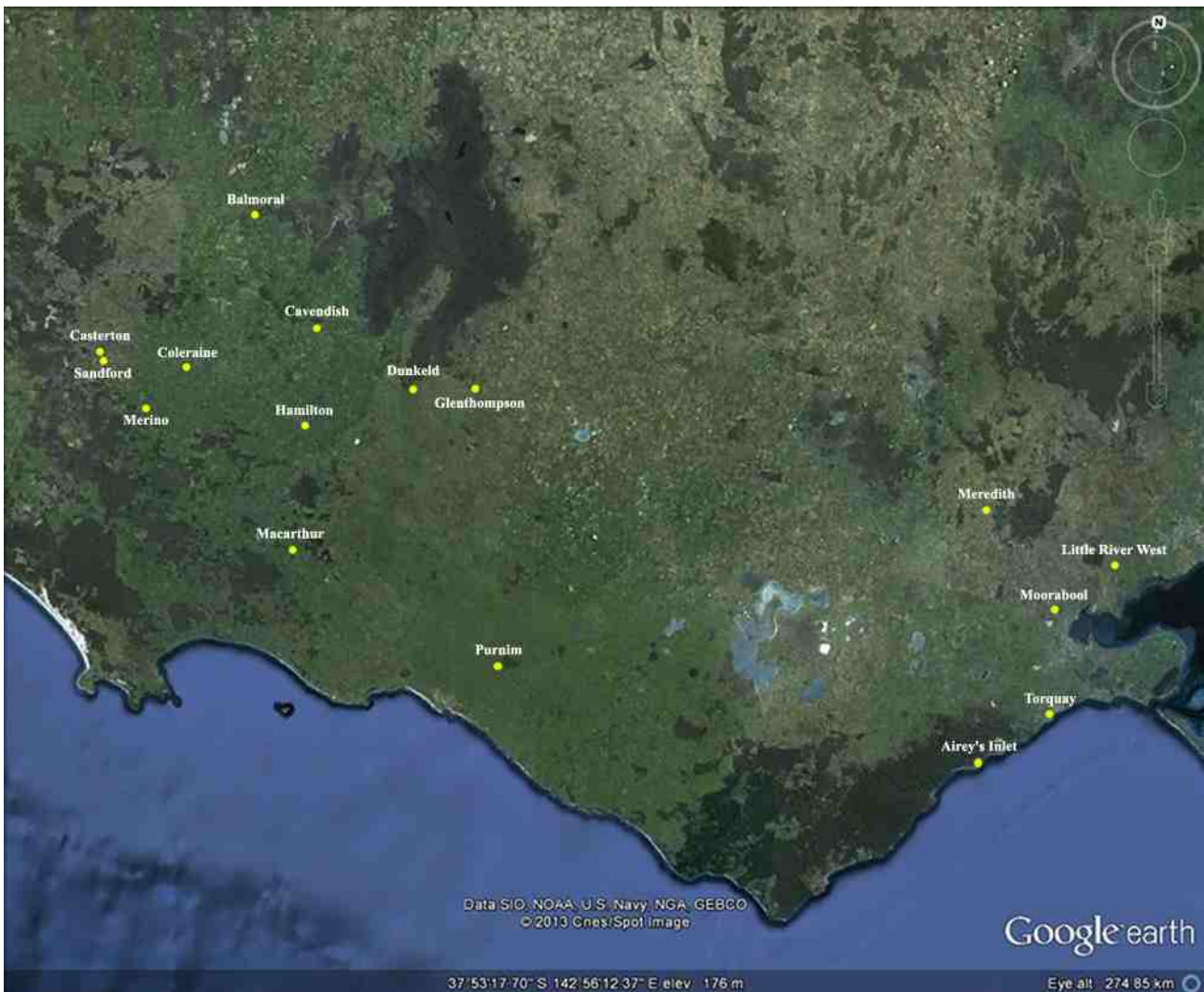


South West Victoria

Wannon Water/Barwon Water

Specific Drinking Water Issues 2006-2012
Aluminium, Arsenic & Bromodichloromethane
March 2013



South West Victoria Locality Map – Places Of Interest In This Report

Friends of the Earth Melbourne



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1. Introduction

In December 2012, Friends of the Earth sent Freedom of Information requests to Wannon Water and Barwon Water. The FOI's hoped to shed some light on possible "under-reported" breaches to both the World Health Organisation And Australian Drinking Water Guidelines.

"I require details of water quality testing results (including tap water tests) ... regarding all health related results recorded between the dates 1/1/05 to 6/12/12... Aesthetic guidelines are not required.

Health related criteria would include;

- *Chlorine based/Chloramination based disinfection by product chemicals*
- *Trihalomethanes [Trichloromethane (Chloroform), Dibromochloromethane, Tribromomethane (Bromoform), Bromodichloromethane etc].*
- *Dichloroacetic Acid, Trichloroacetic Acid, Chloroacetic Acid, Chloral Hydrate etc.*
- *N-nitrosodimethylamine (NDMA), Cyanogen Chloride (as Cyanide), dichlorophenols.*
- *Ecoli.*

Other substances also requested would include Fluoride, Chlorite, Chlorate, Cyanide, Nitrate, Nitrite and Radionuclides (including beta and gamma emitting).

Health related criteria for a range of heavy metals including antimony, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, zinc and selenium are also requested.

I also request all detections of pesticides, PAH's and organic chemicals recorded in the Barwon Water network between the dates 01/04/11 to 6/12/12."

During the FOI process it became clear that Wannon Water had problems processing the request in its original form. Wannon Water eventually sent back the information as requested but only as far back as January 2010. Further requests for information prior to this date eventually were confined to Bromodichloromethane and the addition of Aluminium results for Hamilton and Arsenic for Macarthur and Koroit. During the FOI process, the original Barwon Water request was modified to just include chlorine disinfection byproducts, however only a small number of samples for Dibromochloromethane were included in the response from Barwon Water, making it impossible to quantify Total THM levels.

This project was seen as a follow up to a similar report produced in October 2012, looking at substances exceeding ADWG in the SA Water Network between 2000-2012.

http://www.foe.org.au/sites/default/files/SAWater2012a_0.pdf

Of particular concern in South Australia was the high number of chlorine disinfection byproducts breaching World Health Organisation Guidelines. Of particular concern was that 2382 detections breached the WHO guidelines for the Trihalomethane, Bromodichloromethane/Dichlorobromoform. These WHO breaches for single Trihalomethanes do not have to be publicly reported by water authorities in Australia.

"THM's consist of 4 chemicals: Chloroform, Bromoform, Dibromochloromethane and Bromodichloromethane (BDCM). The Australian Drinking Water Guidelines (ADWG) combine

these four substances and then give a guideline level only for the sum of the four. That guideline is 250 parts per billion. The WHO however give guidelines for each of the four substances, with the most toxic, BDCM given a safe drinking water guideline of 60 parts per billion.

The IARC (International Agency for Research on Cancer) has classified BDCM in Group 2B (possibly carcinogenic to humans). What this could indicate is that many other communities across Australia may have none or low numbers of breaches for THM's, yet could be consuming dangerous levels of individual DBP's and these results are not made public by water authorities. Some DBP's have been linked to bladder cancer and adverse reproductive outcomes. Water authorities test for a handful of DBP's, yet 700 have been discovered. DBP's are created when chlorine used as a disinfectant, combines with organic molecules in the water distribution process.

People are also exposed to DBP's through inhalation when swimming, showering in chlorinated water or by simply turning on a tap and breathing. This accumulated exposure is often ignored when setting standards for drinking water. DBP's can be higher first thing in the morning, due to overnight accumulation. It is common practice by water authorities to carry out testing on drinking water after first running taps for 3 minutes. Yet how many people leave a tap running for three minutes in the morning before pouring a glass of water, putting a jug on for tea or coffee and when having a shower?"

The main question of concern to Friends of the Earth, when this project was instigated was, "What is the extent of the Bromodichloromethane issue in Victoria. Is it as serious as South Australia?"

That being said, Friends of the Earth also had concerns regarding aluminium detections at Hamilton and surrounding towns between 2007-9 and arsenic readings at the town of Macarthur between 2005-2010. FoE had raised concerns as early as January 2010, after learning that detections of aluminium at Hamilton had been recorded at levels 95 times above the Australian Drinking Water Guideline level.

The matter was not pursued further, because under the Australian Drinking Water Guidelines, only aesthetic guideline levels for Aluminium are granted. There are no health related criteria for aluminium. This discrepancy therefore appears to mean that the National Health and Medical Research Centre, who publish The Australian Drinking Water Guidelines appear not to perceive aluminium in drinking water to pose a risk to human health. Thankfully in the modified request to Wannon Water, aluminium levels for Hamilton were included.

Internet scans on the aluminium issue led to email contact with Professor Chris Exley.
<http://www.telegraph.co.uk/health/9119528/Is-aluminium-really-a-silent-killer.html>

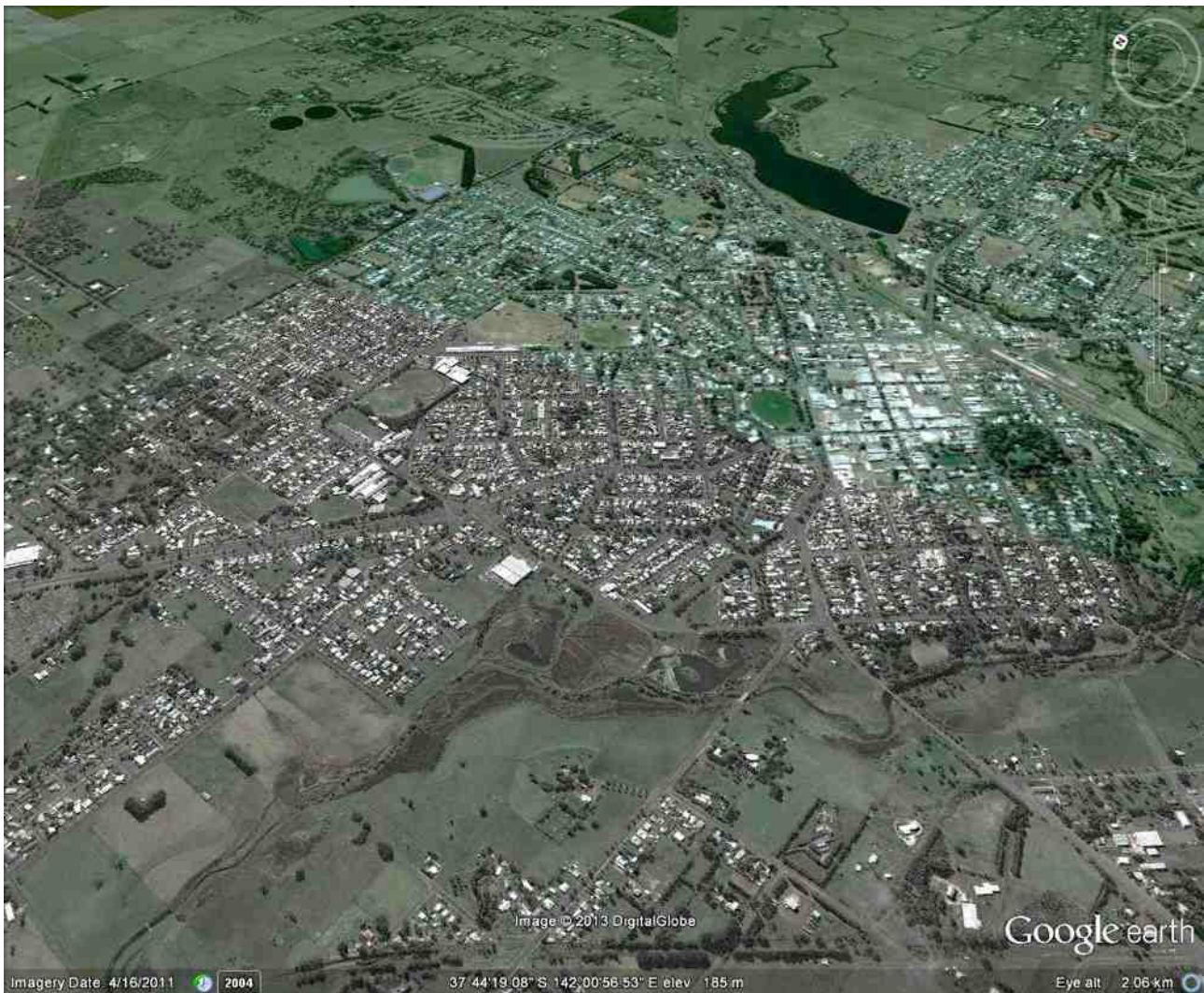
Chris has kindly included a short statement regarding his concerns relating to the levels of Aluminium detected at Hamilton, after the results were emailed through to him in March 2013. FoE's initial concerns about the issue have been confirmed by Chris's statement.

