shown in Table 2.1.

AquaTower operates four water treatment plants under a 25-year Build Own Operate Transfer (BOOT) Scheme. Three of these plants (Halls Gap, Stawell and Ararat) use the dissolved air flotation and filtration process, with coagulation, flocculation, disinfection and pH correction facilities. The other (Great Western) plant utilises microfiltration.

Horsham, Haven and Natimuk water supplies have fluoride added, pursuant to a direction from DH under the *Health (Fluoridation) Act 1973* in November 2006.

Table 2. 1– Water Treatment Processes and Chemicals

Water Supply	Treatment Processes	Chemicals used in Treatment
Ararat^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, potassium permanganate, powdered activated carbon, aluminium sulphate, chlorine
Beulah	Disinfection	Chlorine
Birchip	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, Polyaluminium chloride, chlorine
Brim	Disinfection	Chlorine, ammonia
Charlton	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, Polyaluminium chloride, chlorine
Dimboola	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sodium hydroxide, aluminium sulphate, chlorine
Donald	Disinfection	Chlorine
Edenhope	Coagulation, flocculation, dissolved air flotation, filtration, desalination, disinfection	Aluminium sulphate, sodium hypochlorite
Great Western^	Microfiltration, disinfection, pH correction	Sulphuric acid, poly-aluminium chloride, sodium hydroxide, chlorine
Halls Gap^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, aluminium sulphate, chlorine

Table 2.1 - Water Treatment Processes and Chemicals

Haven	Receives water from Horsham	-
Hopetoun	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Soda ash, aluminium sulphate, chlorine
Horsham	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction, fluoridation	Lime, aluminium sulphate, chlorine, carbon dioxide, fluorosilicic acid
Jung	Disinfection	Chlorine
Lake Bolac	Receives water from Willaura	-
Lalbert	Disinfection	Chlorine
Manangatang	Disinfection	Chlorine
Minyip	Disinfection	Chlorine
Murtoa	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sodium hydroxide, aluminium sulphate, chlorine
Natimuk	Receives water from Horsham, booster disinfection	Chlorine
Nullawil	Disinfection	Chlorine
Ouyen	Microfiltration, disinfection	Chlorine
Pomonal	Receives water from Halls Gap	-
Quambatook	Disinfection	Chlorine
Rainbow	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, polyaluminium chloride, soda ash, chlorine
Rupanyup	Disinfection	Chlorine
Sea Lake	Disinfection	Chlorine
St Arnaud	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Aluminium sulphate, sodium hydroxide, chlorine
Stawell^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Carbon dioxide, sodium hypochlorite, lime, aluminium sulphate, chlorine
Ultima	Disinfection	Chlorine
Underbool	Coagulation, flocculation, sand filters, pH correction	Sulphuric acid, polyaluminium chloride, chlorine
Walpeup	Disinfection	Chlorine
Warracknabeal	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Powdered activated carbon, lime, aluminium sulphate, chlorine
Willaura	Coagulation, flocculation, microfiltration, disinfection, pH correction	Soda ash, calcite, aluminium sulphate, Hydrochloric acid, sodium hypochlorite, ammonia
Woomelang	Disinfection	Chlorine
Wycheproof	Disinfection	Chlorine

^ *Operated by AquaTower under a BOOT Contract*

2.1 Issues

2.2.1 Flooding

GWMWater experienced three extreme weather events and subsequent flooding during the reporting period, all of which had a detrimental impact on raw water quality and the region as a whole.

1. During August and September 2010 flooding in the Murray River gave rise to increased turbidity and colour concentrations in raw water sourced from the river. The rises in the turbidity concentration led GWMWater, in consultation with the Department of Health (DH), to issued Boil Water Notices (BWN) at Lalbert, Manangatang and Ultima. The BWNs were issued on 7 October 2010. GWMWater has since constructed a filtration system at Manangatang which allowed for the BWN to be lifted. The notices remain in place at Lalbert and Ultima.
2. In January 2011 further heavy rains gave rise to flooding across much of GWMWater north eastern operational area. The flooding was on such a scale that many towns were without road access and electricity for prolonged periods. Due to the loss of power at these towns there was uncertainty on whether the water supplies could be assured as safe. For this reason GWMWater, in consultation with DH issued BWNs at Birchip, Charlton, Donald, St Arnaud, Wycheproof and Quambatook. The BWNs were issued on 15 January 2011. Once GWMWater and DH could be confident that the supplies no longer presented a risk the BWNs were lifted. This occurred at Birchip, Charlton, St Arnaud and Quambatook. Notices remain in place at Donald and Wycheproof.
3. As part of the same January heavy rainfall event a large number of landslides and significant erosion occurred in the Grampians National Park. The erosion caused the trunk main supplying Halls Gap and Pomonal to be washed out and severed. In close proximity to the trunk main a large sewer main was also washed out and severed. Even though the WTP remained operational GWMWater could not be certain that stormwater and wastewater had entered the trunk main. On 15 January BWNs were issued at Halls Gap and Pomonal. Once GWMWater and DH could be confident that the supplies no longer presented a risk the BWNs were lifted.
4. The land slides which occurred in the Grampians also gave rise to a massive deterioration in the water quality in Lake Bellfield. Because Lake Bellfield provides water to Supply systems 1 to 4 and 6 of the Wimmera Mallee Pipeline (WMP) deteriorating water quality in the pipeline was soon evident. The event led to large increases in the turbidity and colour in unfiltered disinfection only supplies. Because of the increased turbidity concentration at the unfiltered supplies GWMWater and DH decided to keep the BWNs in place at Donald and Wycheproof. New notices were issued at Minyip and Rupanyup on 3 February, Jung on 7 February and at Beulah and Woomelang on 18 February. The BWNs remain in place at all of these towns.

2.2.2 GWMWater's response to the flood events

GWMWater has been working in collaboration with a number of engineering and scientific organisations in the aftermath of the floods. The goal of this work is to identify and consider long term improvements for water quality. A number of the projects, listed below, require significant planning and capital investment, and they are currently under consideration but, at the time of writing, no final decision has been made on their merit.

1. Centralised water treatment for systems 1 – 4 and 6 of the WMP.
2. Water treatment at the Murray River for system 5 of the WMP and the entire NMP.
3. Increasing the capacity of existing Water Treatment Plants (WTP) to supply various sections of the WMP.
4. The construction of a multi-level offtake in Lake Bellfield.
5. Increasing the capacity of the aeration device in Lake Bellfield.

GWMWater has installed a trial filtration device at Manangatang to improve the town's water supply. The filtration device was chosen as an innovative, cost effecting way of improving water quality at towns which have elevated turbidity and colour. The other aspect of the filtration system is that it could be delivered in a much shorter time frame than other conventional filtration systems. Given the large number of towns with water quality issues the rapid delivery of the filtration systems is advantageous. GWMWater will continue to monitor the performance of the filtration system to ascertain whether they are a viable medium to long term method for improving water quality.

GWMWater has undertaken smaller scale options to improve the water quality in towns which have current BWNs in place. These smaller scale water quality improvement strategies are aimed to give customers short term relief from the impacts of poor quality water that is not fit for household use, whilst longer term solutions can be developed.

The small scale options involve installing flocculation devices at various towns to reduce the turbidity and colour in their supplies. The towns where these devices are being installed are: Beulah, Brim, Donald, Jung, Lalbert, Minyip, Nullawil, Rupanyup, Ultima, Woomelang and Wycheproof. These devices have proved effective in reducing the turbidity and colour in these supplies. GWMWater will continue rolling the coagulation devices out towns during the 2011/12 reporting period.

2.2.3 GWMWater response to the locust plague

During spring 2010 much of northern Victoria experience a locust plague, the plague affected a large proportion of GWMWater's operational area. Whilst the locusts themselves didn't present a serious threat to the quality of water supplied to customers, the sprays used to control them did. In order to manage the potential risk GWMWater set up a locust management team who had the responsibility of tracking locusts and locust spraying in GWMWater operational area.

GWMWater collaborated with Department of Primary Industries (DPI), local land owners, DH and other water corporations to help implement the response to the locusts. The collaboration included sharing data on locust numbers and when and where spraying of the locusts occurred as well as test results for spray residues in water storages. This data allowed GWMWater to manage the risk of spray residue being present in the water supplies to customer.

GWMWater conducted testing for spray residues in water supplies which were deemed to be of a higher risk. This testing was carried out before and after spraying was carried out. Testing did not find any evidence of residues in the supplies tested.

2.2.3 Bulk Water Distribution System

GWMWater experienced massive changes in raw water quality during the reporting period due to the heavy rains and flooding which occurred across much of the region. The flooding led to increased levels of turbidity and colour in the entire WMP and NMP systems.

2.2.4 Cyanobacteria and Algal Toxins

Many reservoirs within GWMWater's region, as well as the Murray River are susceptible to seasonal algal blooms and are monitored closely. Towns with tank storage which receive water through the Wimmera Mallee Pipeline are now less susceptible to algae blooms. Open storages still remain a possible source of BGA contamination.

2.2.5 Disinfection By-Products

GWMWater experienced sporadic non-compliances with the standards for dichloroacetic acid, trichloroacetic acid and trihalomethanes during the reporting period. The prevalence of the non-compliances can be directly attributed to the increased colour and dissolved organic carbon (DOC) in the raw water as a result of the flooding. GWMWater expects that non-compliances with these standards will occur until the raw water quality improves.

2.2.6 Chlorinator Failures

GWMWater did not experience any chlorine failures other than at times when towns were without power due to flooding. Please refer to section 2.2.1 for further details.

2.2.7 Chlorine Overdoses

There were no chlorine overdoses for the reporting period.

2.3 Water Storage Manager

In addition to being a water supplier for the purposes of the Safe Drinking Water Act, GWMWater is also a water storage manager. This situation arises when a Water Corporation supplies water to another Water Corporation, which in turn uses it for the supply to a water sampling locality. GWMWater assumes this role for the two Water Corporations described below. Being both a water supplier and water storage manager places some additional legislative responsibilities onto GWMWater. To address this, GWMWater has executed a Memorandum of Understanding (MOU)

with Wannon Water and Coliban Water stating how its obligations as a water storage manager will be met.

GWMWater and DSE have developed a monitoring program designed to assess the water quality in the GWMWater managed reservoirs. Monthly monitoring is undertaken for a suite of predetermined parameters with all analysis being conducted by a NATA accredited laboratory. These results are made available to the other water corporations as needed, as is access to all monitoring data conducted by GWMWater in its role of Water Supply Manager.

GWMWater has developed a risk management framework for the headworks storages under its control. The framework identifies risks and mitigation measures designed to minimise those risks. The framework forms the basis for the establishment of the individual risk management plan (RMP) associated with a particular water supply. This information has been provided to both Coliban Water and Wannon Water.

GWMWater operational staff meet with personnel from Coliban Water and Wannon Water on a twice yearly basis to discuss the progress or implementation of the memorandum of understanding for supply water. Issues pertaining to GWMWater's function as a water storage manager are discussed in this open forum that also allows for the assimilation of information between the Corporations.

2.3.1 Coliban Water

GWMWater provides raw water to Coliban Water which subsequently treats the water and supplies it to the localities of Wedderburn, Borung, Korong Vale and Wychitella. This water is sourced from the Grampians Headworks and is supplied though the Wimmera Mallee Pipeline.

2.3.2 Wannon Water

GWMWater provides raw water to Wannon Water which subsequently treats the water and supplies it to the localities of Balmoral and Glenthompson. The water for the latter is sourced from the Willaura headworks and is delivered to Wannon Water through the Glenthompson Pipeline. The water for Balmoral is supplied directly from Rocklands Reservoir.

3.0 Water Quality Performance Standards

Individual monitoring results that do not comply with the performance standard are highlighted in the tables in this section.

Table 3.1 below details the water quality reporting standards specified by the Regulations.

Table 3. 1- Water Quality Reporting Standards

Parameter		Benchmark Compliance Standard	Examples of compliance including rounding#
Microbiological organisms	*Escherichia coli* (*E. coli*)	At least 98% of all samples of drinking water collected in any 12 months period to contain no *E. coli* per 100mL	97.5% and above is compliant. 97.4% and below is noncompliant.
Chlorine-based chemicals	Chloroacetic acid	Must not exceed 0.15 mg/L	Results of 0.155 mg/L and greater are noncompliant, results of 0.154 mg/L and less are compliant.
	Dichloroacetic acid	Must not exceed 0.1 mg/L	Results of 0.145 mg/L and greater are noncompliant, results of 0.144 mg/L and less are compliant.
	Trichloroacetic acid	Must not exceed 0.1 mg/L	Results of 0.145 mg/L and greater are noncompliant, results of 0.144 mg/L and less are compliant.
	Total Trihalomethanes	Must not exceed 0.25 mg/L	Results of 0.255 mg/L and greater are noncompliant, results of 0.254 mg/L and less are compliant.
Chemicals derived from disinfection or treatment with ozone	Bromate^	Must not exceed 0.02 mg/L	Results greater than 0.02 mg/L are noncompliant, results of 0.02 mg/L and less are compliant.
	Formaldehyde^	Must not exceed 0.5 mg/L	Results of 0.55 mg/L and greater are noncompliant, results of 0.54 mg/L and less are compliant.
Aluminium-based chemicals	Aluminium (acid soluble)	Must not exceed 0.2 mg/L	Results of 0.25 mg/L and greater are noncompliant, results of 0.24 mg/L and less are compliant.
Other parameters	Turbidity	95% upper confidence limit of mean of drinking water samples collected in the preceding 12 months must be ≤ 5.0# NTU.	95% UCL results of 5.05 NTU and greater are noncompliant, 95% UCL results of 5.04 NTU and less are compliant.

^ GWMWater does not use ozone as a disinfectant and hence does not test for these parameters

The Department of Health stipulates that results are deemed to be complaint with the Regulations at or below the benchmark standard when rounding of the value has been conducted.

3.1 Escherichia coli (*E. coli*)

The health impacts and epidemiology of thermotolerant coliforms and specifically *E. coli* are described in detail in the ADWG fact sheets.

E. coli is used as a specific indicator of faecal contamination and hence the safety of water for drinking. *E. coli* should not be detected in a sample of drinking water. If detected, immediate action is taken.

As required by the Regulations, at least 98% of all samples of drinking water collected in any 12 months period must contain no *E. coli*. In practical terms this means that two or more individual failing samples must be recorded for this standard to fail for the year.

3.1.1 Results

Microbiological sampling and analysis for *E. coli* was undertaken on a weekly basis for drinking water supplies, in accordance with the Regulations. As per the ADWG the population sizes of Horsham, Ararat and Stawell dictate the requirement to take two samples each week from within the reticulation system. Hence there is a requirement to report against 104 samples for these three towns over the reporting year.

There were five positive *E. coli* results during the reporting period occurring at five separate towns. The positive results were received from the Lake Bolac supply on 29 July 2010, the Jung and Murtoa supplies on 8 October 2010, the Horsham supply on 11 December 2010 and from Sea Lake on 12 January 2011.

In all cases the supply systems were thoroughly checked for disinfectant residuals, equipment and water treatment plant log sheets were check and an assessment of the network integrity was conducted. Re-sampling of all supplies took place, and all secondary samples returned negative results. The Department of Health was notified on each occasion.

The positive results at Jung and Murtoa were received on the same date and were part of the same sample collection run. Because of the systematic nature of the negative results an investigation of GWMWater sample procedure was undertaken. This investigation highlighted that some sample taps were not fitted with the recommended "goose neck" style of tap and that some sample points there were difficulties in obtaining samples due to points becoming overgrown with weeds. GWMWater is undertaking to roll out the goose neck styled taps to sampling points where they are not currently installed.

In all cases the positive results were deemed to be from a cause unknown.

Refer to Table 3.2 for *E. coli* monitoring results.

Missing Samples

There were five missing *E. coli* samples during the reporting period, two from Quambatook and one each from Lalbert, Nullawil and Wycheproof. The samples were not taken at these towns during the weeks ending 16 and 23 January 2011 because flood waters had cut access to the towns. In many cases flood waters had also cut electricity to the towns which resulted in chlorine dosing failures. As a result of the chlorine failures, GWMWater in consultation with DH, had already issued BWNs.

There were no reports of illness at the towns.

Regulated Water Supplies

Monitoring of regulated water supplies for the presence of *E. coli* is no longer conducted by GWMWater due to there being no management action available if positive results were received, and the water supplies being of a non-drinking water standard.

Table 3. 2- Results for *E. coli* in Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	No. Non Complying Samples	Max Results (orgs/100mL)	% Samples with no *E. coli*	Complying?
Ararat *	Twice weekly	104	0	0	100.0%	Yes
Beulah	Weekly	52	0	0	100.0%	Yes
Birchip	Weekly	52	0	0	100.0%	Yes
Brim	Weekly	52	0	0	100.0%	Yes
Charlton	Weekly	52	0	0	100.0%	Yes
Dimboola	Weekly	52	0	0	100.0%	Yes
Donald	Weekly	52	0	0	100.0%	Yes
Edenhope	Weekly	52	0	0	100.0%	Yes
Great Western	Weekly	52	0	0	100.0%	Yes
Halls Gap	Weekly	52	0	0	100.0%	Yes
Haven	Weekly	52	0	0	100.0%	Yes
Hopetoun	Weekly	52	0	0	100.0%	Yes
Horsham *	Twice weekly	104	1	1	99.1%	Yes
Jung	Weekly	52	1	1	98.1%	Yes
Lake Bolac	Weekly	52	1	1	98.1%	Yes
Lalbert^	Weekly	51	0	0	100.0%	Yes
Manangatang	Weekly	52	0	0	100.0%	Yes
Minyip	Weekly	52	0	0	100.0%	Yes
Murtoa	Weekly	52	1	1	98.1%	Yes
Natimuk	Weekly	52	0	0	100.0%	Yes
Nullawil^	Weekly	51	0	0	100.0%	Yes
Ouyen	Weekly	52	0	0	100.0%	Yes
Pomonal	Weekly	52	0	0	100.0%	Yes
Quambatook^	Weekly	50	0	0	100.0%	Yes
Rainbow	Weekly	52	0	0	100.0%	Yes
Rupanyup	Weekly	52	0	0	100.0%	Yes
Sea Lake	Weekly	52	1	1	98.1%	Yes
St Arnaud	Weekly	52	0	0	100.0%	Yes
Stawell *	Twice weekly	104	0	0	100.0%	Yes
Ultima	Weekly	52	0	0	100.0%	Yes
Underbool	Weekly	52	0	0	100.0%	Yes
Walpeup	Weekly	52	0	0	100.0%	Yes
Warracknabeal	Weekly	52	0	0	100.0%	Yes
Willaura	Weekly	52	0	0	100.0%	Yes
Woomelang	Weekly	52	0	0	100.0%	Yes
Wycheproof^	Weekly	51	0	0	100.0%	Yes

* Due to the population size of these towns two *E. coli* samples are taken every week

^ Samples were missed at these towns due to flood waters making them inaccessible.

3.2 Chlorine-based Chemicals

Chloroacetic acids are produced in drinking water as by-products of the reaction between chlorine and naturally occurring humic and fulvic acids. The ADWG fact sheets provide a detailed account of the health impacts and other considerations relating to chloroacetic acids.

Based on health considerations and as laid down in the Regulations, the concentrations of chloroacetic acids in drinking water should not exceed the following values:

- chloroacetic acid 0.15 mg/L
- dichloroacetic acid 0.1 mg/L
- trichloroacetic acid 0.1 mg/L

Trihalomethanes (THM) are present in drinking water principally as the result of disinfection using chlorination or, to a much lesser extent, chloramination.

Based on health considerations, the concentration of trihalomethanes, either individually or in total, in drinking water should not exceed 0.25 mg/L.

3.2.1 Results

Disinfection By-Product (DBP) sampling and analysis for was undertaken on a monthly basis for all drinking water supplies.

GWMWater satisfied the standards for chloroacetic acid in all drinking water supplies during the reporting period.

The following towns did not satisfy the drinking water standards for dichloroacetic acid; Lalbert, Manangatang and Ultima.

The following towns did not satisfy the drinking water standards for trichloroacetic acid; Beulah, Great Western, Jung, Lalbert, Manangatang, Minyip, Nullawil, Ouyen, Rupanyup, Ultima, Woomelang and Wycheproof.

The following towns did not satisfy the drinking water standards for trihalomethanes; Beulah, Dimboola, Donald, Horsham, Jung, Lalbert, Manangatang, Minyip, Natimuk, Nullawil, Ouyen, Quambatook, Rupanyup, Ultima, Walpeup, Warracknabeal, Woomelang and Wycheproof.

The increased number of non-compliant results can be directly attributed to the changed raw water characteristic after the flood events. Tables 3.7, 3.8 and 3.9 all clearly indicate that there was a sudden increase in the number of non-compliances in November 2010 and February 2011. The results correlated with the first samples taken from the supplies after the flood events.

3.2.2 Actions Undertaken in Relation to Non-Compliance

The dissolved organic carbon (DOC) and other natural organic matter react with the chlorine used to disinfect the water and create disinfection by-products (DBP), namely chloroacetic acids and trihalomethanes.

GWMWater experienced a spate of non-compliances with the DBP standards which coincided with the major flood events in the region. GWMWater's ability to resolve these non-compliances is very limited at towns which receive an unfiltered water supply, these towns include: Beulah, Donald, Jung, Lalbert, Manangatang, Minyip, Nullawil, Quambatook, Rupanyup, Ultima, Walpeup, Woomelang and Wycheproof which all failed the standards. BWNs were issued at all these towns, with the exception of Walpeup, as part of GWMWater's response to the flood event. Although the BWNs were issued primarily to safeguard the supplies against microbiological contamination laboratory testing confirmed the DBPs were volatilised when the water was boiled. This was considered the most appropriate action to deal with the DBPs at the time.

The Ouyen water supply also experienced non-compliances with the standard as a result of the high DOC concentrations found in the Murray River after the flood events. Although Ouyen has a fully treated supply there is limited capacity to remove DOC during the treatment processes, which led to the non-compliances. It is expected that Ouyen will become compliant with the standard when DOC levels in the river return to pre-flood levels.

The fully treated supplies at Dimboola, Horsham, Natimuk and Warracknabeal experienced short term non-compliances with the standard. These non-compliances can also be attributed to the changes in the DOC concentration in the raw water due to the floods. GWMWater made changes to the treatment processes at these supplies which reduced the DBP concentrations to compliant levels.

Missing Samples

The population sizes of Horsham, Ararat and Stawell dictate the requirement to take two trihalomethane and haloacetic acids samples per month from within the reticulation system. Hence there is a requirement to report against 24 monthly samples for these three towns.

There were no missing samples during the reporting period.

Table 3. 3- Results for Chloroacetic Acid

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat*	Twice Monthly	24	0.005	<0.005	Yes
Beulah	Monthly	12	0.009	<0.005	Yes
Birchip	Monthly	12	0.005	<0.005	Yes
Brim	Monthly	12	0.005	<0.005	Yes
Charlton	Monthly	12	0.005	<0.005	Yes
Dimboola	Monthly	12	0.005	<0.005	Yes
Donald	Monthly	12	0.005	<0.005	Yes
Edenhope	Monthly	12	0.005	<0.005	Yes
Great Western	Monthly	12	0.010	<0.005	Yes
Halls Gap	Monthly	12	0.005	<0.005	Yes
Haven	Monthly	12	0.005	<0.005	Yes
Hopetoun	Monthly	12	0.005	<0.005	Yes
Horsham*	Twice Monthly	24	0.005	<0.005	Yes
Jung	Monthly	12	0.006	<0.005	Yes
Lake Bolac	Monthly	12	0.005	<0.005	Yes
Lalbert	Monthly	12	0.018	<0.005	Yes
Manangatang	Monthly	12	0.013	<0.005	Yes
Minyip	Monthly	12	0.005	<0.005	Yes
Murtoa	Monthly	12	0.005	<0.005	Yes
Natimuk	Monthly	12	0.005	<0.005	Yes
Nullawil	Monthly	12	0.005	<0.005	Yes
Ouyen	Monthly	12	0.008	<0.005	Yes
Pomonal	Monthly	12	0.005	<0.005	Yes
Quambatook	Monthly	12	0.006	<0.005	Yes
Rainbow	Monthly	12	0.005	<0.005	Yes
Rupanyup	Monthly	12	0.005	<0.005	Yes
Sea Lake	Monthly	12	0.005	<0.005	Yes
St Arnaud	Monthly	12	0.005	<0.005	Yes
Stawell*	Twice Monthly	24	0.005	<0.005	Yes
Ultima	Monthly	12	0.015	<0.005	Yes
Underbool	Monthly	12	0.005	<0.005	Yes
Walpeup	Monthly	12	0.019	<0.005	Yes
Warracknabeal	Monthly	12	0.006	<0.005	Yes
Willaura	Monthly	12	0.005	<0.005	Yes
Woomelang	Monthly	12	0.008	<0.005	Yes
Wycheproof	Monthly	12	0.010	<0.005	Yes

* Due to the population size of these towns two samples are taken every month

Table 3. 4– Results for Dichloroacetic Acid

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat*	Twice Monthly	24	0.030	0.005	Yes
Beulah#	Monthly	12	0.110	0.005	Yes
Birchip	Monthly	12	0.020	0.005	Yes
Brim	Monthly	12	0.027	0.005	Yes
Charlton	Monthly	12	0.028	0.006	Yes
Dimboola	Monthly	12	0.026	0.012	Yes
Donald	Monthly	12	0.068	0.008	Yes
Edenhope	Monthly	12	0.005	0.005	Yes
Great Western	Monthly	12	0.120	0.014	Yes
Halls Gap	Monthly	12	0.041	0.014	Yes
Haven	Monthly	12	0.060	0.010	Yes
Hopetoun	Monthly	12	0.023	0.005	Yes
Horsham*	Twice Monthly	24	0.074	0.005	Yes
Jung	Monthly	12	0.097	0.007	Yes
Lake Bolac	Monthly	12	0.023	0.006	Yes
Lalbert	Monthly	12	0.330	0.005	No
Manangatang	Monthly	12	0.330	0.006	No
Minyip	Monthly	12	0.080	0.006	Yes
Murtoa	Monthly	12	0.037	0.005	Yes
Natimuk	Monthly	12	0.037	0.005	Yes
Nullawil#	Monthly	12	0.120	0.005	Yes
Ouyen#	Monthly	12	0.110	0.015	Yes
Pomonal	Monthly	12	0.033	0.017	Yes
Quambatook	Monthly	12	0.051	0.005	Yes
Rainbow	Monthly	12	0.028	0.006	Yes
Rupanyup#	Monthly	12	0.100	0.011	Yes
Sea Lake	Monthly	12	0.048	0.010	Yes
St Arnaud	Monthly	12	0.017	0.007	Yes
Stawell*	Twice Monthly	24	0.023	0.005	Yes
Ultima	Monthly	12	0.280	0.008	No
Underbool	Monthly	12	0.037	0.006	Yes
Walpeup	Monthly	12	0.049	0.007	Yes
Warracknabeal	Monthly	12	0.041	0.013	Yes
Willaura	Monthly	12	0.019	0.005	Yes
Woomelang	Monthly	12	0.097	0.008	Yes
Wycheproof	Monthly	12	0.081	0.005	Yes

* Due to the population size of these towns two samples are taken every month

These towns returned results above the 0.1 mg/L limit set out in the Regulations but are under the 0.145 mg/L limit for reporting purposes.

Table 3. 5– Results for Trichloroacetic Acid

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat*	Twice Monthly	24	0.035	0.010	Yes
Beulah	Monthly	12	0.240	0.022	No
Birchip	Monthly	12	0.031	0.009	Yes
Brim	Monthly	12	0.006	0.005	Yes
Charlton	Monthly	12	0.045	0.011	Yes
Dimboola	Monthly	12	0.022	0.010	Yes
Donald#	Monthly	12	0.130	0.035	Yes
Edenhope	Monthly	12	0.005	0.005	Yes
Great Western	Monthly	12	0.180	0.049	No
Halls Gap	Monthly	12	0.048	0.017	Yes
Haven	Monthly	12	0.091	0.013	Yes
Hopetoun	Monthly	12	0.016	0.006	Yes
Horsham*	Twice Monthly	24	0.094	0.005	Yes
Jung	Monthly	12	0.190	0.026	No
Lake Bolac	Monthly	12	0.005	0.005	Yes
Lalbert	Monthly	12	0.560	0.005	No
Manangatang	Monthly	12	0.860	0.005	No
Minyip	Monthly	12	0.190	0.024	No
Murtoa	Monthly	12	0.027	0.011	Yes
Natimuk	Monthly	12	0.099	0.005	Yes
Nullawil	Monthly	12	0.230	0.005	No
Ouyen	Monthly	12	0.300	0.012	No
Pomonal	Monthly	12	0.038	0.016	Yes
Quambatook	Monthly	12	0.079	0.010	Yes
Rainbow	Monthly	12	0.027	0.007	Yes
Rupanyup	Monthly	12	0.170	0.012	No
Sea Lake	Monthly	12	0.064	0.016	Yes
St Arnaud	Monthly	12	0.009	0.005	Yes
Stawell*	Twice Monthly	24	0.027	0.006	Yes
Ultima	Monthly	12	0.540	0.011	No
Underbool	Monthly	12	0.053	0.005	Yes
Walpeup	Monthly	12	0.065	0.008	Yes
Warracknabeal	Monthly	12	0.033	0.013	Yes
Willaura	Monthly	12	0.005	0.005	Yes
Woomelang	Monthly	12	0.220	0.056	No
Wycheproof	Monthly	12	0.170	0.005	No

* Due to the population size of these towns two samples are taken every month

These towns returned results above the 0.1 mg/L limit set out in the Regulations but are under the 0.145 mg/L limit for reporting purposes