Anthony Amis March 12 2013.

2. Key Findings

1. Between September 2007 and July 2008, Hamilton residents were supplied with drinking water containing Aluminium, much of which was a significant health risk to consumers, at average levels almost 10 times the Guideline limit for Aluminium as specified in the Australian Drinking Water Guidelines. The drinking water contained an average of 3 times the Aluminium Guideline limit for a period of 50 months between July 2006 and October 2010. The highest aluminium level at Hamilton was recorded in July 2008, at 19mg/L, 95 times higher than recommended levels.
2. It appears that no health warnings were sent to Hamilton residents alerting them of the excessive levels of aluminium in their reticulated water supply. The highest aluminium readings were some of the highest recorded anywhere in the world.
3. An internationally recognised Aluminium expert, Professor Chris Exley, has confirmed that the water supplied to Hamilton during some of the time of concern was a “*significant health risk*” and that Wannon Water “*should have warned the public not to drink or even use these waters until the contents of Al were back within the acceptable limits.*”
4. An \$850,000 upgrade of the Hamilton Water Treatment Plant – completed in October 2010 and the Hamilton Grampians pipeline, appear to have rectified the aluminium problem.
5. Balmoral recorded levels of Bromodichloromethane (BDCM) six times higher than WHO Guidelines in September 2007 and recorded the highest average levels within the study area of BDCM for 17 months in 2006/7. A new water treatment plant has significantly improved Balmoral's drinking water and resolved this issue, however for at least 17 months Balmoral residents were supplied with drinking water containing double the guideline level of BDCM.
6. The highest average levels of BCDM recorded over 6 years were Coleraine and Sandford.
7. The greatest number of BDCM detections above the WHO Guidelines was Coleraine with 20.
8. Balmoral, Sandford, Glenthompson and Dunkeld all had BDCM averages above WHO Guidelines for longer than 6 months.
9. Coleraine is still sourcing BDCM tainted water above WHO Guidelines.
10. Moorabool River source water also breaches BDCM guidelines on occasions causing problems at Meredith and potentially Geelong and surrounding communities. The highest recorded BDCM level in the Moorabool catchment was recorded in February 2012.
11. The National Health and Medical Research Centre have not revisited the Trihalomethane issue since 1996. The risks of showering or swimming in THM tainted water have not been included under the Australian Drinking Water Guidelines.

3. Hamilton Aluminium Detections July 2007 – October 2010



“... any value above 0.5 mg/L is totally unacceptable and a potential health risk...”

Hamilton sources its drinking water from the Grampians National Park or more specifically seven streams on the western slopes of Victoria Range and McCutcheons, Bullawin & Headworks drought relief bores. Tarrington, Cavendish and Dunkeld also rely on this source for their drinking water. Tarrington and Dunkeld rely on water treated at the Hamilton water treatment plant. Aluminium Sulphate is added to the water at Hamilton to assist in the process called coagulation.

Serious problems started emerging with the Hamilton water supply in July 2007. An aluminium level of 17mg/L was recorded in September 2007 (85 times over the Australian Drinking Water Guideline), with that same level reached again in late November 2007. Seven months later, on July 2nd 2008, a level of 19mg/L was reached (95 times over the Australian Guideline) – possibly an Australian record and possibly one the highest Aluminium levels recorded anywhere in the world.

According to Aluminum expert Professor Chris Exley from The Birchall Centre, Staffordshire UK,

who was informed by Friends of the Earth of the Hamilton aluminium problems in March 2013:

“Thank you for sending me the data for aluminium in potable waters of Hamilton, Victoria. The data cover a number of years and, in the main, it would appear that the aluminium content is under control with the concentrations being below the upper acceptable limit of 0.2 mg/L. I am slightly confused about the use of the term 'acid soluble' Al as this implies that the total Al in the potable waters is actually higher. The maximum admissible level of 0.2 mg/L used in the EU refers to total Al and not any particular fraction of Al in the water.

Closer scrutiny of the data does reveal not only the odd 'spike' in the Al content to values in excess of 1.0 mg/L but also that there have been extended periods of time when such 'spikes' have been sustained. These values are worryingly high for the consumer as during such times all users of the waters will be exposed to unacceptably high levels of Al without any knowledge of such and so without any opportunity to take any sort of evasive action, such as choosing not to drink the water or to use it for cooking etc.

It is my opinion that any value above 0.5 mg/L is totally unacceptable and a potential health risk. Where such values are maintained over days, weeks or even months, as indeed is indicated by the data you sent to me, these represent a significant health risk to all consumers. While consumers may not experience any short term health effects the result of longer term exposure to elevated levels of aluminium in potable waters may be a significant increase in the body burden of aluminium in these individuals. This artificially increased body burden will not return to 'normal' levels when the Al content of the potable water returns to normal but will act as a new platform level from which the Al body burden will continue to increase with age.

While it is not my intention to scare anyone we had a problem in England in 1988 (Lowermoor Incident) where people were exposed to high levels of Al in their tapwater over a number of weeks and it is only recently that we are seeing some of the consequences of this event with, for example, the recent death of a woman from a rare form of Alzheimer's disease which was attributed to a high level of Al in her brain. This case study has been published and I sent you the requisite publication.

To summarise, while the water authorities in Victoria may have good explanations as to why they failed to control the levels of Al in potable waters during these periods they should have warned the public not to drink or even use these waters until the contents of Al were back within the acceptable limits. Problems do happen when Al salts are used to clean potable waters. However, water companies need to act responsibly when they do happen and alert all users to the problem at the earliest possible time. There is no evidence that this happened in Hamilton during each of these adverse events.”

*Do feel free to contact me should you have any further questions.
My best wishes*

Chris Exley

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<http://www.keele.ac.uk/aluminium>*

The main problem at Hamilton was that traditionally, the source water from the Western slopes of the Victoria Range in the Grampians National Park, is high in dissolved organic material and therefore is highly coloured. According to Wannon Water: *“The treatment process is optimised to remove this colour and therefore reduce the levels of disinfection by-products formed when the water is disinfected. Sudden changes in the incoming water quality may result in the treatment process operating at less than its optimal efficiency. This may result in exceedences in Aluminium being recorded.”* (Wannon Water Drinking Water Quality Report 2005/6 p37).

High levels of Alum (Aluminium Sulphate) were used by Wannon Water to achieve coagulation* and to remove high levels of dissolved organic material. (*Coagulation brings together particles in the raw water supply, forming floc. Coagulants such as Aluminium Sulphate and Polyelectrolytes also encourage the formation of floc. This process maximises the removal of particulates and colour later in the treatment process. Treatment of the water then removes the dosed coagulants).

By 2007 however, impacts of a sustained drought were being felt and as an alternative to traditional surface runoff, groundwater bores located in the catchment area were utilised by Wannon Water. Surface water from the Grampians actually ceased during 2006/7. High levels of Aluminium started to be detected in Hamilton in July 2007. Tarrington also started having aluminium issues after this date.

The groundwater sources, were of a different quality to the traditional surface water. Higher levels of salt, iron and manganese were some of the differences. Because the treatment process at Hamilton was not designed to optimally treat water of this highly variable make up, aluminium problems occurred. Essentially water entering the treated plant had deteriorated to the extent that it was outside the design specifications of the plant. Due to drought Wannon Water was also attempting to capture as much of this water as possible.

The higher doses of Alum in late 2006 that were required to treat the water made it difficult to control the pH of the chemically dosed water which probably resulted in dissolving aluminium passing through filters at the treatment plant. *“On occasions, to achieve effective colour removal, high levels of alum were required, resulting in some aluminium carry through in the treatment process.”* (Wannon Water Drinking Water Quality Report 2006/7 p88).

“During winter months, the source water coming from the Grampians has extremely high colour and low turbidity. This requires higher doses of coagulant which reduces the pH significantly, and this causes coagulation issues and aluminium exceedance. High lime doses are also required to counter the low pH caused by high doses of coagulant. The lime system was difficult to operate and was not capable of dosing sufficient lime in response to water quality changes.” (Wannon Water Annual Drinking Water Quality Report 2009/10 p22).

“The 52-kilometre Hamilton-Grampians Pipeline was completed in June 2010, securing the Hamilton region's future water needs. The pipeline can supply up to two billions litres of water annually from Rocklands Reservoir to top up the existing supply from the Southern Grampians system, if required. The completion of the pipeline saw water restrictions in Hamilton, Cavendish, Dunkeld and Tarrington lifted and replaced with Permanent Water Saving Measures, ending more than four years of tough water restrictions in those towns.”

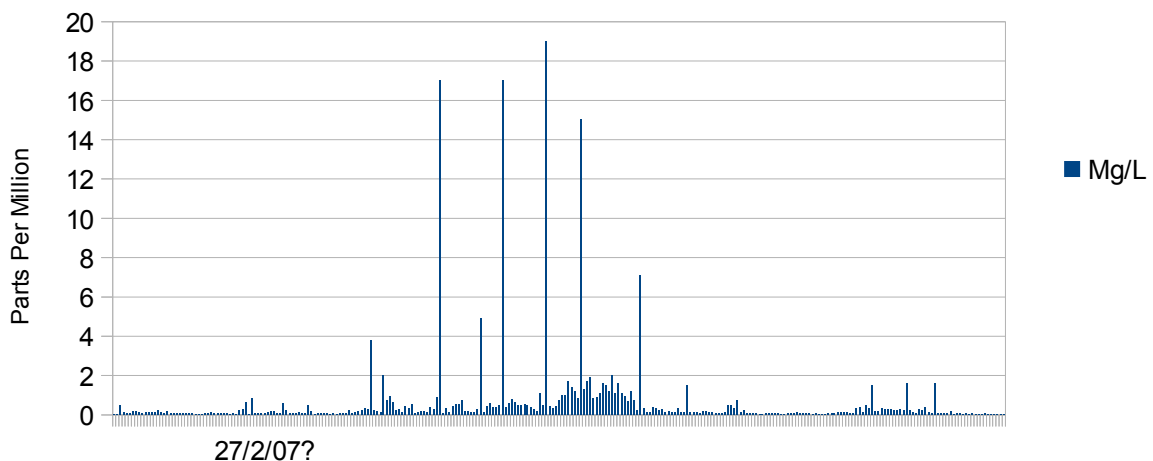
http://www.wannonwater.com.au/index.php?option=com_content&task=view&id=554&Itemid=563

The excessive aluminium levels meant that a project team was established to deal with the problem which eventually meant that \$850,000 had to be spent on upgrading the water treatment plant through an undertaking with the Department of Health. The upgrade was announced on the 5th of December 2009. The completed finished upgrades were publicly announced on the 30th of September 2010.

No information regarding the high levels of Aluminium recorded at Hamilton for close to four years were apparently publicly reported, except by Wannon Water in their Water Quality Annual Reports and by a Friends of the Earth press release dated January 7 2010. <http://www.melbourne.foe.org.au/?q=node/665>. It is also highly likely that most residents exposed to this water were not properly informed at the time by either Wannon Water or the Department of Health.