Table 3. 6 – Results for Total Trihalomethanes

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat*	Twice Monthly	24	0.120	0.043	Yes
Beulah	Monthly	12	0.420	0.100	No
Birchip	Monthly	12	0.130	0.051	Yes
Brim	Monthly	12	0.028	0.006	Yes
Charlton	Monthly	12	0.200	0.069	Yes
Dimboola	Monthly	12	0.260	0.046	No
Donald	Monthly	12	0.270	0.093	No
Edenhope	Monthly	12	0.013	0.001	Yes
Great Western	Monthly	12	0.230	0.090	Yes
Halls Gap	Monthly	12	0.160	0.061	Yes
Haven	Monthly	12	0.210	0.012	Yes
Hopetoun	Monthly	12	0.120	0.033	Yes
Horsham*	Twice Monthly	24	0.300	0.001	No
Jung	Monthly	12	0.490	0.10	No
Lake Bolac	Monthly	12	0.007	0.001	Yes
Lalbert	Monthly	12	0.610	0.034	No
Manangatang	Monthly	12	0.850	0.033	No
Minyip	Monthly	12	0.390	0.016	No
Murtoa	Monthly	12	0.200	0.056	Yes
Natimuk	Monthly	12	0.270	0.110	No
Nullawil	Monthly	12	0.260	0.045	No
Ouyen	Monthly	12	0.400	0.041	No
Pomonal	Monthly	12	0.130	0.057	Yes
Quambatook	Monthly	12	0.290	0.140	No
Rainbow	Monthly	12	0.200	0.026	Yes
Rupanyup	Monthly	12	0.400	0.012	No
Sea Lake	Monthly	12	0.190	0.058	Yes
St Arnaud	Monthly	12	0.120	0.045	Yes
Stawell*	Twice Monthly	24	0.079	0.036	Yes
Ultima	Monthly	12	0.550	0.028	No
Underbool	Monthly	12	0.120	0.030	Yes
Walpeup	Monthly	12	0.270	0.066	No
Warracknabeal	Monthly	12	0.270	0.043	No
Willaura	Monthly	12	0.006	0.001	Yes
Woomelang	Monthly	12	0.430	0.100	No
Wycheproof	Monthly	12	0.480	0.140	No

* Due to the population size of these towns two samples are taken every month

Table 3. 7 – Dichloroacetic Acid Failures

Water Supply	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-1	Mar-11	Apr-1	May-11	Jun-11
Lalbert	✓	✓	✓	✓	×	✓	✓	×	✓	✓	✓	✓
Manangatang	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓
Ultima	✓	✓	✓	×	✓	✓	×	✓	✓	✓	✓	✓

× Represents results more than the reporting limit of 0.144mg/L

✓ Represents results less than the reporting limit of 0.145mg/L

Table 3. 8 – Trichloroacetic Acid Failures

Water Supply	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-1	Mar-11	Apr-1	May-11	Jun-11
Beulah	✓	✓	✓	✓	×	✓	✓	✓	×	×	×	×
Great Western	✓	✓	✓	×	✓	✓	✓	×	×	✓	✓	✓
Jung	✓	✓	✓	✓	×	×	×	×	×	×	×	×
Lalbert	✓	✓	✓	×	×	✓	✓	×	✓	×	×	✓
Manangatang	✓	✓	✓	×	×	×	✓	✓	×	✓	✓	✓
Minyip	✓	✓	✓	✓	×	✓	✓	✓	×	×	×	×
Nullawil	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×
Ouyen	✓	✓	✓	✓	×	✓	×	×	×	✓	✓	✓
Rupanyup	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	×	×
Ultima	✓	✓	✓	×	×	×	×	×	×	×	✓	✓
Woomelang	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	×
Wycheproof	✓	✓	✓	×	✓	✓	×	×	✓	✓	✓	×

× Represents results more than the reporting limit of 0.144mg/L

✓ Represents results less than the reporting limit of 0.145mg/L

Table 3. 9 – Trihalomethane Failures

Water Supply	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-1	Mar-11	Apr-1	May-11	Jun-11
Beulah	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Dimboola	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓
Donald	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	✓
Horsham*	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	× ×	✓ ✓	✓ ✓	✓ ✓	✓ ✓
Jung	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	✓
Lalbert	✓	✓	✓	✓	×	×	×	×	×	×	✓	✓
Manangatang	✓	✓	✓	✓	×	×	×	×	×	×	✓	✓
Minyip	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Natimuk	✓	✓	✓	✓	✓	✓	×	×	✓	✓	✓	✓
Nullawil	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓
Ouyen	✓	✓	✓	✓	✓	×	×	×	×	×	×	×
Quambatook	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	×	✓
Rupanyup	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	✓
Ultima	✓	✓	✓	✓	×	×	×	×	×	✓	✓	✓
Walpeup	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓
Warracknabeal	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓
Woomelang	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓
Wycheproof	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×

× Represents results more than the reporting limit of 0.254mg/L

✓ Represents results less than the reporting limit of 0.255mg/L

* Due to the population size of these towns two samples are taken every month

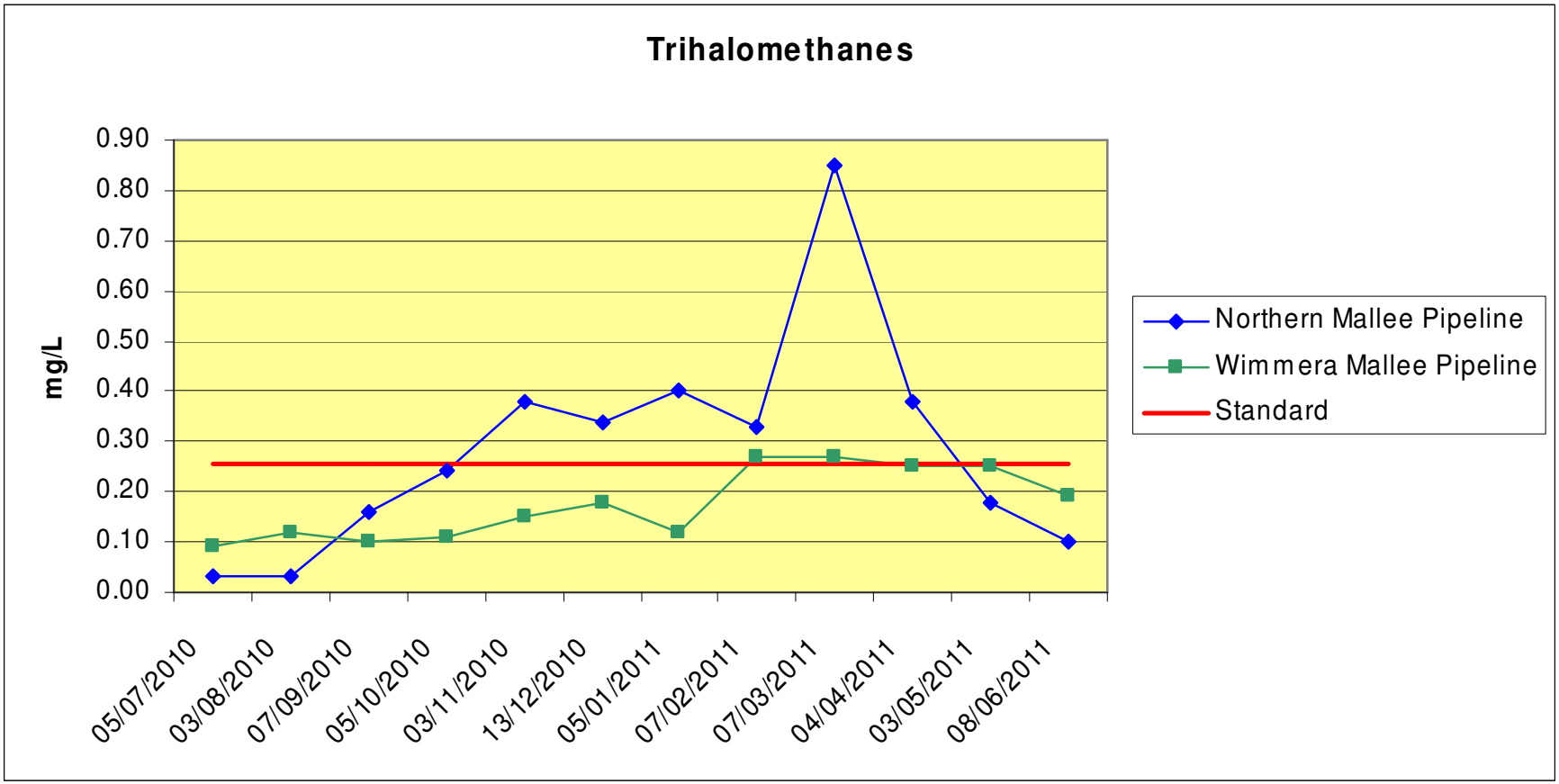

Figure 2: Average trihalomethane results from disinfection only towns on the Northern Mallee and Wimmera Mallee Pipelines

3.3 Ozone-based Chemicals

Bromate may be formed during ozonation. Bromate is a strong oxidant and may react with organic matter in water, forming bromide as a by-product.

Based on health considerations, ADWG recommends that the concentration of bromate in drinking water not exceed 0.02 mg/L.

Formaldehyde may be present in drinking water through ozonation of naturally occurring humic material, contamination by accidental spills, or deposition from the atmosphere.

Based on health considerations, ADWG recommends the concentration of formaldehyde in drinking water not exceed 0.5 mg/L.

3.3.1 Results

GWMWater does not use ozone-based chemicals in any of its supply systems. Consequently, sampling and analysis was not undertaken for either bromate or formaldehyde. These chemicals are not considered a risk in drinking water supplied by GWMWater, and are subsequently not tested.

3.4 Aluminium

Aluminium sulphate (alum) and polyaluminium chloride (PACL) are general-purpose coagulants that are used in water treatment to remove turbidity, natural organic matter (including colour), micro-organisms and many inorganic chemicals. Removal of natural organic matter reduces the formation of disinfection by-products, because it removes the organic precursors of the by-products.

Based on aesthetic problems caused by post-flocculation coagulants, the concentration of acid-soluble aluminium in drinking water should not exceed 0.2 mg/L.

3.4.1 Results

Aluminium sampling and analysis is undertaken on a monthly basis at supplies utilising aluminium-based coagulants. Refer to Table 3.9 for monitoring results.

The water supplies at Charlton, Horsham, Natimuk and Underbool were non-compliant with the aluminium parameter over the reporting period.

Missing Samples

The population sizes of Horsham, Ararat and Stawell dictate the requirement to take two acid soluble aluminium samples per month from within the reticulation system. Hence there is a requirement to report against 24 monthly samples for these three towns.

There were no missing samples for the reporting period.

3.4.2 Actions Undertaken in Relation to Non-Compliance

GWMWater experienced single non-compliances with the standard at Charlton, Horsham and Natimuk. Underbool recorded two non-compliances. All non-compliances can be traced back to issues with the treatment of the water, however, all aluminium non-compliances were exacerbated by the change in raw water quality due to the floods. The non-compliances at Horsham and Natimuk can be attributed to a change in pH during treatment. This rendered the coagulant (aluminium sulphate) more soluble which allowed it to pass though the filtration stage when treating the water. Whilst this was a one-off non-compliance GWMWater has made changes to the pH correction facilities at the WTP which will make a similar event less likely in the future.

The non-compliance at Charlton was the result of flood water entering the raw water storage, this caused immediate changes to the chemical make up of the water which led to the non-compliance. Changes were made to the treatment of the water which bought the level back to within the compliance standard.

The Underbool WTP had been experiencing difficulties with the flocculation and filtration stages of the treatment process. This led to acid soluble aluminium making its way through the treatment process and into the treated water. GWMWater was aware of the issue and had made a considerable number of operational changes to try to reduce the aluminium level. None of these changes produced results which were acceptable to GWMWater. GWMWater has since ordered extra flocculation

chambers to add to the treatment process, these chambers will allow for better flocculation and will help to reduce the level of aluminium in the treated water.

The Department of Health was notified in all instances.

Table 3. 9 - Results for Aluminium

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat*	Twice Monthly	24	0.07	0.01	Yes
Birchip	Monthly	12	0.09	0.01	Yes
Charlton	Monthly	12	0.31	0.01	No
Dimboola	Monthly	12	0.05	0.01	Yes
Great Western	Monthly	12	0.05	0.01	Yes
Halls Gap	Monthly	12	0.06	0.02	Yes
Haven	Monthly	12	0.11	0.03	Yes
Hopetoun	Monthly	12	0.17	0.01	Yes
Horsham*	Twice Monthly	24	1.10	0.01	No
Lake Bolac	Monthly	12	0.09	0.04	Yes
Manangatang^	Monthly	1	0.07	0.07	Yes
Murtoa#	Monthly	12	0.24	0.01	Yes
Natimuk	Monthly	12	0.45	0.03	No
Ouyen	Monthly	12	0.02	0.01	Yes
Pomonal	Monthly	12	0.07	0.01	Yes
Rainbow	Monthly	12	0.18	0.01	Yes
St Arnaud	Monthly	12	0.13	0.02	Yes
Stawell*	Twice Monthly	24	0.19	0.02	Yes
Underbool	Monthly	12	1.80	0.01	No
Warracknabeal	Monthly	12	0.14	0.03	Yes
Willaura	Monthly	12	0.06	0.01	Yes

* Due to the population size of these towns two samples are taken every month.

These towns returned results above the 0.2 mg/L limit set out in the Regulations but are under the 0.25 mg/L limit for reporting purposes

^ Prior to the filtration device being commissioned in June 2011, and the towns being classified at disinfection only acid soluble aluminium testing was not carried out in the supply prior to this date.

3.5 Turbidity

Turbidity is caused by the presence in water of very fine suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. High turbidity can result in a water sample having a 'muddy' or 'milky' appearance.

Turbidity is a measurement of the light scattering property of water, and the degree of scattering is dependent on the amount, size and composition of the suspended matter.

The ADWG fact sheets contain a detailed account of turbidity and its implications for water supply.

Based on health and aesthetic considerations, ADWG recommends that turbidity not exceed 5 Nephelometric Turbidity Units (NTU). The Regulations require that the 95% upper confidence limit (UCL) of the mean of samples of drinking water collected in any 12-month period must be less than or equal to 5.0 NTU.

3.5.1 Results

Turbidity sampling and analysis was undertaken on a weekly basis for all drinking water supplies. The population sizes of Horsham, Ararat and Stawell dictate the requirement to take two turbidity samples per week from within the reticulation system. Hence there is a requirement to report against 104 weekly samples for these towns.

GWMWater experienced long term turbidity issues in the Lalbert, Manangatang and Lalbert supplies which lead to the supplies being non-compliant for the entire reporting period (Table 3.11). The flood events in the Murray River catchment further compounded the turbidity issues in these three supplies (Figure 3). The increased turbidity levels lead to GWMWater to issue BWNs for the supplies.

The January flood events also affected the towns receiving water through systems 1 – 4 of the WMP which up until this time had been compliant with the turbidity standard (Table 3.11). After the flood event the turbidity in the water supplied to these towns increased rapidly (Figure 3). The increased turbidity levels lead to GWMWater to issue BWNs for these supplies.

The water supplies for Beulah, Brim, Donald, Jung, Lalbert, Manangatang, Minyip, Rupanyup, Sea Lake, Ultima, Woomelang and Wycheproof were non-compliant with the turbidity standard during the reporting period. Refer to Table 3.10 for the turbidity results.