Hamilton Aluminium Detections July 2006 - December 2012

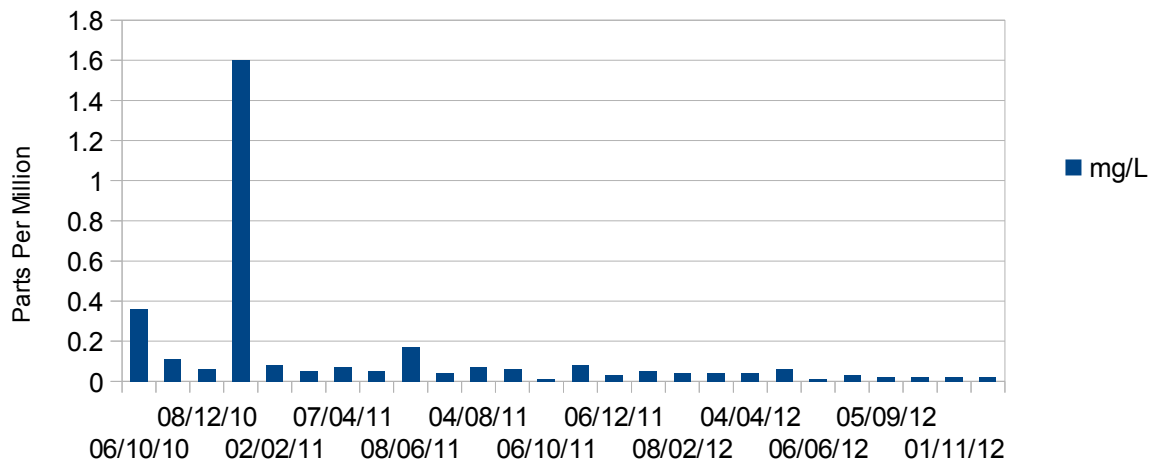
0.2mg/L Australian Drinking Water Guideline



The average Aluminium detection recorded at Hamilton between July 2006 to October 2010 was 0.64mg/L or 3.20 times over the Guideline Limit. From September 2007 to August 2008 however, the average Aluminium level recorded at Hamilton was 1.93mg/L, 965% over the Australian Guideline. The highest level of 19mg/L recorded on July 2 2008 was 95 times in excess of the limit published in the Australian Drinking Water Guidelines produced by the National Medical Research Centre (NHMRC). Hamilton recorded over 100 instances of breaches to the Australian Drinking Water Guidelines for Aluminium between July 2006 – July 2010.

Hamilton Aluminium Detections October 6 2010 - December 4 2012

0.2mg/L Australian Drinking Water Guideline

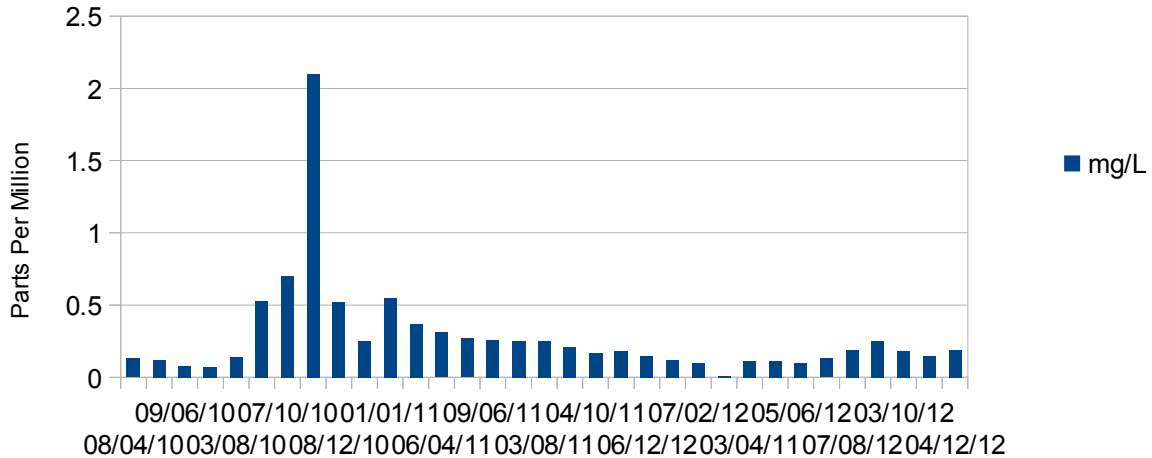


Since the \$850,000 upgrade of the Water Treatment Plant at Hamilton in September 2010, Hamilton has recorded two detections of Aluminium above the Australian Drinking Water Guideline of 0.2mg/L – average Aluminium levels have now been reduced to 0.12mg/L (60% of the Australian Drinking Water Guideline Level).

4. Other Aluminium Detections Of Concern

Cavendish Aluminium Detections April 2010 - December 2012

0.2mg/L Australian Drinking Water Guideline



Average Aluminium Detections at Cavendish between April 2004 and December 2012 are 0.28mg/L 40% above the Australian Drinking Water Guidelines. No information was available to Friends of the Earth to determine detailed aluminium records prior to April 2010.

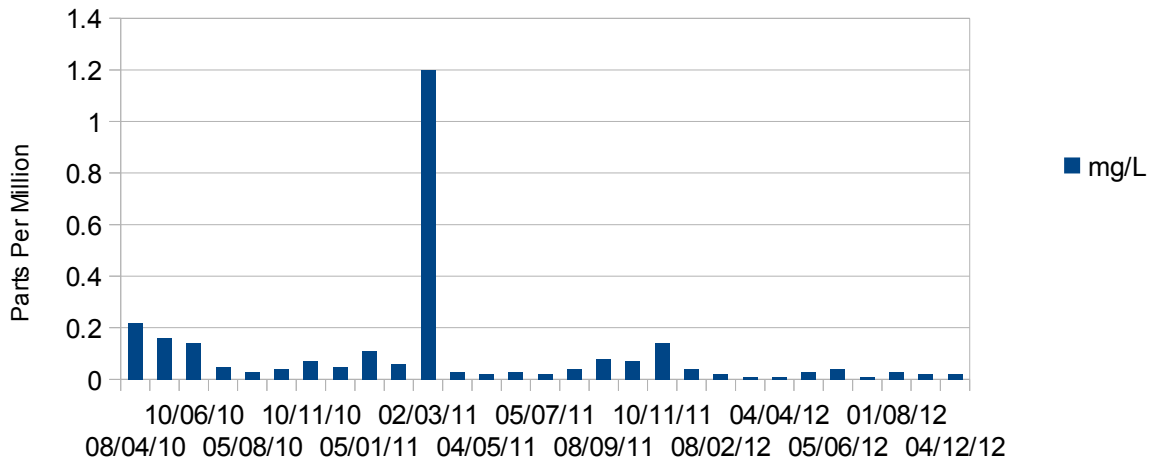
Cavendish sources its drinking water from the Grampians National Park or more specifically 7 streams on the western slopes of Victoria Range and McCutcheons, Bullawin & Headworks drought relief bores. Aluminium was not routinely tested for at Cavendish because alum based coagulants are not used at Cavendish. In 2010 Wannon Water carried out an analysis of the source water. It found that Grampians headworks streams have high natural levels of aluminium (this must have also contributed to Hamilton's problems as well). To stop this aluminium reaching customers, it was allowed to settle out in a detention time at the Cavendish raw water service basin. 80% of the natural aluminium is present as acid soluble aluminium.

From December 2009 to February 2010 the Cavendish raw water basin was bypassed until turbidity and aluminium levels subsided. The incoming waters from the catchment were much lower in aluminium as the majority of the supply was being sourced from bores during these months. (Wannon Water Annual Drinking Water Quality Report 2009/10 p21).

In 2010/11 Wannon Water applied for exemption from the Safe Drinking Water Regulations 2005 in relation to aluminium. The application was assessed by Department of Health and failed to meet the criteria for exemptions in Section 20 of the Safe Drinking Water Act 2003. Wannon Water will continue the exemption process in 2011/12 and undertake comprehensive consultation with the Cavendish community." (Wannon Water Annual Drinking Water Quality Report 2010/11 p28).

Dunkeld Aluminium Detections April 2010 - December 2012

0.2mg/L Australian Drinking Water Guideline



Average aluminium levels detected at Dunkeld between April 2010 and December 2012 was 0.096mg/L, 48% of the Australian Drinking Water Guideline level for Aluminium. Limited information was available to Friends of the Earth to determine detailed aluminium records prior to April 2010. The spike in aluminium in March 2011 was apparently associated with sediment in the mains.

High levels of Aluminium, outside of Hamilton, above Australian Drinking Water Guidelines. (Guideline 0.2mg/L)

**Recorded in other Wannon Water supplied towns
2005/6, sourced from highest values only published in Water Quality Annual Reports.**

Town	Aluminium Level	Date
Tarrington	3.5mg/L	2008/9
Glenthompson	2.5mg/L	2005/6
Cavendish	2.1mg/L	2010/11
Cobden	1.8mg/L	September 2004
Glenthompson	1.7mg/L	2008/9
Simpson	1.4mg/L	2005/6
Cobden	1.2mg/L	2006/7
Dunkeld	1.2mg/L	2010/11
Cobden	1.1mg/L	2005/6
Tarrington	1.1mg/L	2007/8
Dunkeld	0.99mg/L	2008/9
Glenthompson	0.94mg/L	2009/10
Balmoral	0.88mg/L	2008/9
Camperdown (urban)	0.87mg/L	2008/9
Derrinallum	0.82mg/L	2008/9
Cobden	0.65mg/L	2008/9
Glenthompson	0.5mg/L	2006/7
Balmoral	0.47mg/L	2007/8
Cobden	0.42mg/L	2007/8
Cavendish	0.42mg/L natural sources	2009/10
Warrnambool	0.4mg/L	2008/9
Hamilton	0.38mg/L	2005/6
Cavendish	0.38mg/L	2008/9
Camperdown (rural)	0.36mg/L	2008/9
Koroit	0.36mg/L	2008/9
Simpson	0.35mg/L	2007/8
Allansford	0.35mg/L	2008/9
Camperdown (rural)	0.34mg/L	2007/8
Warrnambool	0.32mg/L	2007/8

Dunkeld	0.31mg/L	2009/10
Mortlake	0.3mg/L	2007/8
Balmoral	0.29mg/L	2010/11
Camperdown (Urban)	0.28mg/L	2006/7
Tarrington	0.28mg/L	2009/10
Derrinallum	0.27mg/L	2006/7
Allansford	0.27mg/L	2007/8
Koroit	0.27mg/L	2007/8
Camperdown (Rural)	0.26mg/L	2006/7
Lismore	0.25mg/L	2006/7
Dartmoor	0.25mg/L natural sources	2009/10
Glenthompson	0.25mg/L	2010/11
Coleraine	0.24mg/L natural sources	2009/10
Casterton	0.23mg/L natural sources	2009/10
Merino	0.23mg/L natural sources	2009/10
Sandford	0.23mg/L natural sources	2009/10
Koroit	0.21mg/L	Sep 26 2006
Dunkeld	0.2mg/L	2006/7

Aluminium Exceedence (excluding Hamilton) over Past 5 Years Cobden 34, Camperdown 29, Glenthompson 18, Warrnambool 14, Balmoral 5, Cavendish 4, Dartmoor 1. (Wannon Water Annual Water Quality Report 2009/10 p20)

“Between December 1999 and October 2008, Cobden recorded 43 detections of Aluminium Al/Water Soluble above 0.2mg/L. (Wannon Water Annual Water Quality Report 2007/8 p106)

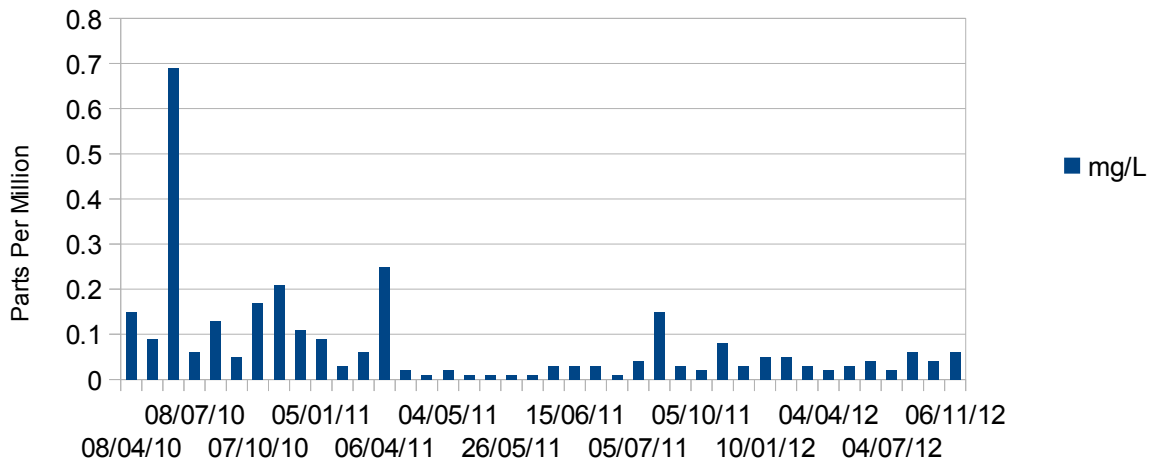
“Between May 2007 and April 2008, Dunkeld recorded 7 detections of Aluminium Al/Water Soluble above 0.2mg/L. (Wannon Water Annual Water Quality Report 2007/8 p107)