Missing Samples

The Lalbert, Nullawil and Wycheproof supplies were missing one sample each for the reporting period. The Quambatook supply had two missing samples. In all cases the missing samples can be attributed to the towns being isolated by flood waters at the times the samples were scheduled to be taken. DH was informed of all missing samples.

3.5.2 Actions Undertaken in Relation to Non-Compliance

GWMWater has limited control over turbidity in water supplies with no coagulation and filtration facilities. As a result of the multiple flood events in GWMWater's catchments all towns without filtration facilities experienced elevated turbidity levels in their supplies.

Turbidity can help mask the presence of pathogens, namely *E. coli*, rendering disinfection less effective. As a result of the increased turbidity levels BWNs were issued at a number of towns, refer to section 2.2.1. The issuing of the BWNs was done as a precautionary measure and weekly *E. coli* testing in these supplies has still not detected the presence of *E. coli.*

GWMWater engaged a specialist company to build a trial filtration plant to remove turbidity from the water supplied to Manangatang. This plant was seen as an innovative, cost-effective way of providing improved water quality to small towns throughout GWMWater's region. The plant was commission during May 2011 and has provided some promising results. GWMWater will closely monitor the performance of the plant until late 2011 when a decision will be made on whether the trial plant will be purchased.

GWMWater has also been trialling the use of small chemical dosing pumps to deliver flocculent into raw water storages at towns which have a current BWN in place. At the end of the reporting period the coagulation trial was achieving significantly improved results. Based on these results GWMWater decided to commission the dosing pump arrangement at all towns currently on BWNs. This project will be finalised during the 2011/12 reporting period.

Table 3. 10– Turbidity Results for Drinking Water Towns

Sampling Locality	Sampling Frequency	No of Samples	Result (NTU)		95% UCL of Mean	Complying (Yes/No)
			Max	Min		
Ararat*	Twice weekly	104	1.2	0.1	0.3	Yes
Beulah	Weekly	52	53.0	0.1	18.2	No
Birchip	Weekly	52	17.0	0.1	1.6	Yes
Brim	Weekly	52	65.0	0.4	23.5	No
Charlton	Weekly	52	2.6	0.1	0.7	Yes
Dimboola	Weekly	52	0.9	0.1	0.4	Yes
Donald	Weekly	52	46.1	0.5	15.2	No
Edenhope	Weekly	52	13.0	0.1	1.0	Yes
Great Western	Weekly	52	1.4	0.1	0.2	Yes
Halls Gap	Weekly	52	3.1	0.1	0.5	Yes
Haven	Weekly	52	2.5	0.1	0.6	Yes
Hopetoun	Weekly	52	1.2	0.1	0.3	Yes
Horsham*	Twice weekly	104	3.0	0.1	0.4	Yes
Jung	Weekly	52	74.0	1.0	26.0	No
Lake Bolac	Weekly	52	1.8	0.1	0.4	Yes
Lalbert^	Weekly	51	63.2	3.8	17.3	No
Manangatang	Weekly	52	38.3	1.8	14.2	No
Minyip	Weekly	52	74.0	0.8	32.1	No
Murtoa	Weekly	52	5.1	0.1	1.4	Yes
Natimuk	Weekly	52	1.2	0.1	0.4	Yes
Nullawil^	Weekly	51	12.0	0.3	4.6	Yes
Ouyen	Weekly	52	3.6	0.1	0.4	Yes
Pomonal	Weekly	52	1.2	0.1	0.4	Yes
Quambatook^	Weekly	50	35.0	0.7	4.7	Yes
Rainbow	Weekly	52	37.0	0.1	2.9	Yes
Rupanyup	Weekly	52	74.0	0.8	31.4	No
Sea Lake	Weekly	52	14.1	0.2	6.4	No
St Arnaud	Weekly	52	4.2	0.1	0.5	Yes
Stawell*	Twice weekly	104	1.5	0.1	0.3	Yes
Ultima	Weekly	52	45.2	5.5	15.9	No
Underbool	Weekly	52	35.0	0.2	3.6	Yes
Walpeup	Weekly	52	4.5	1.1	2.3	Yes
Warracknabeal	Weekly	52	10.0	0.1	1.1	Yes
Willaura	Weekly	52	1.1	0.1	0.3	Yes
Woomelang	Weekly	52	58.0	0.6	21.0	No
Wycheproof^	Weekly	51	61.1	0.8	18.9	No

* Due to the population size of these towns two samples are taken every month.

^ Samples were missed at these towns due to flood waters making them inaccessible.

Table 3. 11– Turbidity Failures Using Monthly Averaged Results

Water Supply	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-1	Mar-11	Apr-1	May-11	Jun-11
Beulah	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Brim	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Donald	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Jung	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Lalbert	×	×	×	×	×	×	×	×	×	×	×	×
Manangatang	×	×	×	×	×	×	×	×	×	×	×	✓
Minyip	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Rupanyup	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Sea Lake	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	×
Ultima	×	×	×	×	×	×	×	×	×	×	×	×
Woomelang	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Wycheproof	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×

× Represents results more than the reporting limit of 5.04 NTU

✓ Represents results less than the reporting limit of 5.05 NTU

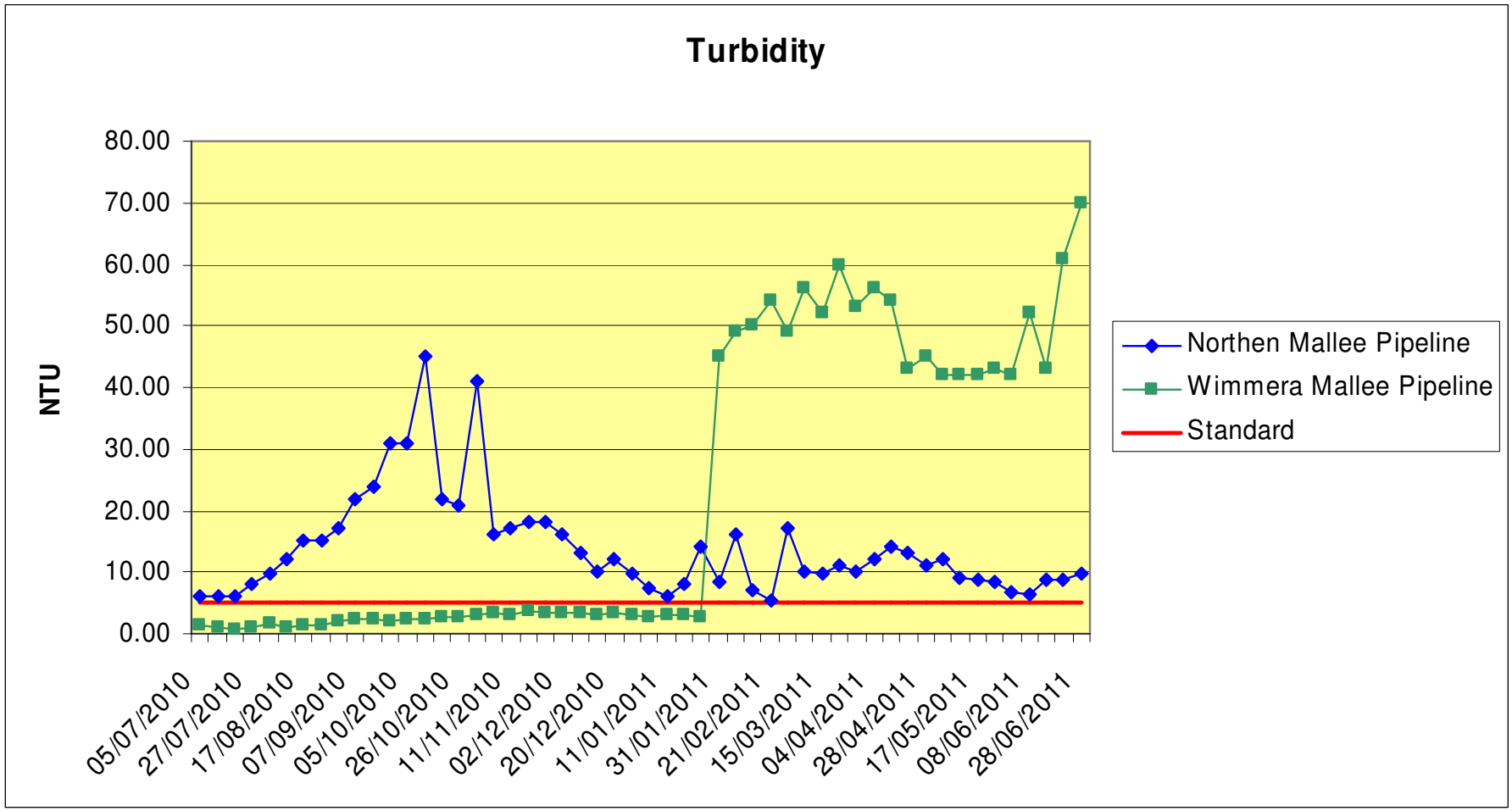

Figure 3: Average turbidity results from disinfection only towns on the Northern Mallee and Wimmera Mallee Pipelines

3.6 Fluoride

Fluoride occurs naturally in seawater, soil and air. Groundwater may also have quite high concentrations (1-10 mg/L) depending on the mineralogy of the strata that the water is drawn from.

Fluoride is added to some water supplies to help protect teeth against dental cavities. GWMWater has only one fluoridated water supply. In November 2006, the Horsham and Haven water supply became fluoridated. The Natimuk water supply is also a fluoridated supply because its water is sourced from Horsham.

A detailed description of fluoride and its implications in a water supply can be found by reference to the ADWG.

Based on health considerations, the concentration of fluoride in fluoridated drinking water supplies should not exceed 1.5 mg/L and have an annual average of less than 1.0 mg/L.

For non-fluoridated drinking water supplies, the concentration of fluoride should not exceed 1.5 mg/L.

3.6.1 Results

Fluoride sampling and analysis is generally undertaken on at least an annual basis for all non-fluoridated drinking water supplies and weekly for all fluoridated drinking water supplies.

All water supplies were tested on an annual basis apart from the Horsham and Haven supplies which have fluoride added to them, in this case the two supplies were tested on a weekly basis.

Refer to Table 3.11 for the monitoring results for fluoride.

All water supplies complied with the ADWG health guideline values for fluoride and the requirements of the *Health (Fluoridation) Act* 1973.

3.6.2 Actions Undertaken in Relation to Non-Compliance

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for fluoride (1.5 mg/L), no corrective action has needed to be taken.

Table 3. 12 – Fluoride Results in Drinking Water Supplies

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Annually	1	0.05	0.05	0.05	Yes
Beulah	Annually	1	0.09	0.09	0.09	Yes
Birchip	Annually	1	0.05	0.05	0.05	Yes
Brim	Annually	1	0.05	0.05	0.05	Yes
Charlton	Annually	1	0.22	0.22	0.22	Yes
Dimboola	Annually	1	0.05	0.05	0.05	Yes
Donald	Annually	1	0.10	0.10	0.10	Yes
Edenhope	Annually	1	0.14	0.14	0.14	Yes
Great Western	Annually	1	0.06	0.06	0.06	Yes
Halls Gap	Annually	1	0.05	0.05	0.05	Yes
Haven^	Weekly	52	0.98	0.05	0.60	Yes
Hopetoun	Annually	1	0.06	0.06	0.06	Yes
Horsham^	Weekly	104	0.96	0.05	0.61	Yes
Jung	Annually	1	0.11	0.11	0.11	Yes
Lalbert	Annually	1	0.14	0.14	0.14	Yes
Lake Bolac	Annually	1	0.06	0.06	0.06	Yes
Manangatang	Annually	1	0.14	0.14	0.14	Yes
Minyip	Annually	1	0.15	0.15	0.15	Yes
Murtoa	Annually	1	0.07	0.07	0.07	Yes
Natimuk^	Weekly	52	0.73	0.09	0.62	Yes
Nullawil	Annually	1	0.10	0.10	0.10	Yes
Ouyen	Annually	1	0.16	0.16	0.16	Yes
Pomonal	Annually	1	0.05	0.05	0.05	Yes
Quambatook	Annually	1	0.25	0.25	0.25	Yes
Rainbow	Annually	1	0.09	0.09	0.09	Yes
Rupanyup	Annually	1	0.15	0.15	0.15	Yes
Sea Lake	Annually	1	0.16	0.16	0.16	Yes
St Arnaud	Annually	1	0.05	0.05	0.05	Yes
Stawell	Annually	1	0.05	0.05	0.05	Yes
Ultima	Annually	1	0.13	0.13	0.13	Yes
Underbool	Annually	1	0.19	0.19	0.19	Yes
Walpeup	Annually	1	0.20	0.20	0.20	Yes
Warracknabeal	Annually	1	0.05	0.05	0.05	Yes
Willaura	Annually	1	0.06	0.06	0.06	Yes
Woomelang	Annually	1	0.16	0.16	0.16	Yes
Wycheproof	Annually	1	0.14	0.14	0.14	Yes

† **Performance Standard:** Fluoride concentration shall not exceed 1.5 mg/L for non-fluoridated supplies. For fluoridated supplies, compliance requires all individual samples to be below 1.5 mg/L and the annual average must not exceed 1 mg/L.

^ Fluoridated water supplies managed by GWMWater.

3.7 Other Algae, Pathogen, Chemical or Substances

Regulation 10(b) requires the water supplier to ensure that the drinking water supplied to customers does not contain any chemical, toxin, pathogen or other substance that may pose a risk to human health.

3.7.1 Results and Actions Taken in Relation to Non Compliance

Blue-green algae (BGA) sampling is generally undertaken on a weekly basis during high risk months for all of the open raw water storages associated with a drinking water supply. Most monitoring is done in-house with samples from known problem storages being sent to the laboratory for more detailed analysis. Samples tested in house which return high counts of potentially toxic blue-green algae are sent to a laboratory for verification. Periodic check samples are also sent to the laboratory for quality assurance of in-house counting technique.

GWMWater has an obligation to notify DH in accordance with the requirements set out in DSEs Blue-Green Algae Circular for the presence of toxic blue-green algae species using either/or the number of cells/mL or the biovolume (mm^3/L) of toxic blue-green algae species present. GWMWater will notify DH by the arrangements set out in Section 22 of the *Safe Drinking Water Act* 2003.

GWMWater experienced three blooms during the reporting period, one being in Taylors Lake, the others in the Dimboola and Warracknabeal raw water storages.

Taylors Lake had been exhibiting signs that a bloom was likely during January 2011 with isolated test results indicating levels of *Anabaena circinalis* were rising. The highest cell count detected during the bloom event was 10,000 cells/mL or a biovolume of 2.50 mm^3/L. At this time Taylors Lake was supplying the WMP due to the flood events rendering Lake Bellfield temporarily unusable. In order to help understand the magnitude of the bloom GWMWater had the algae tested using quantitative Polymerase Chain Reaction (qPCR). This technique allows for the algae to be quickly tested too establish whether or not it contains the toxigenic strain of *A. circinalis.* Results from the qPCR testing indicated that the algae species in Taylors Lake was not able to produce toxins.