“Between July 2006 and June 2008, Tarrington recorded 7 detections of Aluminium Al/Water Soluble above 0.2mg/L. (Wannon Water Annual Water Quality Report 2007/8 p107)

“Between December 2004 and July 2008, Warrnambool recorded 9 detections of Aluminium Al/Water Soluble above 0.2mg/L. (Wannon Water Annual Water Quality Report 2007/8 p107)

Glenthompson Aluminium Detections April 2010 - December 2012

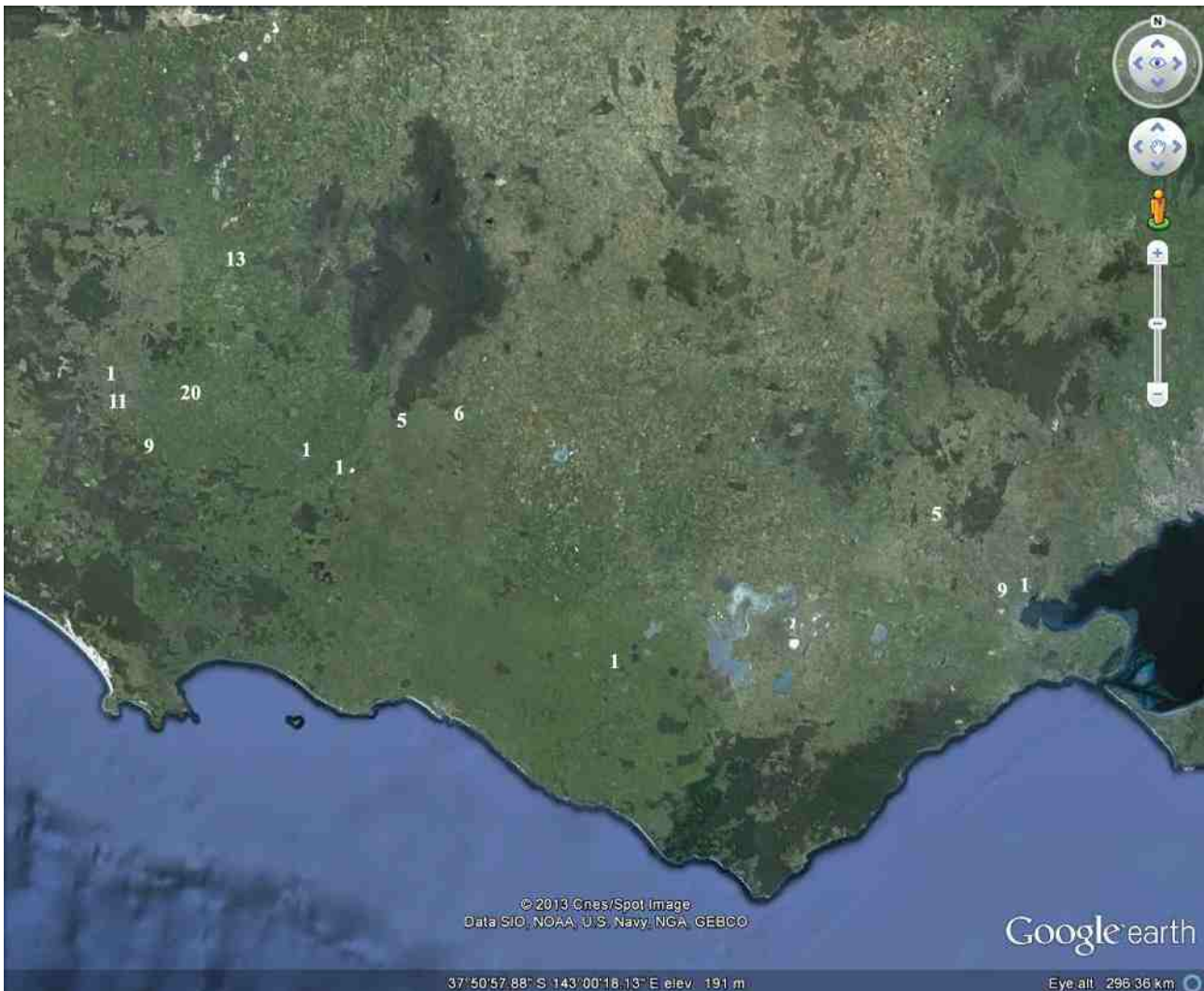
0.2mg/L Australian Drinking Water Guidelines



Average aluminium levels detected at Glenthompson between April 2010 and December 2012 was 0.076mg/L, 38% of the Australian Drinking Water Guideline level for Aluminium. Limited information was available to Friends of the Earth to determine detailed aluminium records prior to April 2010. According to Water Quality Annual Reports, between July 2006 and June 2010, there were eleven Aluminium exceedences of the Australian drinking water guidelines at Glenthompson. The highest being a level of 1.7mg/L (8.5 times higher than the Australian Drinking Water Guideline level.

5. Wannon Water Bromodichloromethane

World Health Organisation Guideline level: 60 parts per billion



Map indicating BDCM detections higher than WHO Guidelines 2006-12

Chlorine was initially added to drinking water as a means of killing disease causing bacteria including cholera, typhoid, dysentery which was responsible for the deaths of millions of people. Its use as a water disinfectant was 'perfected' in the United States in the 1930's. However chlorine does have its own 'problems', such as those related to Disinfection By-Products (DBP's) which were discovered in 1974.

There have been over 600 DBP's identified and some have been linked with cancers, adverse birth outcomes and some birth defects. If detected, water authorities need to conduct regular air scouring, flushing of the reticulation system and powder activated carbon dosing. Trihalomethane's (THM's) can be present in water as a result of chlorination and to a lesser extent chloramination. Regulated THM's include trichloromethane, bromodichloromethane, dibromochloromethane and bromoform. Total THM's refer to the sum of these four compounds.

In the United States, the EPA limits the total concentration of the four chief constituents (chloroform, bromoform, bromodichloromethane, and dibromodichloromethane), referred to as total trihalomethanes (TTHM), to 80 parts per million in treated water. In Australia the limit is 250 parts per billion.

Haloacetic acids (HAA's) are also DBP's. 15 HAA's can be formed in the presence of chlorine, bromide and iodide. The most common HAA's are dichloroacetic acid and trichloroacetic acid. (Other HAA's include: bromochloroacetic acid, dibromoacetic acid, monochloroacetic acid, monobromoacetic acid.

Other DBP's can include: haloacetonitriles, halogenated furanones, halonitromethanes, cyanogen halides, haloketones, haloaldehydes, halogenated phenols.

Bromodichloromethane is a Group 2B Possible carcinogen. The Australian Drinking Water Guidelines do not have a specific guideline for Bromodichloromethane. The ADWG has a guideline level of 250ug/L for Trihalomethanes, three times higher than the United States standard. The trihalomethane guideline includes the sum of four different substances. Classical trihalomethanes consist of chloroform (CHCl₃), dichlorobromoform (CHCl₂Br), dibromochloroform (CHBr₂Cl) and bromoform (CHBr₃).

According to the ADWG “The World Health Organization (WHO) has derived separate guideline values for each compound, but in doing so recognises that the compounds have similar toxicological action. The WHO guideline values for chloroform (0.2 mg/L) and bromodichloromethane (0.06 mg/L) were based on calculations that estimated additional lifetime risks of one fatal cancer per 100,000 people. The use of this approach is questionable because there is evidence that tumours do not occur at low concentrations. The WHO guideline values for bromoform (0.1 mg/L) and dibromochloromethane (0.1 mg/L) were based on different studies and safety factors from those recommended by the NHMRC Standing Committee on Toxicity, although toxicological effects were similar.”

The IARC (International Agency for Research on Cancer) has classified BDCM in Group 2B (possibly carcinogenic to humans). What this could indicate is that many other communities across Australia may have none or low numbers of breaches for THM's, yet could be consuming potentially dangerous levels of individual DBP's and these results are not made public by water authorities. Some DBP's have been linked to bladder cancer and adverse reproductive outcomes.

People are also exposed to DBP's through inhalation when swimming, showering in chlorinated water or by simply turning on a tap. This accumulated exposure is often ignored when setting standards for drinking water. DBP's can be higher first thing in the morning, due to overnight accumulation. It is common practice by water authorities to carry out testing on drinking water after first running taps for 3 minutes. Yet how many people leave a tap running for three minutes in the morning before pouring a glass of water, putting a jug on for tea or coffee and when having a shower?

The Australian Drinking Water Guidelines are produced by the National Health and Medical Research Council. The trihalomethane guideline has not been subject for review since 1996. According to the NHMRC in a letter dated to Friends of the Earth 14 January 2013: “*The National Health and Medical Research Council's Water Quality Advisory Committee is current considering their work program to 2015 and has identified disinfection by-products as an area for revision as part of this work*”

BDCM gave both positive and negative results in a variety of in vitro and in vivo genotoxicity assays. In an NTP bioassay, BDCM induced renal adenomas and adenocarcinomas in both sexes of rats and male mice, rare tumours of the large intestine (adenomatous polyps and adenocarcinomas) in both sexes of rats and hepatocellular adenomas and adenocarcinomas in female mice. Exposure to BDCM has also been linked to a possible increase in reproductive effects (increased risk for spontaneous abortion or stillbirth).

In October 2012, Friends of the Earth produced a report looking at South Australia's drinking water between the years 2000 and 2012. http://www.foe.org.au/sites/default/files/SAWater2012a_0.pdf

In that report it was surprising to find that over 2000 detections above World Health Organisation Guidelines for Bromodichloromethane. Yet none of these detections were reported because under the Australian Drinking Water Guidelines, THM's are not quantified individually, but as a sum of four. Instead, SA Water had 581 detections of THM's above the Australian Guideline, whereas almost 3000 detections of various THM's above WHO guidelines were actually determined by Friends of the Earth.

For these reasons it was decided in this short study to focus on Bromodichloromethane, rather than total THM's, because it is Friends of the Earth's contention that many BCDM breaches are going unreported, meaning that the issue is far more significant than what is publicly detailed by water authorities.



The South Western Community of Coleraine has recorded the most detections of Bromodichloromethane, above World Health Organisation Guidelines between June 2006 and July 2012.

Bromodichloromethane Breaches to World Health Organisation Standard of 60 parts per billion since 2005*. Total = 84

Wannon Water	68	(81%)
Barwon Water	16	(19%)

Towns with Bromodichloromethane Breaches

Town	Number Of Breaches	Water Authority
Coleraine	20	Wannon Water
Balmoral	13	Wannon Water
Sandford	11	Wannon Water
Moorabool	10	Barwon Water
Merino	9	Wannon Water
Glenthompson	6	Wannon Water
Meredith	5	Barwon Water
Dunkeld	5	Wannon Water
Tarrington	1	Wannon Water
Hamilton	1	Wannon Water
Noorat/Glenormiston	1	Wannon Water
Casterton	1	Wannon Water
Lovely Banks	1	Barwon Water

Year	Total Breaches	Barwon Water	Wannon Water
2006	4		4
2007	22	1	21
2008	14	5	9
2009	20	6	14
2010	1		1
2011	15		15
2012	7	4	3

Highest Long Term Bromodichloromethane Averages

Town/Location	Amount	% of ADWG
Coleraine	0.047mg/L	78.3%

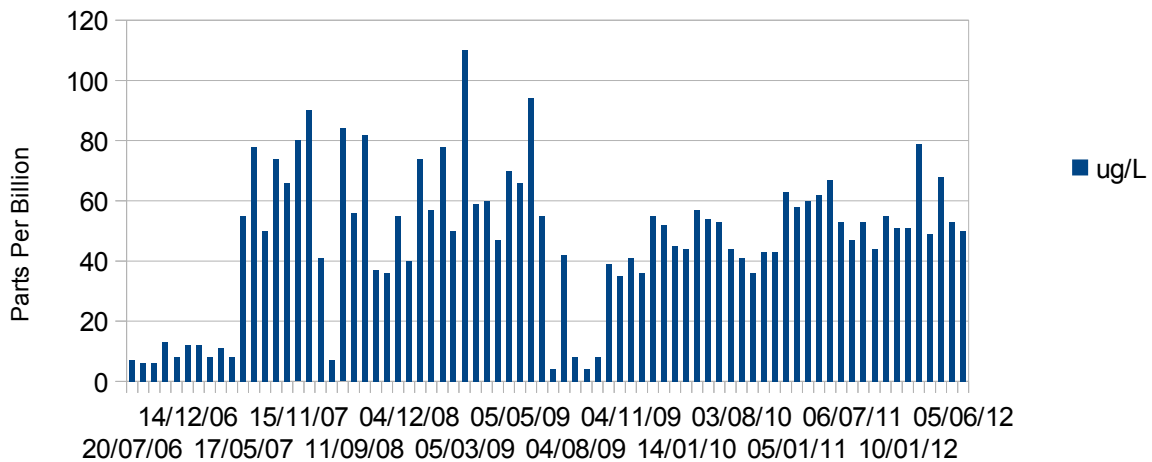
Sandford	0.046mg/L	76.7%
Merino	0.045mg/L	75%
Balmoral	0.043mg/L	71.7%
Moorabool	0.042mg/L	70%

Highest Short Term Bromodichloromethane Averages

Town	Average	Dates	% of WHO Guideline
Balmoral	0.134mg/L	August 2006-December 2007 (17 months +)	223.3%
Glenthompson	0.076mg/L	January 2011-May 2011 (6 months)	126.7%
Sandford	0.064mg/L	December 2010-June 2012 (18 months)	106.7%
Dunkeld	0.061mg/L	January 2007–August 2007 (8 months)	101.7%
Coleraine	0.057mg/L	July 2008-July 2009 (12 months)	95%
Merino	0.056mg/L	September 2007-May 2009 (20 months)	93.3%
Moorabool	0.048mg/L	December 2007-November 2008 (19 months)	80%
Casterton	0.043mg/L	November 2011-June 2012 (8 months)	71.7%
Meredith	0.042mg/L	December 2007-November 2008 (11 months)	70%
Little River West	0.042mg/L	October 2011-August 2012 (11 months)	70%

Coleraine Bromodichloromethane Detections July 2006 - June 2012

60ppb World Health Organisation Guideline



Average Bromodichloromethane detections at Coleraine July 2006-June 2012 0.047mg/L (78.3% of the Australian Drinking Water Guidelines). Average July 2008-09 0.057mg/L (95% of ADWG). Unfortunately the information requested from Wannon Water regarding total THM detections to 2005 was not provided, so these problems can only be glimpsed at through Water Quality Annual Reports. Note that there have been several detections of BCDM above WHO Guidelines since the new Casterton pipeline was constructed in 2009.

Between December 1999 to March 2010 Coleraine THM detections:

>250ug/L 54 times, <250ug/L 31 times.
(Wannon Water Annual Water Quality Report 2009/10 p30)

Highest Trihalomethane Levels Detected at Coleraine 2005-2010

400ug/L	2005/6
400ug/L	2006/7
610ug/L	2007/8
660ug/L	2008/9
260ug/L	2009/10

“Exceeding values for trihalomethanes (THMs) were recorded at Coleraine. Water sourced from Konongwootong Reservoir is high in dissolved organic material. The system is not fully treated, therefore upon disinfection with sodium hypochlorite, trihalomethanes are produced at levels which exceed the Safe Drinking Water Regulations. Construction and commissioning of a pipeline from the Casterton Water Treatment plant is scheduled for completion by June 2008.” (Wannon Water Water Quality Report 2005/6 p36)

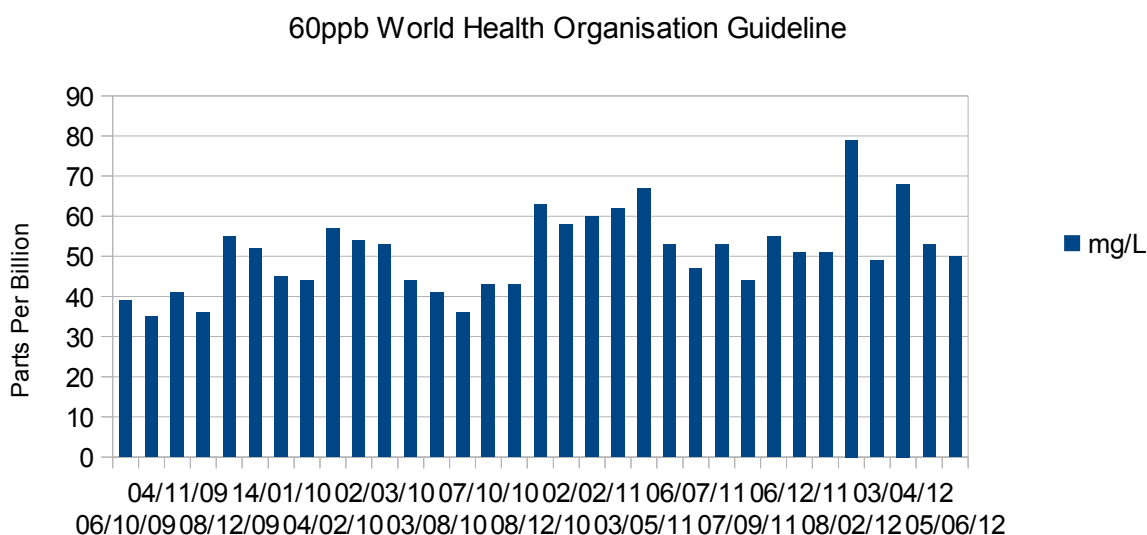
“A Coleraine community liaison group has backed Glenelg Water’s preferred supply option and their decision was conveyed to a public meeting in Coleraine last Thursday...The town needed a new water supply because Kononwootong Reservoir’s salt levels are too high. Konongwootong now supplies only Coleraine – it used to supply two thirds of Casterton but its salt problems now see

Casterton totally supplied from the Tullich bores. Two new bores will be needed at Tullich to supply Coleraine...The Konongwootong Reservoir has a salt content that is typically 2000 micro siemens per centimetre – extremely high levels considering 1000 ms/cm is rated ‘unpalatable’....In a survey of one fifth of Coleraine’s consumers, just two per cent drank the water supply from Konongwootong with most relying on tank water. The survey showed 88 per cent were dissatisfied or very dissatisfied with the water’s taste, while 72 per cent objected to the odour.”
<http://www.spec.com.au/blog/2005/04/26/6m-for-water-supply/>

The trihalomethane levels in the Coleraine locality have been rising since June 2006. This is likely to be related to a reduction in water levels at Konongwootong Reservoir and the subsequent concentration of organic matter. During 2008/09 Wannon Water had an undertaking with the Department of Human Services to reduce the level of trihalomethane within the Coleraine reticulation. This will be achieved by changing the Coleraine source water from Konongwootong Reservoir to Tullich bores. (Wannon Water Annual Water Quality Report 2008/9 p88)

From the 1 July 2009 to 23 September 2009 the water piped from Casterton was transferred into the Coleraine Service Basin prior to disinfection. As such, Coleraine was being supplied with water blended from Konongwootong and Casterton (note the basin retained some Konongwootong water prior to filling with Casterton Water). In July 2009 the disinfection by-products were less than the guideline values. Extensive flushing of the reticulation occurred in early July, this reduced the organic matter within the reticulation system and therefore minimised trihalomethanes formation. However in August 0.26 mg/L of trihalomethanes was measured in the reticulation. The reticulation was air scoured on the 24th August 2009, removing organic residual from the reticulation and therefore reduced trihalomethanes formation within the reticulation system. The Coleraine clear water storage was commissioned on the 23rd of September 2009, eliminating the need to use the Coleraine basin, and the blended water supply (Figure 9)”. (Wannon Water Annual Water Quality Report 2009/10 p29-30)

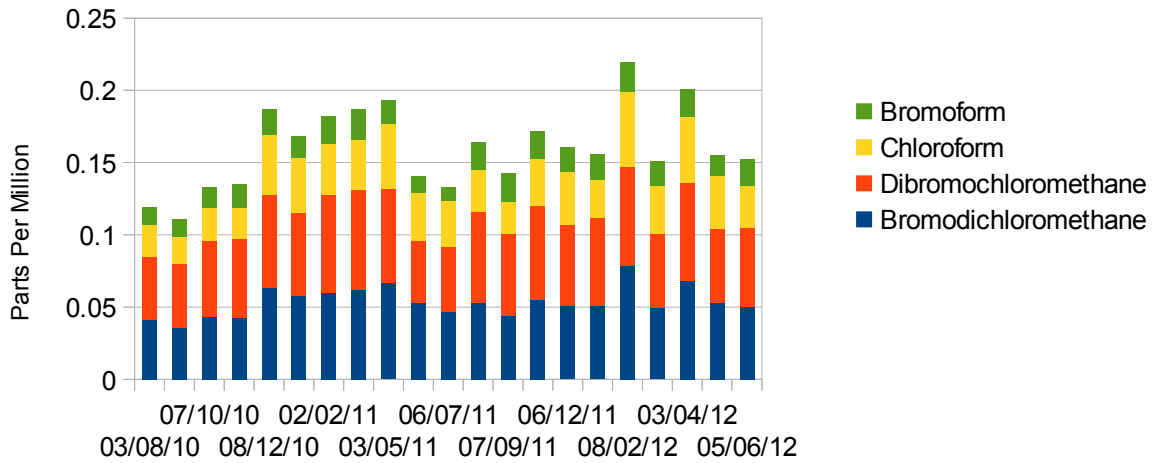
Coleraine Bromodichloromethane Detections October 2009 - June 2012



Average level of Bromodichloromethane recorded at Coleraine since 23 September 2009, is 52.53ug/L (87.5% of World Health Organisation Guidelines). Six breaches to the WHO guidelines since Coleraine's new water supply was “brought online”, meaning that the BDCM problem has not been solved.

Coleraine THM Detections August 2010 - June 2012

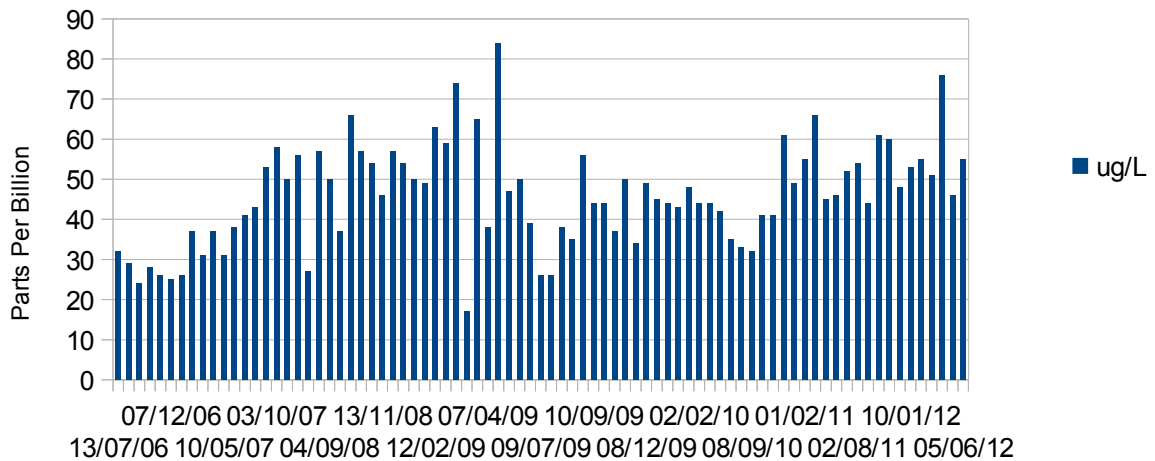
Australian Drinking Water Guideline 0.25mg/L



Under the Australian Drinking Water Guidelines a level is only granted for THM's as a sum of four Trihalomethane's. This means that individual breaches for Bromodichloromethane under World Health Organisation Guidelines do not have to be reported in Australia. Consumers of this drinking water therefore may be drinking water that complies with Australian Guidelines, but not World Health Organisation guidelines.