GWMWater also tested for the taste and odour compounds 2-Methylisoborneol (MIB) and Geosmin which are associated with algal blooms. Whilst these compounds are not a danger to health they can impart an unpleasant taste and smell to the water. The testing revealed that there was no MIB present in the lake but Geosmin was present at a 52 ng/L. This level would have been detectable by humans.

Given the extremely poor state of the water in Lake Bellfield at the time of this bloom (>2,000 NTU) and the fact that the algae present in was unable to produce toxins the decision was made to maintain supplying the WMP from Taylors Lake. GWMWater was in close contact with DH and DSE throughout the bloom and all parties agreed to the course of action taken.

Routine sampling detected the presence of *A. circinalis* in the plastic lined raw water storages of Dimboola and Warracknabeal on 22 June 2011. The cell counts in the

storages were 68,400 cells/mL and 100,000 cells/mL in the Dimboola and Warracknabeal storages respectively. GWMWater immediately isolated the raw water storages and supplied the towns directly from the WMP. As a precaution Powdered Activated Carbon (PAC) dosing was initiated at Warracknabeal to eliminate the possibility of any toxins or taste and odour compounds being passed onto customers.

With the raw water storages being isolated, treatment of the storages using an approved algaecide was undertaken. The storages were left offline for a further two weeks to allow for any residual algal compounds to naturally dissipate. There were no reports of illness nor were there any taste and odour complaints during the bloom. GWMWater notified DH and DSE of the bloom.

4.0 Chemicals of Concern

Individual monitoring results that do not comply with the performance standard are highlighted in the tables in this section.

4.1 Chlorine Dioxide-based Chemicals

Chlorine dioxide is not used as a disinfectant in any of the water supplies managed by GWMWater.

4.2 Arsenic

Arsenic is a naturally occurring element that can be introduced into water through the dissolution of minerals or other means.

ADWG recommends that on the basis on health considerations, the concentration of arsenic in drinking water should not exceed 0.007 mg/L.

4.2.1 Results

Arsenic sampling and analysis is undertaken at towns which have open storages or receive water from a source other than Supply Systems 1 to 4 of the WMP.

Refer to Table 4.1 for the monitoring results for arsenic.

All water supplies complied with the ADWG health values for arsenic.

Missing Samples

There were no missing samples during the reporting period.

4.2.2 Actions Undertaken in Relation to Non-Compliance

There were no non-compliances with the performance standard for the reporting period.

Table 4. 1 – Arsenic Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	Result (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.001	Yes
Birchip	Annually	1	0.002	Yes
Edenhope	Annually	1	0.005	Yes
Great Western	Annually	1	0.001	Yes
Haven	Annually	1	0.001	Yes
Hopetoun	Annually	1	0.001	Yes
Horsham	Annually	1	0.001	Yes
Lake Bolac	Annually	1	0.002	Yes
Manangatang	Annually	1	0.002	Yes
Ouyen	Annually	1	0.002	Yes
Quambatook	Annually	1	0.002	Yes
Rainbow	Annually	1	0.001	Yes
Sea Lake	Annually	1	0.002	Yes
St Arnaud	Annually	1	0.001	Yes
Stawell	Annually	1	0.001	Yes
Ultima	Annually	1	0.005	Yes
Underbool	Annually	1	0.002	Yes
Walpeup	Annually	1	0.002	Yes
Warracknabeal	Annually	1	0.001	Yes
Willaura	Annually	1	0.004	Yes

† **Performance Standard:** *Arsenic must not exceed 0.007 mg/L*

4.3 Copper

Copper is commonly used in domestic water supply pipes and fittings. Copper concentrations can rise substantially when water with a low pH and hardness remains in contact with copper plumbing.

A detailed description of copper and its implications in a water supply can be found by reference to the ADWG.

The taste threshold for copper is in the range 1-5 mg/L, depending on the water purity. ADWG suggest that based on health considerations, the concentration of copper in drinking water should not exceed 2 mg/L, while for aesthetic considerations, the concentration of copper in drinking water should not exceed 1 mg/L.

4.3.1 Results

Copper sampling and analysis is undertaken at towns which have open storages or receive water from a source other than Supply Systems 1 to 4 of the WMP.

Refer to Table 4.2 for the monitoring results for copper.

All water supplies complied with both the ADWG aesthetic and health values for copper.

Missing Samples

There were no missing samples for the reporting period.

4.3.1 Actions Undertaken in Relation to Non-Compliance

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for copper (2 mg/L), no corrective action has needed to be taken.

The samples taken for analysis were taken from the reticulation. Copper levels may be higher at customer's internal taps, as a consequence of utilising copper plumbing. If a customer is experiencing copper staining or discolouration of their water, please contact the GWMWater Customer Service Centre on 1300 659 961.

Table 4. 2– Copper Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	Result (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.001	Yes
Birchip	Annually	1	0.002	Yes
Edenhope	Annually	1	0.005	Yes
Great Western	Annually	1	0.001	Yes
Haven	Annually	1	0.001	Yes
Hopetoun	Annually	1	0.001	Yes
Horsham	Annually	1	0.001	Yes
Lake Bolac	Annually	1	0.002	Yes
Manangatang	Annually	1	0.002	Yes
Ouyen	Annually	1	0.002	Yes
Quambatook	Annually	1	0.002	Yes
Rainbow	Annually	1	0.001	Yes
Sea Lake	Annually	1	0.002	Yes
St Arnaud	Annually	1	0.001	Yes
Stawell	Annually	1	0.001	Yes
Ultima	Annually	1	0.005	Yes
Underbool	Annually	1	0.002	Yes
Walpeup	Annually	1	0.002	Yes
Warracknabeal	Annually	1	0.001	Yes
Willaura	Annually	1	0.004	Yes

† **Performance Standard:** *Copper must not exceed 2.0 mg/L.*

4.4 Lead

Lead can be present in drinking water as a result of dissolution from natural sources, or from household plumbing systems containing lead. This may include lead in pipes, or in solder used to seal joints.

A detailed description of lead and its implications in a water supply can be found by reference to ADWG.

In humans, lead is a cumulative poison that can severely affect the central nervous system. ADWG suggest that based on health considerations, the concentration of lead in drinking water should not exceed 0.01 mg/L.

4.4.1 Results

Lead sampling and analysis is undertaken at towns which have open storages or receive water from a source other than Supply Systems 1 to 4 of the WMP.

Refer to Table 4.3 for the monitoring results for lead.

All water supplies complied with the ADWG health values for lead.

Missing Samples

There were no missing samples for the reporting period.

4.4.2 Actions Undertaken in Relation to Non-Compliance

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for lead (0.01 mg/L), no corrective action has needed to be taken.

Table 4. 3- Lead Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	Result (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.001	Yes
Birchip	Annually	1	0.001	Yes
Edenhope	Annually	1	0.001	Yes
Great Western	Annually	1	0.001	Yes
Haven	Annually	1	0.001	Yes
Hopetoun	Annually	1	0.001	Yes
Horsham	Annually	1	0.001	Yes
Lake Bolac	Annually	1	0.001	Yes
Manangatang	Annually	1	0.001	Yes
Ouyen	Annually	1	0.001	Yes
Quambatook	Annually	1	0.001	Yes
Rainbow	Annually	1	0.001	Yes
Sea Lake	Annually	1	0.001	Yes
St Arnaud	Annually	1	0.001	Yes
Stawell	Annually	1	0.001	Yes
Ultima	Annually	1	0.001	Yes
Underbool	Annually	1	0.001	Yes
Walpeup	Annually	1	0.001	Yes
Warracknabeal	Annually	1	0.001	Yes
Willaura	Annually	1	0.001	Yes

† **Performance Standard:** *Lead must not exceed 0.01 mg/L.*

4.5 Manganese

At concentrations exceeding 0.1 mg/L, manganese imparts an undesirable taste to water and stains plumbing fixtures and laundry. Even at concentrations of 0.02 mg/L, manganese will form a coating on pipes, which can slough off as black ooze. Some nuisance micro-organisms can concentrate manganese and give rise to taste, odour and turbidity problems in distribution systems.

A detailed description of manganese and its implications in a water supply can be found by reference to the ADWG.

ADWG suggest that, based on aesthetic considerations, the concentration of manganese in drinking water should not exceed 0.1 mg/L. Manganese would not be a health consideration unless the concentration exceeded 0.5 mg/L.

4.5.1 Results

Manganese sampling and analysis is undertaken at towns which have open storages or receive water from a source other than Supply Systems 1 to 4 of the WMP.

Refer to Table 4.4 for the monitoring results for manganese.

All water supplies complied with both the ADWG aesthetic and health values for manganese.

Missing Samples

There were no missing samples for the reporting period.

4.5.2 Actions Undertaken in Relation to Non-Compliance

As none of the samples collected returned an analysis result in excess of the ADWG health-based value for manganese, no corrective action has been taken.

Table 4. 4- Manganese Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	Result (mg/L)	Complying (Yes/No)
Ararat	Annually	1	0.001	Yes
Birchip	Annually	1	0.001	Yes
Edenhope	Annually	1	0.001	Yes
Great Western	Annually	1	0.001	Yes
Haven	Annually	1	0.001	Yes
Hopetoun	Annually	1	0.001	Yes
Horsham	Annually	1	0.001	Yes
Lake Bolac	Annually	1	0.001	Yes
Manangatang	Annually	1	0.001	Yes
Ouyen	Annually	1	0.001	Yes
Quambatook	Annually	1	0.001	Yes
Rainbow	Annually	1	0.001	Yes
Sea Lake	Annually	1	0.001	Yes
St Arnaud	Annually	1	0.001	Yes
Stawell	Annually	1	0.001	Yes
Ultima	Annually	1	0.001	Yes
Underbool	Annually	1	0.001	Yes
Walpeup	Annually	1	0.001	Yes
Warracknabeal	Annually	1	0.001	Yes
Willaura	Annually	1	0.001	Yes

† **Performance Standard:** *Manganese should not exceed 0.5 mg/L.*

5.0 Non-Standard Aesthetic Parameters

Individual monitoring results that exceed the aesthetic guideline value set out in ADWG are highlighted in the tables in this section.

5.1 Hydrogen Ion Concentration, pH

The parameter pH is a measure of the hydrogen ion concentration of water. It is measured on a logarithmic scale from 0 to 14. A pH of 7 is neutral, while a pH greater than 7 is alkaline, and a pH less than 7 is acidic.

The ADWG suggests that, based on the need to reduce corrosion and encrustation in pipework, drinking water should have a pH value between pH 6.5 and pH 8.5. GWMWater has an internal performance benchmark that the mean pH will be between pH 6.5 and pH 8.5.

5.1.1 Results

Sampling and laboratory analysis for pH during the reporting period was undertaken on a weekly basis for all drinking water towns. The water samplers use a TPS WP81 hand-held meter to undertake in-house analysis.

Refer to Table 5.1 for monitoring results for pH.

There were numerous individual results which were outside the guideline pH value, however, all towns were compliant with the mean value apart from Lake Bolac.

Missing Samples

There are numerous supplies which are missing the required number of samples for the reporting period, refer to Table 5.1. GWMWater has conducted a rigorous search of all databases and electronic devices used during the sampling process but is unable to account for all samples. GWMWater is satisfied that these tests were conducted, as all field based pH tests are taken when the weekly compliance samples for turbidity and *E. coli* are collected. GWMWater can account for all compliance samples apart from those which could not be taken during the floods.

The missing results can be traced to the Portable Data Assistants (PDA) used to transfer field data to GWMWater's database. The PDAs were not transferring data in the correct fashion due to a software malfunction. When GWMWater became aware of the issue the paper based system that had been used in previous years was reinstated. GWMWater expects that all results will be accounted for in the upcoming reporting period.

The missing results are not deemed to be a risk to customers because all test results which are outside the pH standards are reported at the time of sampling.

5.1.2 Actions Undertaken in Relation to Non-Compliance

All water supplies met the mean standard. Individual failures to meet pH guidelines are not actioned. If sustained high pH values are recorded, or individual pH readings return values well outside the guidelines, an investigation would be initiated.

Lake Bolac was found to be routinely above the pH 8.5 threshold; to help reduce the pH GWMWater is investigating the viability of installing a carbon dioxide dosing system. Systems such as these have been used in other supplies managed by GWMWater and have proved to be a reliable and safe method of reducing pH.

There have been no complaints related to elevated pH from Lake Bolac.

Table 5. 1– pH Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples^	Results (pH)			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Weekly	70	8.4	6.8	7.3	Yes
Beulah	Weekly	52	7.4	6.0	6.7	Yes
Birchip	Weekly	47	9.5	6.2	7.0	Yes
Brim	Weekly	41	9.3	6.9	8.2	Yes
Charlton	Weekly	44	8.6	6.7	7.5	Yes
Dimboola	Weekly	38	8.0	6.5	7.2	Yes
Donald	Weekly	45	7.9	6.8	7.2	Yes
Edenhope	Weekly	43	8.1	6.1	7.1	Yes
Great Western	Weekly	43	7.7	6.6	7.4	Yes
Halls Gap	Weekly	43	7.7	6.8	7.2	Yes
Haven	Weekly	37	9.7	6.1	7.2	Yes
Hopetoun	Weekly	52	9.0	6.1	7.0	Yes
Horsham	Weekly	77	8.5	6.2	7.2	Yes
Jung	Weekly	41	7.9	6.2	7.0	Yes
Lake Bolac	Weekly	31	9.7	8.2	9.1	No
Lalbert	Weekly	44	9.9	5.8	6.7	Yes
Manangatang	Weekly	52	7.5	5.9	6.7	Yes
Minyip	Weekly	43	8.8	6.2	7.4	Yes
Murtoa	Weekly	42	8.5	6.8	7.4	Yes
Natimuk	Weekly	17	10.0	6.1	7.1	Yes
Nullawil	Weekly	46	9.0	6.2	7.0	Yes
Ouyen	Weekly	52	8.5	6.5	7.4	Yes
Pomonal	Weekly	43	7.6	6.7	7.2	Yes
Quambatook	Weekly	48	8.0	6.5	7.3	Yes
Rainbow	Weekly	52	8.9	6.1	7.0	Yes
Rupanyup	Weekly	40	7.8	6.6	7.1	Yes
Sea Lake	Weekly	52	8.6	6.6	7.5	Yes
St Arnaud	Weekly	40	8.8	7.0	7.6	Yes
Stawell	Weekly	79	8.7	6.8	7.3	Yes
Ultima	Weekly	51	7.4	5.8	6.5	Yes
Underbool	Weekly	52	8.1	6.6	7.3	Yes
Walpeup	Weekly	52	9.2	6.9	7.8	Yes
Warracknabeal	Weekly	45	8.5	6.8	7.4	Yes
Willaura	Weekly	43	8.1	7.0	7.5	Yes
Woomelang	Weekly	52	7.7	6.1	6.8	Yes
Wycheproof	Weekly	43	8.9	5.9	6.9	Yes

† Guideline Value: *The pHof samples should be between 6.5 and 8.5.*

^ The number of sample taken during the reporting period varies due to software issues with field based Potable Data Assistance

5.2 Colour

In natural waters, colour is due mainly to the presence of Dissolved Organic Matter (DOM), which originates from soil and decaying vegetation.