Sandford Bromodichloromethane Detections July 2006 - June 2012

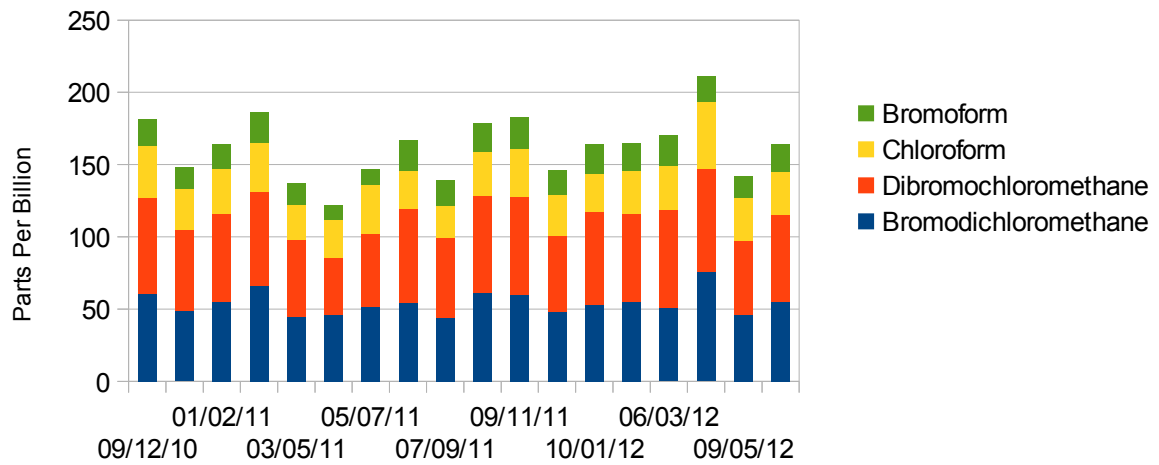
60ppb World Health Organisation Guideline



Nothing was reported publicly by Wannon Water between 2006-12 regarding Bromodichloromethane breaches at Sandford, yet there were nine instances of Bromodichloromethane breaching World Health Organisation Guidelines at Sandford over that same period of time. Average Bromodichloromethane detections 46 ppb(or 76.7% of ADWG).

Sandford THM Detections December 2010 - June 2012

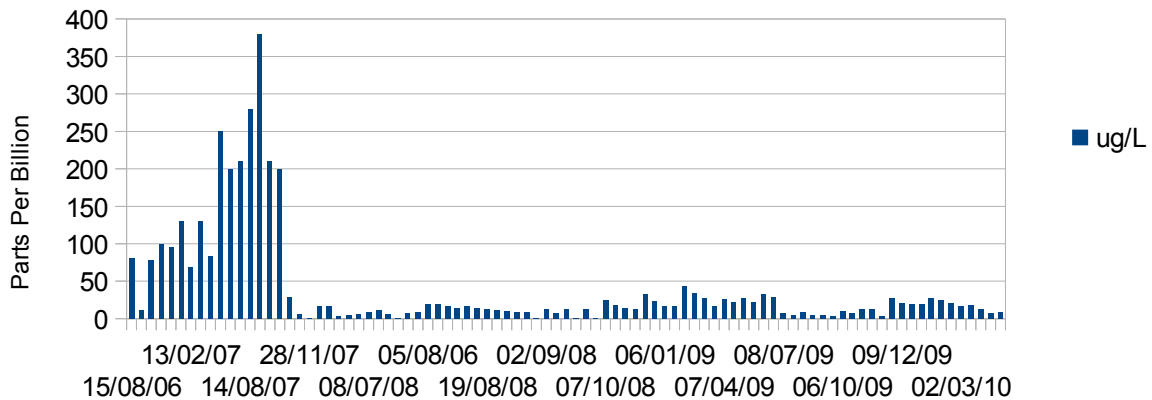
Australian Drinking Water Guideline 250 parts per billion



During December 2010 – June 2012, Sandford recorded Bromdichloromethane, equal to or above the World Health Organisation Guideline limit on five instances, yet these did not have to be reported by Wannon Water because the combined THM's did not exceed 250ppb.

Balmoral Bromodichloromethane Detections August 2006 - March 2010

60ppb World Health Organisation Guideline



Prior to the new water treatment plant completed in June 2007, THM levels at Balmoral were excessive. The Bromodichloromethane reading of 380ug/L in September 2007 could be one of the highest levels ever recorded in an Australian water supply. 633% higher than the World Health Organisation Guideline for this substance.

Between May 2002 to June 2008 Balmoral THM detections >250ug/L 55 times, <250ug/L 2 times. June 2008 to August 2010 Balmoral THM detections >250ug/L 1 time, <250ug/L 34 times.

Highest Balmoral THM Detections on a year by year basis

970ug/L	388% above ADWG	2007/8
750ug/L	300% above ADWG	2005/6
740ug/L	296% above ADWG	2006/7
260ug/L	104% above ADWG	2009/10

“Exceeding values for trihalomethanes (THMs) were recorded at Balmoral. Water sourced from Rocklands Reservoir is high in dissolved organic material. The system is not fully treated, therefore upon disinfection with sodium hypochlorite, trihalomethanes are produced at levels which exceed the Safe Drinking Water Regulations. Construction and commissioning of a new treatment plant to reduce the level of trihalomethanes produced is scheduled for completion by June 2007.” (Wannon Water Water Quality Report 2005/6 p36).

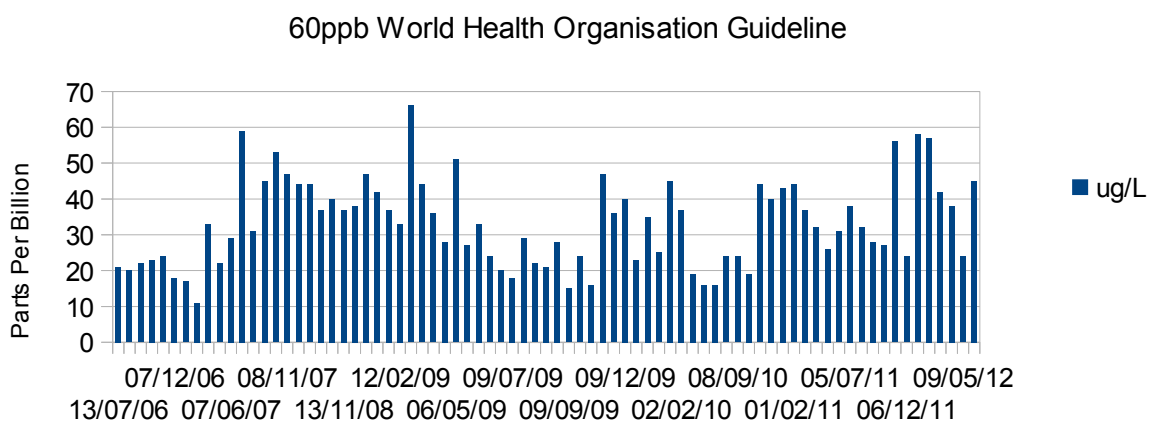
“An undertaking was entered into between Wannon Water and the Department of Human Services to rectify the problem. This committed Wannon Water to finding an appropriate solution by June 2007. As a result, capital expenditure has been allocated to improve water quality. A full DAFF treatment plant is currently being tendered. Construction and commissioning are expected to be completed by June 2007.” (Wannon Water Water Quality Report 2005/6 p54/5).

“Prior to the construction of the Balmoral Water Treatment Plant, the water from Rocklands was directly disinfected with sodium hypochlorite which resulted in the production of trihalomethanes at levels which exceed the Safe Drinking Water Regulations. Construction of a new water treatment plant was completed in January 2008. The new water treatment plant process involves coagulation, flocculation, dissolved air flotation, filtration and disinfection. The commissioning of this plant and

the changing of the disinfection from chlorination to chloramination resulted in a reduction of the levels of trihalomethanes being generated. The water now complies with the requirements of the Safe Drinking Water Regulations 2005.” (Drinking Water Annual Report 2007/8 p17)

“Figure 7 shows that in April 2008 trihalomethanes concentrations in Balmoral decreased from 0.4 mg/L to 0.02 mg/L. This decline in concentration was due to the installation of a new treatment plant and changing the disinfection from chlorination to chloramination. Trihalomethanes levels have consistently been below 0.25 mg/L for the past two years. (Wannon Water Water Quality Annual Report 2009/10 p29)

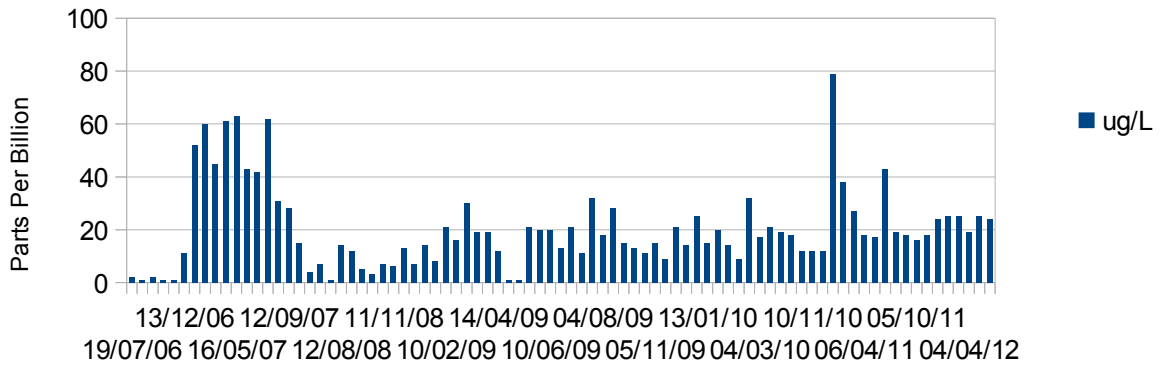
Casterton Bromodichloromethane Detections July 2006 - June 2012



Nothing was reported publicly by Wannon Water between 2006-12 regarding Bromodichloromethane breaches at Casterton, yet there was one instance of Bromodichloromethane breaching World Health Organisation Guidelines at Casterton over that same period of time. Average Bromodichloromethane detections 33.1 ppb(or 55.2% of ADWG).

Dunkeld Bromodichloromethane Detections July 2006 - June 2012

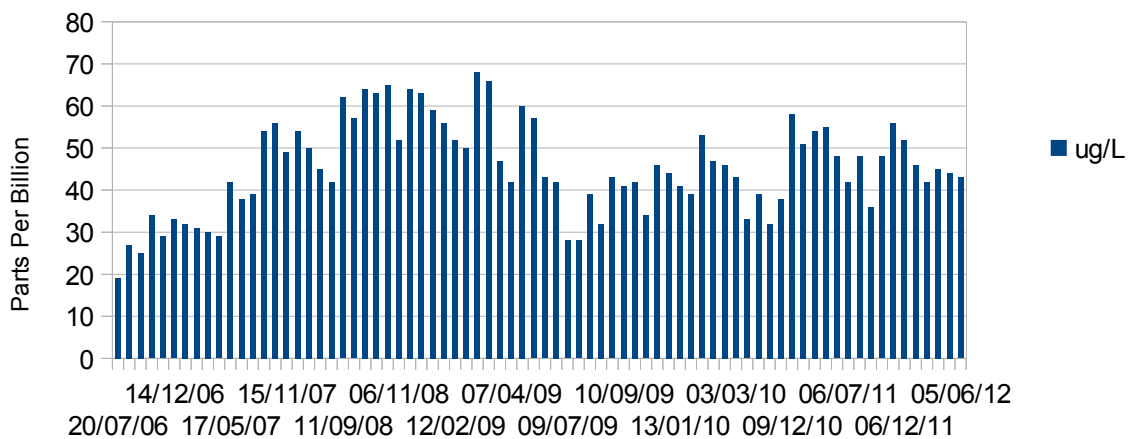
60ppb World Health Organisation Guideline



Nothing was reported publicly by Wannon Water between 2006-12 regarding Bromodichloromethane breaches at Dunkeld, yet there were five instances of Bromodichloromethane breaching World Health Organisation Guidelines at Dunkeld over that same period of time.

Merino Bromodichloromethane Detections July 2006 - June 2012

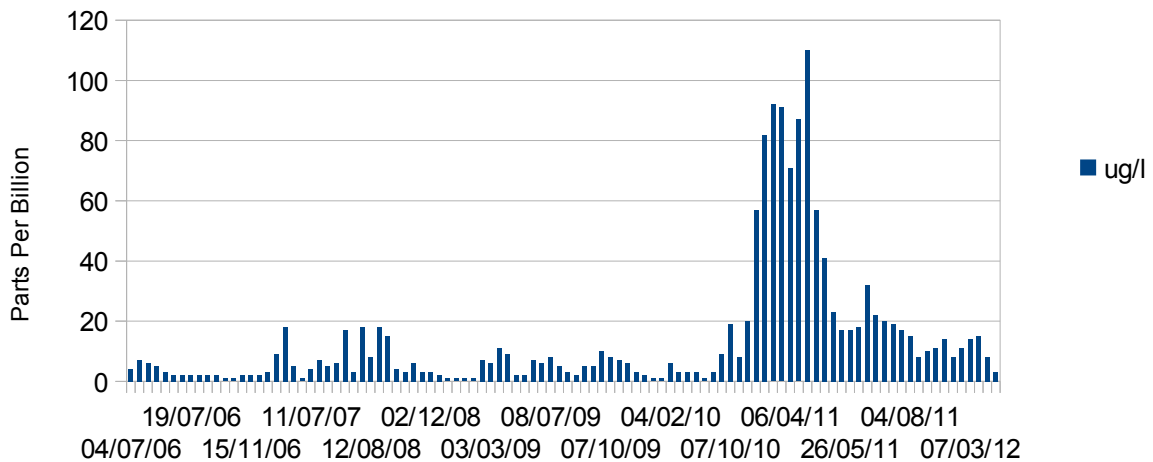
60ppb World Health Organisation Guideline



Nothing was reported publicly by Wannon Water between 2006-12 regarding Bromodichloromethane breaches at Merino, yet there were nine instances of Bromodichloromethane breaching or equal to World Health Organisation Guidelines at Merino over that same period of time.

Glenthompson Bromodichloromethane Detections July 2006 - June 2012

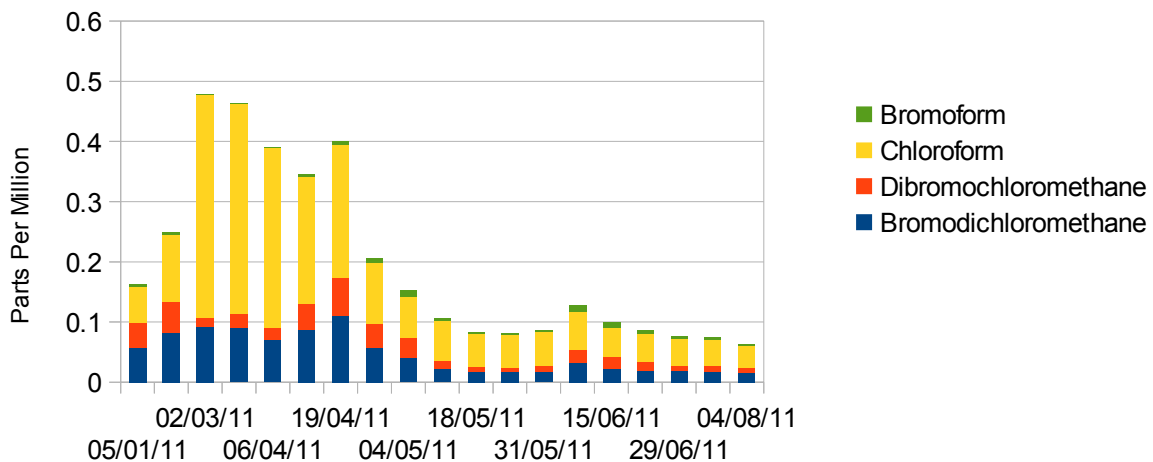
60ppb World Health Organisation Guidelines



A full suite of THM levels for Glenthompson going back to 2005 were not provided by Wannon Water, however Water Quality Annual Reports show that THM breaches occurred in 2005/6 (highest level 360ppb) and March/April 2011 (highest level 490ppb).

Glenthompson THM Detections January 2011 - August 2011

Australian Drinking Water Guidelines 0.25mg/L

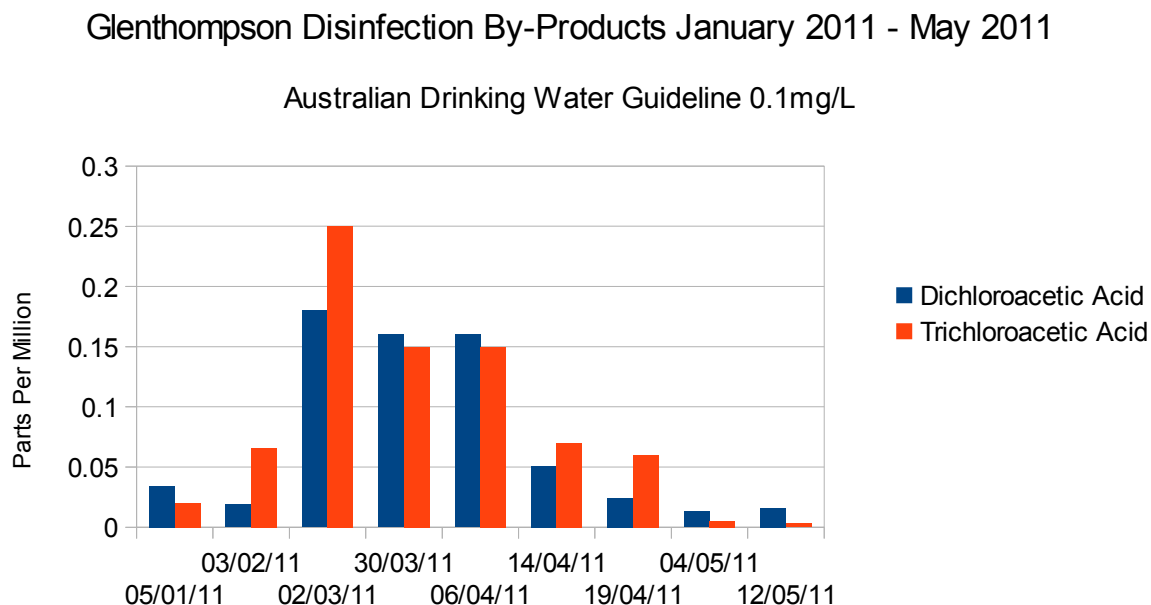


“Exceeding values for trihalomethanes (THMs) were recorded at Glenthompson. Glenthompson has full treatment so trials were conducted to optimize the plant. The treatment system has been fully enclosed and a change from chlorination to chloramination implemented to reduce the levels of trihalomethanes generated. This met the obligations of the undertaking with the Department of Human Services.” (Wannon Water Annual Drinking Water Quality Report 2005/6 p37).

“Exceedence in trihalomethane levels were recorded for this system. A high level of organic matter is present in the source water and leads to the formation of by-products upon chlorination. The issue was identified in Wannon Water’s risk assessment of the water supply. An undertaking was

entered into between Wannon Water and the Department of Human Services to rectify the problem. This committed Wannon Water to finding an appropriate solution by June 2006. The filter media within the plant was changed and the filter unit enclosed to eliminate sources of contamination. The disinfection process was changed from chlorination using sodium hypochlorite to chloramination using aqueous ammonin and sodium hypochlorite. A public notification process was undertaken prior to the change. As a result of these changes, the levels of trihalomethanes produce has been decreased to well below the requirement of Schedule 2 of the Safe Drinking Water Regulations (2005) and Australian Drinking Water Guidelines (2004).” Wannon Water Annual Drinking Water Quality Report 2005/6 p55)

Dichloroacetic Acid was recorded at Glenthompson at 180 and 160ug/L March/April 2011.



Dichloroacetic Acid and Trichloroacetic Acid are also chlorine disinfection by-products both of which are individually recognised by the Australian Drinking Water Guidelines. The guideline for both substances is 0.1mg/L.

“During 2010/11 Glenthompson experienced water quality exceedances that resulted from the following: Failure of coagulant mixing

Glenthompson Water Treatment Plant uses a vacuum mechanism to mix the coagulant. This mechanism failed on several occasions causing carryover from the clarifier to the filters. This has caused high turbidity and aluminium breakthrough in the treated water. Wannon Water installed an inline mixer to provide rapid mixing prior to the vacuum chamber and optimised coagulant dosing. Stratification of reservoir

The raw water source stratified in October 2010. The water quality deteriorated dramatically and resulted high manganese, iron and turbidity levels in the reticulation in January 2011. Wannon Water commenced pre-chlorine dosing in January 2011 to oxidise the iron and manganese. Jar testing was undertaken to determine if disinfection by-products would be an issue. It was found to be satisfactory.

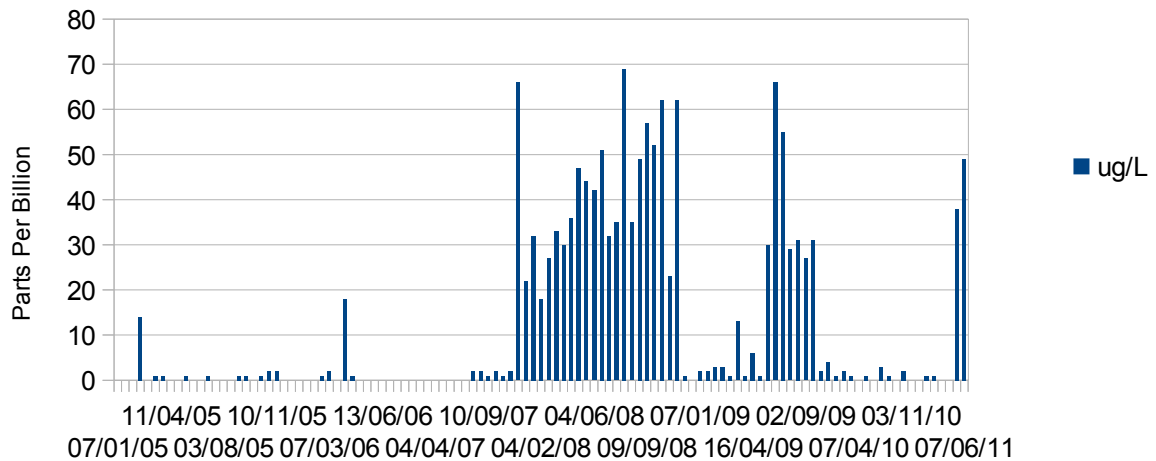
Pre-chlorine dosing

Pre-chlorine dosing was effective at reducing iron and manganese; however the chlorine doses required in the field were higher than initially jar tested. This resulted in exceedances of disinfection by-products, namely dichloroacetic acid, trichloroacetic acid and trihalomethanes. Calgon was added in April 2011 and pre-chlorine dosing ceased, eliminating the issues.” Wannon Water Annual Drinking Water Quality Report 2010/11 p20)

6. Barwon Water Bromodichloromethane

Meredith Bromodichloromethane Detections January 2005 - June 2011

60ppb World Health Organisation Guideline



Limited Dibromochloromethane data was given by Barwon Water after 2007 meaning overall THM levels could not be researched during this project. Higher levels of BDCM occurred at Meredith between December 2007 to November 2008 and May 2009 to October 2009. Meredith was sourcing their drinking water from the environmentally stressed Moorabool River.