The dissolution of metals in pipes and fittings can also discolour drinking water. In bore water, 'red water' is a frequent problem, caused by the oxidation of iron. In addition, a black discolouration in reservoirs and distribution systems can result from the action of bacteria on dissolved manganese to produce insoluble oxides. Some of these compounds form colloidal suspensions, or are only partially dissolved, and so contribute to apparent rather than true colour.

The ADWG fact sheet for colour states that, based on aesthetic considerations, true colour in drinking water should not exceed 15 Hazen Units (HU). GWMWater has an internal performance benchmark that the mean true colour will be less than 15 Hazen Units.

5.2.1 Results

True colour sampling and analysis was undertaken on a minimum monthly basis for all drinking water supplies.

Refer to Table 5.2 for true colour monitoring results. The drinking water towns of: Beulah, Brim, Dimboola, Jung, Lake Bolac, Manangatang, Quambatook, Rupanyup, Willaura, Woomelang and Wycheproof recorded results outside of the ADWG aesthetic values for true colour during the reporting period.

Missing Samples

There were no missing samples for the reporting period.

5.2.2 Actions Undertaken in Relation to Non-Compliance

GWMWater has limited control over colour in water supplies with no coagulation and filtration facilities. As a result of the multiple flood events in GWMWater's catchments all towns without filtration facilities experienced elevated colour levels in their supplies.

GWMWater engaged a specialist company to build a trial filtration plant to remove colour from the water supplied to Manangatang. This plant was seen as an innovative, cost effective way of providing improved water quality to small towns throughout GWMWater's region. The plant was commissioned during May 2011 and has provided some promising results. GWMWater will closely monitor the performance of the plant until late 2011 when a decision will be made on whether the trial plant will be purchased.

GWMWater has also been trialling the use of small chemical dosing pumps to deliver flocculent into raw water storages at towns experiencing high colour levels. At the end of the reporting period the coagulation trial was providing some excellent results. Based on these results GWMWater decided to commission chemical dosing pumps at all towns currently on BWNs. This project will be finalised during the 2011/12 reporting period.

Table 5. 2– True Colour Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	Results (Pt/Co)			Complying (Yes/No)^
			Max	Min	Mean	
Ararat*	Twice Monthly	24	4	2	2	Yes
Beulah	Monthly	12	64	16	34	No
Birchip	Monthly	12	4	2	2	Yes
Brim	Monthly	12	72	25	43	No
Charlton	Monthly	12	6	2	2	Yes
Dimboola	Monthly	12	6	2	3	Yes
Donald	Monthly	12	56	12	28	No
Edenhope	Monthly	12	2	2	2	Yes
Great Western	Monthly	12	8	2	5	Yes
Halls Gap	Monthly	12	4	2	2	Yes
Haven	Monthly	12	4	2	2	Yes
Hopetoun	Monthly	12	4	2	2	Yes
Horsham*	Twice Monthly	24	4	2	2	Yes
Jung	Monthly	12	72	20	38	No
Lake Bolac	Monthly	12	25	6	14	Yes
Lalbert	Monthly	12	100	8	41	No
Manangatang	Monthly	12	140	4	46	No
Minyip	Monthly	12	70	18	41	No
Murtoa	Monthly	12	30	2	4	Yes
Natimuk	Monthly	12	4	2	2	Yes
Nullawil	Monthly	12	25	2	13	Yes
Ouyen	Monthly	12	20	2	7	Yes
Pomonal	Monthly	12	8	2	3	Yes
Quambatook	Monthly	12	14	2	5	Yes
Rainbow	Monthly	12	6	2	3	Yes
Rupanyup	Monthly	12	70	12	41	No
Sea Lake	Monthly	12	20	2	5	Yes
St Arnaud	Monthly	12	4	2	2	Yes
Stawell*	Twice Monthly	24	4	2	2	Yes
Ultima	Monthly	12	100	12	41	No
Underbool	Monthly	12	4	2	2	Yes
Walpeup	Monthly	12	35	2	7	Yes
Warracknabeal	Monthly	12	4	2	2	Yes
Willaura	Monthly	12	20	4	12	Yes
Woomelang	Monthly	12	56	14	31	No
Wycheproof	Monthly	12	56	4	28	No

* Due to the population size of these towns two samples are taken every month.

^ Compliance against GWMWater performance benchmark (mean of true colour samples should be less than 15 HU)

5.3 Hardness

Hardness is caused primarily by the presence of calcium and magnesium ions.

The ADWG has a full discussion on the ramifications of hardness and what constitutes hard and soft water. ADWG suggest that, to minimise build-up of scale in hot water systems, total hardness (as calcium carbonate) in drinking water should not exceed 200 mg/L. GWMWater has an internal performance benchmark that the mean hardness will be less than 200 mg/L.

High total hardness may be a problem for supplies reliant on groundwater. Surface waters can generally be expected to have acceptable values.

5.3.1 Results

Hardness sampling and analysis was undertaken on a quarterly basis for all drinking water supplies. Refer to Table 5.3 for the hardness results.

Missing Samples

There were no missing samples for the reporting period.

5.3.2 Actions Undertaken in Relation to Non-Compliance

There were no non-compliant results for the reporting period.

Table 5. 3- Hardness Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)			Complying (Yes/No)^
			Max	Min	Mean	
Ararat*	Twice Quarterly	8	54	9	42	Yes
Beulah	Quarterly	4	65	27	50	Yes
Birchip	Quarterly	4	66	32	42	Yes
Brim	Quarterly	4	110	32	54	Yes
Charlton	Quarterly	4	120	25	119	Yes
Dimboola	Quarterly	4	47	27	37	Yes
Donald	Quarterly	4	77	27	42	Yes
Edenhope	Quarterly	4	140	5	52	Yes
Great Western	Quarterly	4	41	29	37	Yes
Halls Gap	Quarterly	4	43	24	33	Yes
Haven	Quarterly	4	53	40	48	Yes
Hopetoun	Quarterly	4	68	31	53	Yes
Horsham*	Twice Quarterly	8	74	15	54	Yes
Jung	Quarterly	4	86	23	42	Yes
Lake Bolac	Quarterly	4	30	19	27	Yes
Lalbert	Quarterly	4	59	24	34	Yes
Manangatang	Quarterly	4	54	21	39	Yes
Minyip	Quarterly	4	98	32	51	Yes
Murtoa	Quarterly	4	120	35	63	Yes
Natimuk	Quarterly	4	55	25	54	Yes
Nullawil	Quarterly	4	25	19	34	Yes
Ouyen	Quarterly	4	84	39	57	Yes
Pomonal	Quarterly	4	42	23	31	Yes
Quambatook	Quarterly	4	170	64	106	Yes
Rainbow	Quarterly	4	80	49	55	Yes
Rupanyup	Quarterly	4	97	23	48	Yes
Sea Lake	Quarterly	4	95	58	71	Yes
St Arnaud	Quarterly	4	53	35	45	Yes
Stawell*	Twice Quarterly	8	41	19	34	Yes
Ultima	Quarterly	4	56	15	29	Yes
Underbool	Quarterly	4	97	79	90	Yes
Walpeup	Quarterly	4	91	60	76	Yes
Warracknabeal	Quarterly	4	74	34	48	Yes
Willaura	Quarterly	4	24	15	22	Yes
Woomelang	Quarterly	4	130	36	68	Yes
Wycheproof	Quarterly	4	230	36	110	Yes

* Due to the population size of these towns two samples are taken every quarter.

^ Compliance against GWMWater performance benchmark (mean of hardness samples should be less than 200 mg/L $CaCO_3$.)

5.4 Electrical Conductivity

Electrical Conductivity (EC) is caused by inorganic salts and small amounts of organic matter that are dissolved in water. Electrical conductivity comprises sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate (and nitrite) and phosphate.

High EC values may be associated with excessive scaling in pipes, fittings and household appliances.

The ADWG provides that, based on taste, electrical conductivity in drinking water should not exceed 1000 µS/cm. GWMWater has an internal performance benchmark that the mean electrical conductivity will be less than 1000 µS/cm.

The ADWG fact sheet describes guideline values for Total Dissolved Solids (TDS) and approximates that the electrical conductivity standard is approximately twice that of the total dissolved solids. As it is easier and more cost effective to monitor electrical conductivity than total dissolved solids, the analysis for compliance is based on electrical conductivity.

5.4.1 Results

Sampling and field analysis for electrical conductivity was undertaken on a weekly basis for all drinking water supplies other the Ararat, Stawell and Horsham where twice weekly samples were taken. All analysis was undertaken using a TPS WP81 hand-held meter.

Refer to Table 5.4 for electrical conductivity monitoring results.

During the reporting period there were fluctuations in the EC supplied to customers. The fluctuations were most evident through Supply Systems 1 to 4 of the WMP when water from Taylors Lake was supplied to the towns for approximately one month following the landslides in the Grampians.

The only supply to exceed the 1000 µS/cm limit was Wycheproof. Wycheproof exceeded the standard for a short time when the old town storage was used which was less turbid and lower in colour than the water being supplied though the WMP.

No supplies had a mean EC concentration that exceeded the 1000 µS/cm limit.

Missing Samples

There are numerous supplies which are missing the required number of samples for the reporting period, refer to Table 5.4. GWMWater has conducted a rigorous search of all databases and electronic devices used during the sampling process but is unable to account for all samples. GWMWater is satisfied that these tests were conducted, as all field based EC tests are taken when the weekly compliance samples for turbidity and *E. coli* are collected. GWMWater can account for all compliance samples apart from those which could not be taken during the floods.

The missing results can be traced to the Portable Data Assistant (PDA) used to transfer field data to GWMWater's database. The PDAs were not transferring data in the correct fashion due to a software malfunction. When GWMWater became aware

of the issue the paper based system that had been used in previous years was reinstated. GWMWater expects that all results will be accounted for in the upcoming reporting period.

5.4.2 Actions Undertaken in Relation to Non-Compliance

There were no non-compliant results for the reporting period.

Table 5. 4– Electrical Conductivity (EC) Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples^	Results (uS/cm)			Complying (Yes/No)
			Max	Min	Mean	
Ararat	Weekly	69	243	160	194	Yes
Beulah	Weekly	52	709	94	264	Yes
Birchip	Weekly	47	451	117	238	Yes
Brim	Weekly	41	753	120	267	Yes
Charlton	Weekly	45	760	115	337	Yes
Dimboola	Weekly	38	980	136	296	Yes
Donald	Weekly	45	728	115	271	Yes
Edenhope	Weekly	43	750	88	326	Yes
Great Western	Weekly	43	230	190	209	Yes
Halls Gap	Weekly	42	185	110	138	Yes
Haven	Weekly	37	280	180	222	Yes
Hopetoun	Weekly	52	543	118	287	Yes
Horsham	Weekly	77	284	170	224	Yes
Jung	Weekly	41	786	110	297	Yes
Lake Bolac	Weekly	31	168	140	152	Yes
Lalbert	Weekly	44	334	90	150	Yes
Manangatang	Weekly	52	334	92	207	Yes
Minyip	Weekly	42	810	66	280	Yes
Murtoa	Weekly	41	853	150	350	Yes
Natimuk	Weekly	17	946	190	264	Yes
Nullawil	Weekly	46	290	75	127	Yes
Ouyen	Weekly	52	296	112	228	Yes
Pomonal	Weekly	43	188	115	141	Yes
Quambatook	Weekly	48	620	113	388	Yes
Rainbow	Weekly	52	773	117	277	Yes
Rupanyup	Weekly	40	840	110	292	Yes
Sea Lake	Weekly	52	451	159	253	Yes
St Arnaud	Weekly	40	315	130	278	Yes
Stawell	Weekly	79	184	125	143	Yes
Ultima	Weekly	51	242	70	135	Yes
Underbool	Weekly	52	424	167	319	Yes
Walpeup	Weekly	52	386	166	267	Yes
Warracknabeal	Weekly	45	991	120	295	Yes
Willaura	Weekly	44	155	125	137	Yes
Woomelang	Weekly	52	789	119	270	Yes
Wycheproof	Weekly	44	2087	111	510	Yes

† **Guideline Value:** *Electrical Conductivity (EC) should not exceed 1000 uS/cm.*

^ *The number of sample taken during the reporting period varies due to software issues with field based Potable Data Assistance*

5.5 Iron

At concentrations exceeding 0.3 mg/L, iron imparts an undesirable taste to water and stains plumbing fixtures and laundry. Some nuisance micro-organisms can concentrate iron and give rise to taste, odour and turbidity problems in distribution systems.

A detailed description of iron and its implications in a water supply can be found by reference to the ADWG.

ADWG suggest that, based on aesthetic considerations, the concentration of iron in drinking water should not exceed 0.3 mg/L.

5.5.1Results

Iron sampling and analysis is generally undertaken on a quarterly basis for all drinking water supplies.

Refer to Table 5.5 for monitoring results for iron.

The supplies at the disinfection only towns of Beulah, Brim, Donald, Jung, Lalbert, Manangatang, Minyip, Nullawil, Quambatook, Rupanyup, Sea Lake, St Arnaud, Ultima, Woomelang and Wycheproof all had results that exceeded 0.3 mg/L on a regular basis. The Murtoa supply recorded one result which was above the guideline value.

5.5.2 Actions Undertaken in Relation to Non-Compliance

As the ADWG Standard for iron is an aesthetic guideline. The only towns which exceeded the value, apart from Murtoa, are disinfection only supplies with no specific mechanism for removing iron. The large number of towns non-compliant with this parameter can be attributed to the poor raw water quality as a result of the flood events. The non-compliant result at Murtoa was a single event which did not constitute a systematic problem with the treatment of the water, and the cause was unknown.

In order to try and reduce the iron concentration at the disinfection only towns a tank flocculation trial is being conducted. This trial should help to decrease the iron concentration in the water supplied to customers.

Customers are encouraged to call the GWMWater Customer Service Centre on 1300 659 961 should they be concerned with taste and odour issues.

Table 5. 5—Iron Results for Drinking Water

Sampling Locality	Sampling Frequency	No of Samples	Results (mg/L)		Complying (Yes/No)
			Max	Min	
Ararat*	Twice Quarterly	8	0.06	0.02	Yes
Beulah	Quarterly	4	1.70	0.38	No
Birchip	Quarterly	4	0.03	0.02	Yes
Brim	Quarterly	4	2.00	0.43	No
Charlton	Quarterly	4	0.09	0.04	Yes
Dimboola	Quarterly	4	0.04	0.02	Yes
Donald	Quarterly	4	1.80	0.13	No
Edenhope	Quarterly	4	0.21	0.03	Yes
Great Western	Quarterly	4	0.04	0.02	Yes
Halls Gap	Quarterly	4	0.11	0.03	Yes
Haven	Quarterly	4	0.04	0.02	Yes
Hopetoun	Quarterly	4	0.06	0.02	Yes
Horsham*	Twice Quarterly	8	0.06	0.02	Yes
Jung	Quarterly	4	1.30	0.49	No
Lake Bolac	Quarterly	4	0.02	0.02	Yes
Lalbert	Quarterly	4	1.20	0.75	No
Manangatang	Quarterly	4	2.50	0.55	No
Minyip	Quarterly	4	3.60	0.52	No
Murtoa	Quarterly	4	0.46	0.10	No
Natimuk	Quarterly	4	0.03	0.02	Yes
Nullawil	Quarterly	4	0.74	0.09	No
Ouyen	Quarterly	4	0.03	0.02	Yes
Pomonal	Quarterly	4	0.09	0.02	Yes
Quambatook	Quarterly	4	1.20	0.16	No
Rainbow	Quarterly	4	0.06	0.03	Yes
Rupanyup	Quarterly	4	3.10	0.51	No
Sea Lake	Quarterly	4	1.10	0.11	No
St Arnaud	Quarterly	4	0.52	0.02	No
Stawell*	Twice Quarterly	8	0.11	0.02	Yes
Ultima	Quarterly	4	1.70	0.59	No
Underbool	Quarterly	4	0.19	0.03	Yes
Walpeup	Quarterly	4	0.17	0.14	Yes
Warracknabeal	Quarterly	4	0.03	0.02	Yes
Willaura	Quarterly	4	0.02	0.02	Yes
Woomelang	Quarterly	4	1.80	0.52	No
Wycheproof	Quarterly	4	1.00	0.35	No

* Due to the population size of these towns two samples are taken every quarter.

† **Guideline Value:** Iron should not exceed 0.3 mg/L.

6.0 Analysis of Results

Tables in section 6 provide a comparison between the current and historic results for various parameters.

Table 6. 1- Comparison of *E. coli* results from 2007/08 to 20010/11

Water Supply	2007/08		2008/09		2009/10		2010/11	
	No. samples	% with no *E. coli*	No. samples	% with no *E. coli*	No. samples	% with no *E. coli*	No. samples	% with no *E. coli*
Ararat	104	100%	104	100%	104	100%	104	100%
Beulah	52	100%	52	100%	52	100%	52	100%
Birchip	52	100%	52	100%	52	100%	52	100%
Brim	52	100%	52	100%	52	100%	52	100%
Charlton	52	100%	52	100%	52	100%	52	100%
Dimboola	52	100%	52	100%	52	100%	52	100%
Donald	52	100%	52	100%	52	100%	52	100%
Edenhope	52	100%	52	100%	52	100%	52	100%
Great Western	52	100%	52	100%	52	100%	52	100%
Halls Gap	52	100%	52	100%	52	100%	52	100%
Haven	52	99%	52	99%	52	99%	52	100%
Hopetoun	52	100%	52	100%	52	100%	52	100%
Horsham	104	100%	104	98%	104	100%	104	99%
Jung	54	99%	52	100%	52	99%	52	99%
Lake Bolac	52	100%	52	100%	52	100%	52	99%
Lalbert	52	100%	52	100%	52	100%	51	100%
Manangatang	52	100%	52	100%	52	100%	52	100%
Minyip	52	98%	52	99%	52	100%	52	100%
Murtoa	52	100%	52	100%	52	99%	52	99%
Natimuk^	-	-	-	-	-	-	52	100%
Nullawil	52	100%	52	100%	52	100%	51	100%
Ouyen	52	100%	52	100%	52	100%	52	100%
Pomonal	52	100%	52	100%	52	100%	52	100%
Quambatook	52	100%	52	100%	52	100%	50	100%
Rainbow	52	100%	52	100%	52	100%	52	100%
Rupanyup	52	100%	52	100%	52	100%	52	100%
Sea Lake	52	100%	52	100%	52	100%	52	99%
St Arnaud	52	99%	52	100%	52	100%	52	100%
Stawell	104	100%	104	100%	104	100%	104	100%
Ultima	52	100%	52	100%	52	100%	52	100%
Underbool ~	-	-	41	100%	52	100%	52	100%
Walpeup	52	99%	52	100%	52	100%	52	100%
Warracknabeal	52	100%	52	100%	52	100%	52	100%
Watchem‡	41	100%	-	-	-	-	-	-
Willaura	52	99%	52	92%	52	99%	52	100%
Woomelang	52	100%	52	100%	52	100%	52	100%
Wycheproof	52	100%	52	100%	52	100%	51	100%

‡ Watchem water supply was declared as regulated on 14 March 2008

~ Underbool was declared a drinking water supply on 17 September 2008

^Natimuk was declared a drinking water supply on 01 July 2010

Table 6.2 - Comparison of Turbidity Results from 2008/09 to 2010/11 using the 95% UCL method.

Water Supply	2008/09		2009/10		2010/11	
	No. samples	95% UCL of mean (NTU)	No. samples	95% UCL of mean (NTU)	No. samples	95% UCL of mean (NTU)
Ararat	104	0.5	104	0.3	104	0.3
Beulah	52	3.0	52	2.1	52	18.7
Birchip	52	0.6	52	0.3	52	1.6
Brim	52	6.4	52	2.3	52	22.9
Charlton	52	0.4	52	0.4	52	0.7
Dimboola	52	0.3	52	0.5	52	0.4
Donald	52	1.5	52	1.3	52	15.2
Edenhope	52	1.4	52	0.3	52	1.0
Great Western	52	0.3	52	0.3	52	0.2
Halls Gap	52	0.4	52	0.3	52	0.6
Haven#	52	0.7	52	0.3	52	0.5
Hopetoun	52	0.7	52	0.3	52	0.3
Horsham	104	0.5	104	0.3	104	0.4
Jung	52	3.8	52	3.1	52	25.2
Lake Bolac	52	0.4	52	0.4	52	0.4
Lalbert	52	6.5	52	13.3	51	17.2
Manangatang	52	22.6	52	16.4	52	14.4
Minyip	52	3.3	52	2.7	52	31.4
Murtoa	52	1.7	52	0.5	52	1.4
Nullawil	52	6.6	52	7.3	51	4.6
Natimuk^	-	-	-	-	52	0.3
Ouyen	52	0.5	52	0.2	52	0.4
Pomonal	52	0.5	52	0.4	52	0.4
Quambatook	52	4.0	52	3.4	50	4.7
Rainbow	52	0.8	52	0.9	52	3.0
Rupanyup	52	4.7	52	2.5	52	29.2
Sea Lake	52	3.9	52	3.2	52	6.4
St Arnaud	52	0.7	52	0.4	52	0.5
Stawell	104	0.4	104	0.3	104	0.3
Ultima	52	32.0	52	30.0	52	16.0
Underbool ~	41	2.2	52	3.5	52	3.6
Walpeup	52	2.8	52	2.7	52	2.3
Warracknabeal	52	0.5	52	0.5	52	1.1
Willaura	52	0.9	52	0.4	52	0.3
Woomelang	52	5.4	52	2.2	52	21.2
Wycheproof	52	3.1	52	2.7	51	19.1

~ Underbool was declared a drinking water supply on 17 September 2008

^Natimuk was declared a drinking water supply on 01 July 2010

Table 6.3 - Comparison of the mean THM concentrations from 2008/09 to 20010/11.

Water Supply	2008/09		2009/10		2010/11	
	No. samples	Mean result (mg/L)	No. samples	Mean result (mg/L)	No. samples	Mean result (mg/L)
Ararat	24	0.091	24	0.077	24	0.084
Beulah	12	0.268	12	0.144	12	0.232
Birchip	12	0.128	11	0.082	12	0.085
Brim	12	0.081	12	0.012	12	0.014
Charlton	12	0.210	12	0.124	12	0.131
Dimboola	12	0.102	12	0.063	12	0.088
Donald	12	0.402	12	0.178	12	0.175
Edenhope	12	0.012	12	0.007	12	0.003
Great Western	12	0.164	12	0.154	12	0.167
Halls Gap	12	0.080	12	0.075	12	0.086
Haven	12	0.144	12	0.138	12	0.148
Hopetoun	12	0.125	12	0.062	12	0.066
Horsham	24	0.157	24	0.138	24	0.169
Jung	12	0.278	12	0.146	12	0.262
Lake Bolac*	-	-	12	0.002	12	0.003
Lalbert	12	0.087	11	0.078	12	0.246
Manangatang	12	0.071	12	0.060	12	0.282
Minyip	12	0.386	12	0.164	12	0.257
Murtoa	12	0.177	12	0.065	12	0.103
Natimuk^	-	-	-	-	12	0.200
Nullawil	12	0.070	11	0.065	12	0.117
Ouyen	12	0.069	12	0.073	12	0.236
Pomonal	12	0.076	12	0.085	12	0.086
Quambatook	12	0.287	12	0.228	12	0.208
Rainbow	12	0.132	12	0.045	12	0.087
Rupanyup	12	0.380	12	0.172	12	0.212
Sea Lake	12	0.092	12	0.086	12	0.129
St Arnaud	12	0.129	12	0.090	12	0.069
Stawell	12	0.058	12	0.043	12	0.057
Ultima	12	0.050	12	0.046	12	0.219
Underbool #	9	0.061	12	0.054	12	0.066
Walpeup	12	0.107	12	0.088	12	0.139
Warracknabeal	12	0.202	12	0.098	12	0.104
Willaura*	-	-	12	0.002	12	0.002
Woomelang	12	0.333	12	0.153	12	0.237
Wycheproof	12	0.267	11	0.210	12	0.264

** Lake Bolac and Willaura were not tested for THMs until July 2009 due to the supplies being disinfected with Chlorine Dioxide which does not produce THMs.*

 # Underbool was declared a drinking water supply on 17 September 2008

^Natimuk was declared a drinking water supply on 1 July 2010

Table 6.4 - Comparison of the mean EC concentrations from 2008/09 to 2010/11.

Water Supply	2007/08		2008/09		2009/10	
	No. samples	Mean result (µS/cm)	No. samples	Mean result (µS/cm)	No. samples^	Mean result (µS/cm)
Ararat	104	212	104	197	69	194
Beulah	52	1043	52	159	52	264
Birchip	52	685	52	352	47	238
Brim	52	1501	52	153	41	267
Charlton	52	591	52	554	45	337
Dimboola	52	309	52	175	38	296
Donald	52	2220	52	827	45	271
Edenhope	52	409	52	410	43	326
Great Western	52	247	52	237	43	209
Halls Gap	52	158	52	140	42	138
Haven	52	303	52	269	37	222
Hopetoun	52	637	52	203	52	287
Horsham	104	302	104	263	77	224
Jung	52	847	52	143	41	297
Lake Bolac	52	161	52	153	31	152
Lalbert	52	304	52	132	44	150
Manangatang	52	200	52	117	52	207
Minyip	52	1701	52	143	42	280
Murtoa	52	793	52	166	41	350
Natimuk*	-	-	-	-	17	264
Nullawil	52	124	52	152	46	127
Ouyen	52	166	52	145	52	228
Pomonal	52	162	52	143	43	141
Quambatook	52	386	52	399	48	388
Rainbow	52	692	52	156	52	277
Rupanyup	52	1090	52	319	40	292
Sea Lake	52	222	52	196	52	253
St Arnaud	52	407	52	394	40	278
Stawell	104	151	104	149	79	143
Ultima	52	134	52	87	51	135
Underbool #	41	350	52	286	52	319
Walpeup	52	258	52	256	52	267
Warracknabeal	52	1230	52	173	45	295
Willaura*	52	148	52	144	44	137
Woomelang	52	681	52	143	52	270
Wycheproof	52	948	52	436	44	510

 # Underbool was declared a drinking water supply on 17 September 2008

** Natimuk was declared drinking water on 01 July 2010*

^ The number of sample taken during the reporting period varies due to software issues with field based Potable Data Assistance

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7.0 Emergency / Incident Management

7.1 Emergencies

GWMWater reviewed its Emergency Management Plan during 2009/10. The Emergency Management Plan includes specific procedures for the management of water quality incidents.

Water quality incidents are notifiable to DH under section 22 of the Act. The Emergency Management Plan reflects this requirement.

Table 7.1 summarises all section 22 notifications sent to DH for the reporting period.

Table 7.2 summarises all boil water notices which were implemented during the reporting period.

Table 7.1 – Summary of all Section 22 notifications supplied to DH during the reporting period

Date	Town	Incident	Response
28 July 2010	Lake Bolac	*E. coli* detected in water supply.	Re-testing of the supply returned negative results. All water treatment processes were checked and found to be in order. A disinfection residual was present at the time of sampling. The positive result was from an unknown cause.
6 October 2010	Jung	*E. coli* detected in water supply.	Multiple re-testing of the water supply, a complete check of all water treatment plant logs and a check of the testing laboratory's procedures all failed to isolate the cause. All re-tests were negative. chlorine levels were high, the result was possibly due to a lab or sampling error.
6 October 2010	Murtoa	*E. coli* detected in water supply.	Multiple re-testing of the water supply, a complete check of all Water Treatment Plant logs and a check of the testing laboratory's procedures all failed to isolate the cause. All re-tests were negative. chlorine levels were high the result was possibly due to a lab or sampling error.
09 December 2011	Horsham	*E. coli* detected in water supply.	Re-testing of the supply returned negative results. All water treatment processes were checked and found to be in order. A chlorine residual was present at the time of sampling. The positive result was from an unknown cause.
12 January 2011	Sea Lake	*E. coli* detected in water supply.	Reinforcement of the procedure for the operation of the chlorine dosing system.

Table 7.1 – Summary of Section 22 notifications supplied to DH during the reporting period

Date	Town	Incident	Response
14 April 2011	Ouyen	Elevated levels of trihalomethanes were detected in the supply.	Monitoring of the supply continued with poor quality raw water causing THM levels to increase.
30 June 2011	Dimboola	BGA in the raw water storage	The raw water storage was isolated from the town supply. An algaecide was used to treat the BGA. Normal supply arrangements resumed on 15 July 2011.
30 June 2011	Warracknabeal	BGA in the raw water storage	The raw water storage was isolated from the town supply, powdered activated carbon dosing was implemented. An algaecide was used to treat the BGA. Normal supply arrangements resumed on 15 July 2011.

Table 7.2 Table: 7.2 Summary of Boil Water Notices issued during the reporting period

Town	Date issued	Date rescinded	Incident
Lalbert	07 October 2010	Still in place	Elevated turbidity due to flood events.
Manangatang	07 October 2010	Still in place	Elevated turbidity due to flood events.
Ultima	07 October 2010	Still in place	Elevated turbidity due to flood events.
Warracknabeal	17 December 2010	29 December 2010	Infiltration of storm water to the clear water storage caused by heavy rainfall events.
Birchip	15 January 2011	28 January 2011	Loss of power to the WTP and disinfection system
Charlton	15 January 2011	28 January 2011	Loss of power to the WTP and disinfection system
Donald	15 January 2011	Still in place	Loss of power to the disinfection system. Elevated turbidity due to flood events.
St Arnaud	15 January 2011	28 January 2011	Loss of power to the WTP and disinfection system
Quambatook	15 January 2011	14 February 2011	Loss of power to the disinfection system
Wycheproof	15 January 2011	Still in place	Loss of power to the disinfection system. Elevated turbidity due to flood events.
Halls Gap	15 January 2011	31 January 2011	Possible ingress of flood and wastewater to the trunk main after flood events severed the main.
Pomonal	15 January 2011	31 January 2011	Possible ingress of flood and wastewater to the trunk main after flood events severed the main.
Minyip	3 February	Still in place	Elevated turbidity due to flood events.
Rupanyup	3 February	Still in place	Elevated turbidity due to flood events.
Jung	7 February	Still in place	Elevated turbidity due to flood events.
Beulah	18 February	Still in place	Elevated turbidity due to flood events.
Woomelang	18 February	Still in place	Elevated turbidity due to flood events.

8.0 Complaints

8.1 Complaints and Responses

GWMWater's *Customer Complaints and Disputes Policy* recognises customers' rights, including the right to complain.

GWMWater systematically records all complaints in a complaint register. Trends in water quality complaints are able to be tracked and monitored and appropriate action taken.

When a water quality complaint is received, the complaint is logged and a service request is raised for the incident to be investigated.

Table 8.1 below summarises the complaints received during the reporting period for both drinking water and regulated water supplies.

Table 8.2 and Table 8.3 provide a detailed breakdown of the total number of complaints received from customers supplied with drinking and regulated water.

Table 8. 1– Water Quality Complaints comparison 2009/10 to 2010/11

	2009/10				2010/11			
	No. of Complaints		Complaints per 100 Customers†		No. of Complaints		Complaints per 100 Customers†	
Type of Complaint	Drinking	Regulated	Drinking	Regulated	Drinking	Regulated	Drinking	Regulated
Discoloured	113	41	0.431	1.042	154	71	0.587	1.804
Taste /Odour	35	56	0.133	1.423	25	30	0.010	0.762
Blue water	0	0	-	-	0	0	-	-
Air in water	0	0	-	-	4	0	0.015	-
Suspected illness	0	0	-	-	0	0	-	-
Other	10	2	0.038	-	13	5	0.050	0.138
Total	**158**	**99**	**0.603**	**1.143**	**196**	**106**	**0.747**	**2.693**
Difference					**+ 38**	**+ 7**	**+ 0.144**	**+ 1.55**

† *ESC defines a customer as a property which, is connected to the water business' water system; and receives a fixed and/or usage account.*

8.2 Analysis of Issues

GWMWater received an increase in the number of complaints from both drinking water and regulated supplies during 2010/11. The increased level of complaints can be directly attributed to the elevated concentration of turbidity and colour contained in the raw water. The increase in these two parameters is a direct result of the flooding that occurred in both in the Murray River and Lake Bellfield

With no means to remove turbidity and colour in disinfection only as well as in regulated supplies, customers experienced a deterioration in the quality of the water supplied to them.

Table 8. 2– Water Quality Complaints for Drinking Water Towns

Water Supply	Pop'n served	ESC Customers	Number of Complaints						
			Colour	T & O^	Blue	Air	Illness	Other	Total
Ararat	7,000	3,754	12	2	-	2	-	-	**16**
Beulah	230	179	3	-	-	-	-	-	**3**
Birchip	800	450	2	-	-	-	-	-	**2**
Brim	100	58	8	-	-	-	-		**8**
Charlton	1,100	676	2	-	-	-	-	-	**2**
Dimboola	1,560	869	1	3	-	-	-	-	**4**
Donald	1,380	846	5	-	-	-	-	1	**6**
Edenhope	780	538	-	-	-	-	-	-	**0**
Great Western	150	124	1	-	-	-	-	-	**1**
Halls Gap	260	456	10	2	-	1	-	-	**13**
Hopetoun	670	391	1	-	-	-	-	-	**1**
Horsham#	13,290	7,464	7	3	-	-	-	-	**10**
Jung	90	43	5	-	-	-	-	-	**5**
Lake Bolac	240	164	-	2	-	-	-	-	**2**
Lalbert	100	61	6	-	-	-	-	1	**7**
Manangatang	310	166	4	-	-	-	-	2	**6**
Minyip	480	278	13	1	-	-	-	1	**15**
Murtoa	840	490	-	-	-	-	-	2	**2**
Natimuk	230	165	-	-	-	-	-	-	**0**
Nullawil	100	43	1	-	-	-	-	-	**1**
Ouyen	1,250	668	1	-	-	-	-	-	**1**
Pomonal	150	110	1	-	-	-	-	-	**1**
Quambatook	280	168	32	5	-	-	-	2	**39**
Rainbow	560	373	-	-	-	-	-	-	**0**
Rupanyup	410	251	14	2	-	-	-	2	**18**
Sea Lake	690	419	2	-	-	-	-	1	**3**
St Arnaud	2,640	1,370	2	-	-	1	-	1	**4**
Stawell	6,270	3,187	3	-	-	-	-	-	**3**
Ultima	190	95	5	1	-	-	-	-	**6**
Underbool	230	135	-	-	-	-	-	-	**0**
Walpeup	150	76	1	-	-	-	-	-	**1**
Warracknabeal	2,490	1,438	2	4	-	-	-	-	**6**
Willaura	300	245	-	-	-	-	-	-	**0**
Woomelang	220	145	4	-	-	-	-	-	**4**
Wycheproof	730	438	6	-	-	-	-	-	**6**
Total	**46,210**	**26,221**	**154**	**25**	**0**	**4**	**0**	**13**	**196**

^Taste and Odour (T & O)

Table 8. 3– Water Quality Complaints for Regulated Supplies

Water Supply	Pop'n served	ESC Customers	No. Complaints						
			Colour	T & O^	Blue	Air	Illness	Other	Total
Antwerp	30	12	3	-	-	-	-	-	**3**
Apsley	190	116	-	-	-	-	-	-	**0**
Berriwillock	150	90	-	5	-	-	-	-	**5**
Buangor	50	37	1	3	-	-	-	-	**4**
Chillingollah	20	9	-	-	-	-	-	-	**0**
Chinkapook	20	16	-	-	-	-	-	-	**0**
Clear Lake	20	4	-	-	-	-	-	-	**0**
Cowangie	30	13	-	-	-	-	-	-	**0**
Culgoa	150	77	-	6	-	-	-	3	**9**
Dooen	20	17	-	-	-	-	-	-	**0**
Elmhurst	230	111	-	-	-	-	-	-	**0**
Glenorchy	100	62	7	-	-	-	-	-	**7**
Goroke	270	173	-	-	-	-	-	-	**0**
Harrow	150	90	6	-	-	-	-	-	**6**
Jeparit	400	312	10	2	-	-	-	2	**14**
Kaniva	740	496	1	-	-	-	-	-	**1**
Kiata	20	20	-	-	-	-	-	-	**0**
Lascelles	50	28	-	-	-	-	-	-	**0**
Lillimur	30	16	1	-	-	-	-	-	**1**
Marnoo	120	70	4	-	-	-	-	-	**4**
Miram	20	13	-	-	-	-	-	-	**0**
Moyston	150	88	4	-	-	-	-	-	**4**
Murrayville*	240	183	-	-	-	-	-	-	**0**
Nandaly	90	33	1	-	-	-	-	-	**1**
Nhill	1,890	1,147	9	-	-	-	-	-	**9**
Noradjuha	20	7	-	-	-	-	-	-	**0**
Patchewollock	80	52	-	4	-	-	-	-	**4**
Pimpinio	70	37	10	6	-	-	-	-	**16**
Serviceton	50	34	2	-	-	-	-	-	**2**
Speed	50	38	2	-	-	-	-	-	**2**
Streatham	100	48	1	-	-	-	-	-	**1**
Tarranyurk	20	8	-	-	-	-	-	-	**0**
Tempy	50	33	1	-	-	-	-	-	**1**
Waitchie	10	5	1	-	-	-	-	-	**1**
Watchem	180	86	4	-	-	-	-	-	**4**
Westmere	20	17	2	4	-	-	-	-	**6**
Wickliffe	120	42	-	-	-	-	-	-	**0**
Yaapeet	30	36	1	-	-	-	-	-	**1**
Total	**6,460**	**3,936**	**71**	**30**	**0**	**0**	**0**	**5**	**106**

^Taste and Odour (T & O)

9.0 Undertakings under Section 30 of the Act

There were no undertakings during the reporting period.

10.0 Drinking Water Regulatory Audit Undertaking

DH did not require that GWMWater undertake a regulatory audit during the reporting period. GWMWater's last audit was carried out during the 2009/10 reporting period, with the next audit scheduled for the 2011/12.

11.0 Regulated Water

Regulated water is water that is not intended for drinking but which could reasonably be mistaken as drinking water. This could be the case when such water is delivered to households through a piped reticulation system, for example.

Section 6 of the Safe Drinking Water Act, 2003 allows the Minister for Health to declare certain water as regulated.

GWMWater must manage risks in relation to water that is not intended for drinking, as part of its normal business practices. GWMWater is required to:

- Prepare a Risk Management Plan for the regulated water;
- Ensure the Risk Management Plan contains the matters specified in regulation 6 of the Safe Drinking Water Regulations;
- Have the Plan audited by an approved auditor;
- Take all reasonable steps to minimise the likelihood of the water being mistaken as drinking water;
- Include a summary of the management activities for regulated water supply in the Annual Report

GWMWater had a total of 36 towns supplied with water classified as 'regulated water' under Section 6 of the Act during the reporting period. The regulated water supplies are listed in Table 1.2. The Minister of Health also declared all rural water pipelines, other then the Wimmera Mallee Pipeline as regulated supplies in the Victorian Government Gazette No. s 36 on Monday 23 February 2009.

12.0 Glossary of Terms

Terms and abbreviations used in this Report have been collated into a Glossary to provide clarity.

ADWG, 2004:	The Australian Drinking Water Guidelines provide a framework for the management of drinking water supplies designed to ensure safety at the point of use.
Alum:	Aluminium sulphate as used as a coagulant in the water treatment process.
Anabaena:	A species of Blue Green Algae.
BGA:	Blue Green Algae
BOOT:	Build Own Operate and Transfer. A form of commercial contract associated with the provision of treated water at privately-owned water treatment plants.
Bore:	Conduit for extracting groundwater from an aquifer to the surface for use in a town water supply.
Carcinogen:	A chemical or other agent that is linked to high incidences of cancer.
CCP:	Critical Control Point in the Risk Management Plant
Chlorination:	Process of adding chlorine gas to water as a disinfectant.
Chlorite:	Disinfection by-product formed from the reaction of chlorine dioxide gas with natural organic matter.
Coagulation:	The clumping together of solids so they can more easily be settled out or filtered out of water. A chemical called aluminium sulphate (alum) is generally used to aid coagulation in water treatment
Concentration:	A measure of how much of a given substance there is mixed with another substance (in this case water), usually expressed as a weight to volume, e.g. milligrams per litre (mg/L).
CWS:	Clear Water Storage.
DH:	Department of Health
DBP:	Disinfection By Products – a reaction of natural organic material with the disinfectant medium producing by products via reaction. Chlorine disinfection produces Trihalomethanes, whilst chlorine dioxide disinfection produces chlorite.
Disinfection-only Water Supplies:	Water supplies that have disinfection as their only form of treatment.
Dissolution:	A form of chemical weathering in which water molecules, sometimes in combination with acid or another compound in the environment, attract and remove oppositely charged ions or ion groups from a mineral or rock.
Distribution System:	The system of pipes delivering water from the Water Treatment Plant to the Reticulation System.
DOC:	Dissolved Organic Carbon – a measure of the concentration of humic and fulvic acids in the water.
DOM:	Dissolved Organic Matter – this term can be interrelated with the

	amount of 'colour' in the water (is similar to DOC)
Drinking Water:	Legislatively defined as water intended for human consumption or associated with purposes for human consumption. Also known as a potable supply.
DSE:	Department of Sustainability and Environment, Victoria
EC:	Electrical Conductivity as measured in micro Siemens per centimetre (µS/cm).
Entry Point:	The point at which the water supply enters the reticulation system.
ESC:	Essential Services Commission
Flocculation:	The water treatment process after coagulation that uses gentle stirring to cause suspended particles to form larger, aggregated masses (floc). The aggregates are removed from the water by a separation process (eg, sedimentation, flotation, or filtration)
Fluoridation:	The act of adding fluoride to a water supply in accordance with the *Health (Fluoridation) Act*, 1973.
Fully-treated Water Supplies:	Water supplies that have coagulation and filtration processes in addition to disinfection.
GWMWater:	Grampians Wimmera Mallee Water Corporation (trading as GWMWater)
HAA:	Haloacetic Acids formed as a by-product of disinfection with chlorine. HAAs take the form of chloroacetic acid, dichloroacetic acid and trichloroacetic acid.
Hand-held Meter:	A device used to determine chemical characteristics of water in the field without the need to collect a sample and send to the laboratory for analysis.
Hardness:	Caused by the presence of calcium and magnesium ions in water and can contribute to scale build up in pipes and appliances.
HU:	Scientific units for True Colour measurements – Hazen Units.
Jar Testing:	A bench top test designed to optimise chemical dose rates based on known quality of raw water.
kL:	Kilolitre (1,000 L).
L:	Litre
mg/L:	Scientific units for the concentration of a parameter given as milligrams per litre. Also known as parts per million (ppm).
ML:	Megalitre (1,000,000 L).
NATA:	National Accredited Testing Authority
NMP:	Northern Mallee Pipeline drawing its water from the Murray River.
Notifications:	Pursuant to Sections 18 and 22 of the *Safe Drinking Water Act, 2003*.
NTU:	Scientific units for turbidity measurements – Nephelometric Turbidity Units.
Orgs/100mL:	Organisms per 100 mL. A measure of the number of *E. coli*.
pH:	The measure of the concentration of hydrogen ions in a sample related to a logarithmic scale between 1 (acidic) and 14 (basic).

Regulated Water:	Water not intended for human consumption, but that could easily be mistaken as such. Also known as a non-potable supply. This term is defined in the *Safe Drinking Water Act 2003*.
Reticulation System:	The system of pipes delivering water to the customers tap from the entry point to the system.
RMP:	Risk Management Plan pursuant to the *Safe Drinking Water Act 2003*.
Safe Drinking Water Act, 2003:	Legislative framework for assuring drinking water quality in Victoria
Safe Drinking Water Regulations, 2005:	Regulations made subsequent to the Safe Drinking Water Act that give effect to key aspects of the Act.
Sampling:	The process of collecting a representative amount of water from a reticulation system to analyse and compare against the ADWG Standards and subsequently report to DH.
SCADA	Supervisory Control and Data Acquisition. A computer interface to acquire data remotely through a telemetered communications exchange network.
T & O	Taste and Odour
THMs:	Trihalomethanes – disinfection by-product using chlorine as a disinfectant. Take the form of trichloromethane, bromodichloromethane, dibromochloromethane and tribromomethane.
TWS:	Treated Water Storage (applicable to disinfection only supplies)
UCL:	Upper Confidence Limit. A statistical method of evaluating a sample set.
Undertakings:	Legally binding commitment made pursuant to Section 30 of the *Safe Drinking Water Act, 2003*.
UV:	Ultra-Violet light. UV reacts with organic material in water to form high fractions of DOC.
WMP	Wimmera Mallee Pipeline
WTP:	Water Treatment Plant.

13.0 References

1. ***Australian Drinking Water Guidelines* 2004**, National Health and Medical Research Council, Canberra, 2004
2. **Blue-Green Algae Circular 2010/11** Department of Sustainability and Environment
3. ***Safe Drinking Water Act* 2003** (Act No. 46/2003), 11 June 2003, Parliament of Victoria.
4. ***Safe Drinking Water Regulations 2005*** (S/R No. 88/2005), 19 July 2005, Parliament of Victoria.