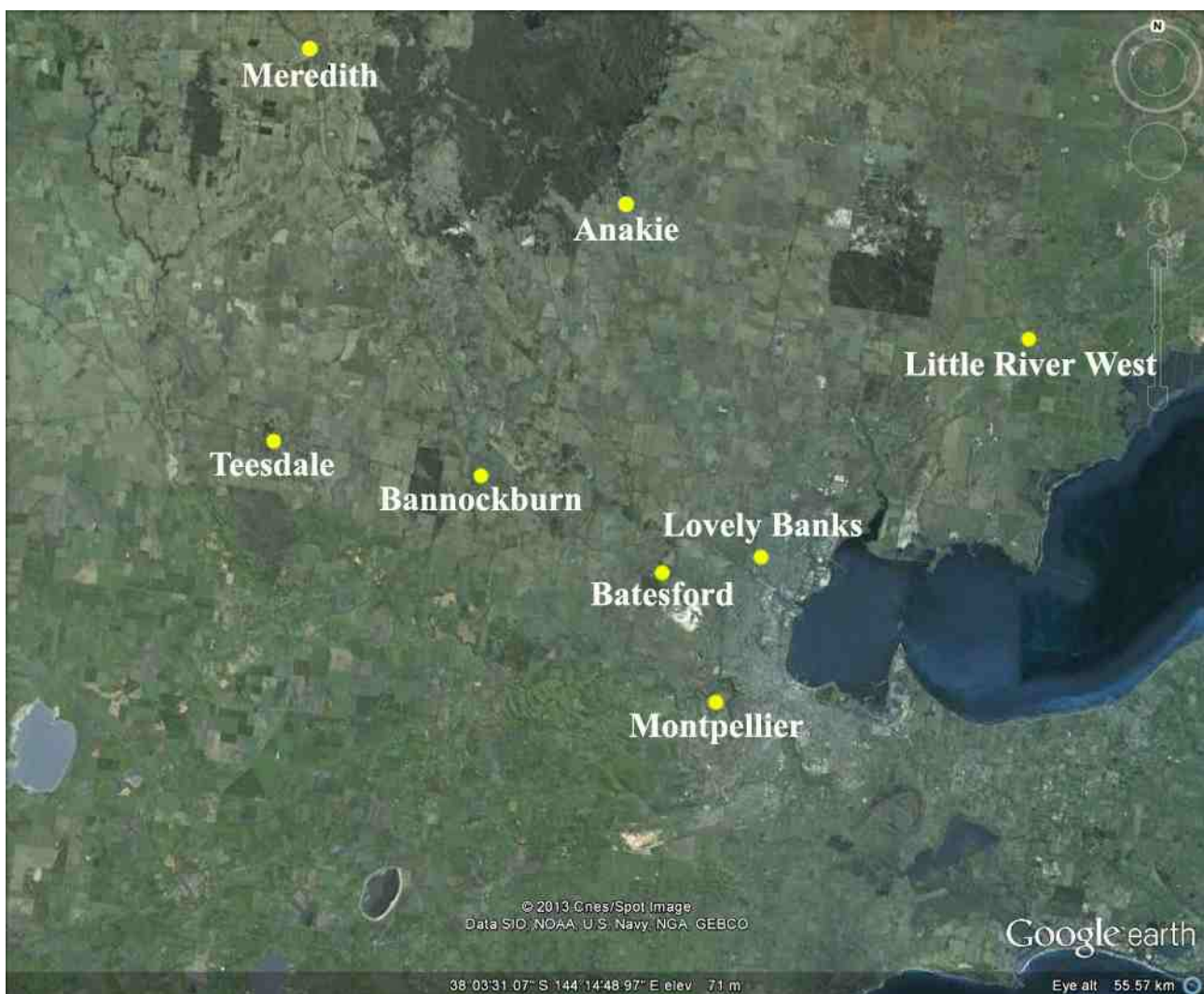
“WATER will be released from the Lal Lal reservoir in a bid to revive the drought-stressed Moorabool River. An environmental flow of 80 megalitres will be let go in stages over five to 10 days from next week, Corangamite Catchment Management Authority announced yesterday. CCMA chief executive officer Don Forsyth said the deep refuge pools between Lal Lal and She Oaks were the target of the release, but it might take several flushes to achieve that aim. But Moorabool Shire councillor Pat Toohey said the move was too little too late. “It’s probably like tipping water on the bleached bones of a carcass. The river is dead,” <http://www.thecourier.com.au/story/504593/water-to-flow-once-again/> March 29 2008.

“BARWON Water’s gift of water to supply Ballarat has run out. The authority’s 750 megalitre share of Lal Lal Reservoir is now being sent back to Meredith. Last year the authority generously gave its share to Ballarat to help the city’s critical water shortages. Water was then trucked to Meredith from the Moorabool water treatment plant to supply the town. But the agreement has now lapsed, meaning the water can be released from the reservoir into the Moorabool River to supply Meredith downstream... Mr Bicknell said as releases from the reservoir begin, Meredith residents would notice a difference in the water taste, due to the river water’s increased salt content. But he assured residents it was safe to drink and abided by the Australian Drinking Water Guidelines.” <http://www.thecourier.com.au/story/529997/barwon-waters-gift-dries-up/> December 1 2008.

“Residents of Meredith, north of Geelong complain their town water is so salty it is making some of

them sick. The local water authority says a new pipeline will make a big difference next year. In the meantime locals just have to put up with the bad taste in their mouths. After consulting a doctor, Carol Broadhurst is convinced she is allergic to Meredith's drinking water. She gets weepy eyes and skin irritations whenever she takes a shower. "I had seven sties in five weeks, irritation all the time, weeping discharge out of both ears and the top of my eyelids are slimey, that's the nicest word to use," she said. "It really is a bit of a joke that you can't turn the tap on." She now relies on rainfall to fill her tank. Other residents have told ABC News they suffer chronic stomach cramps. One local egg farmer, Vincent Colla, carried out independent water testing which also revealed a high level of carbon. He says that is affecting the health of his hens. "You keep checking with other farms and you think there's something not right here," he said. He complained to Barwon Water "All they said was it's not killing them. That tells me there's something in there that shouldn't be there." The water is sourced from the Moorabool river and services 370 households."

<http://www.abc.net.au/news/2010-03-26/merediths-water-making-us-sick--residents/380726> March 26 2010.



Rough location guide showing which communities are most likely to be sourcing water from Moorabool. It is highly likely that the final destination of much of this water extends further than those communities highlighted on map.

The township of Meredith, 45 km north-west of Geelong, has a new water supply. Its 1,100 residents, who previously relied on the stressed West Moorabool River for their drinking water, are

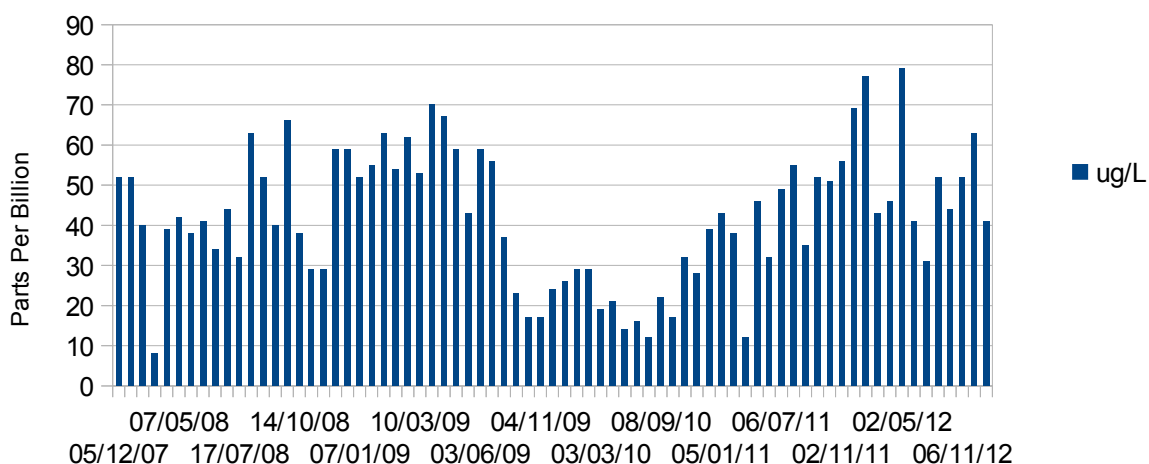
now linked to Geelong's supply network. A new 11.5 kilometre pipeline from the Lethbridge tank on Medina Road means the end of fluctuating water quality from the West Moorabool, which stopped flowing during the recent drought, forcing Barwon Water to truck in fresh supplies. The tank is supplied by the Moorabool water treatment plant, which receives water from the Upper Stony Creek storages. Upper Stony Creek is in the northern catchment of Geelong's supply network... "The project was fast-tracked because of issues associated with Meredith's ongoing supply, including high salt levels in the West Moorabool that could not be removed by the treatment process and the unsustainable practice of carting water," Mr Lowrey said. "The result is that the townspeople are now enjoying greatly improved water quality and can take comfort in the knowledge they have a secure source of supply. The days of poor quality water in Meredith are over ... and that's great news for the local community," he said.

<http://www.barwonwater.vic.gov.au/about/corporate/media/2011/new-water-for-meredith>

September 1 2011

Moorabool Bromodichloromethane Detections December 2007 - November 2012

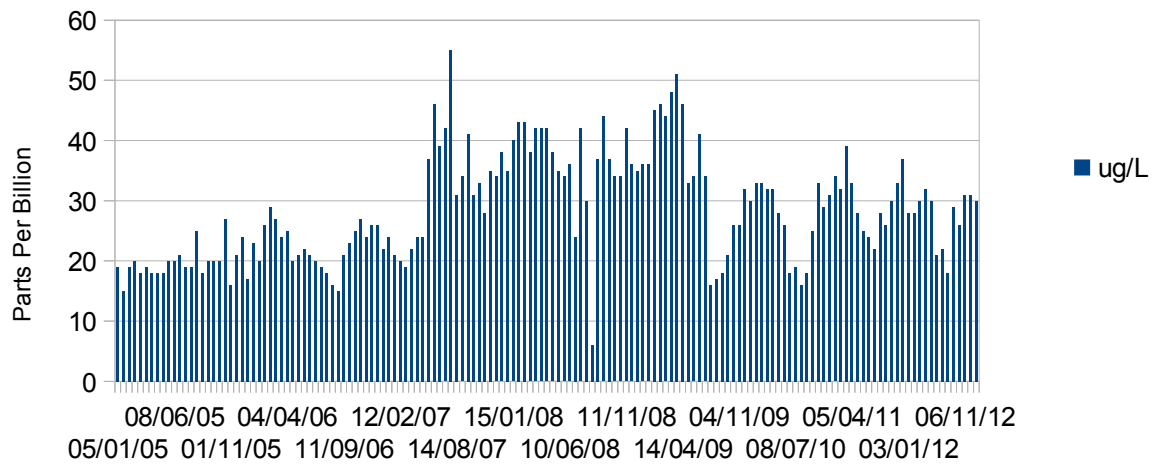
60ppb World Health Organisation Guidelines



Moorabool Supplies Water largely to Montpellier (western Geelong), Lovely Banks (northern Geelong), Bannockburn, Teesdale, Anakie, Little River West and Batesford. High THM level of >200ug/L recorded at Moorabool in 2011/12. No mention of Bromodichloromethane breaches in Drinking Water Annual Reports.

Torquay Bromodichloromethane Detections January 2005 - December 2012

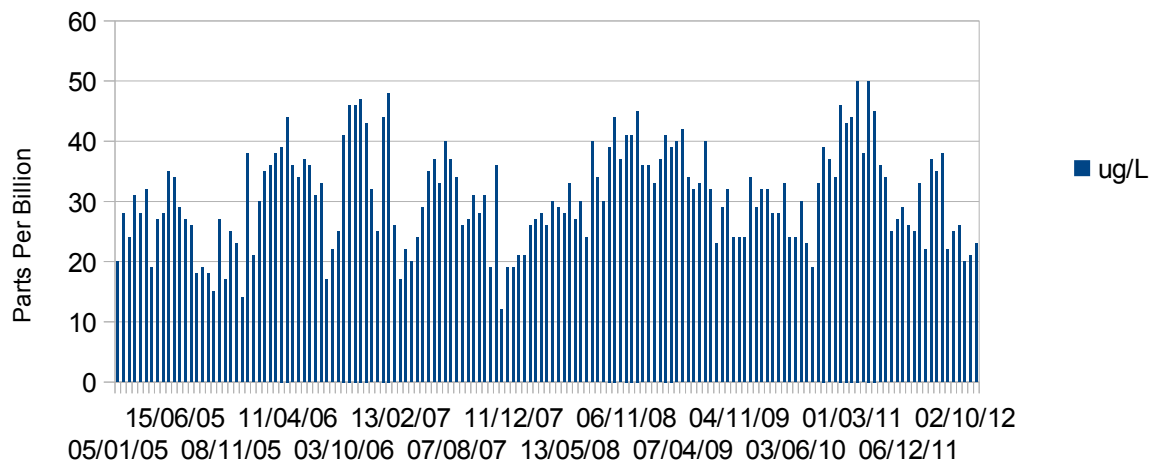
60ppb World Health Organisation Guideline



Torquay, located on the Surf Coast has recorded BDCM levels at an average of 47% of the World Health Organisation Guidelines since January 2005. Levels peaked in Torquay in April 2009.

Airey's Inlet Bromodichloromethane Detections January 2005 - December 2012

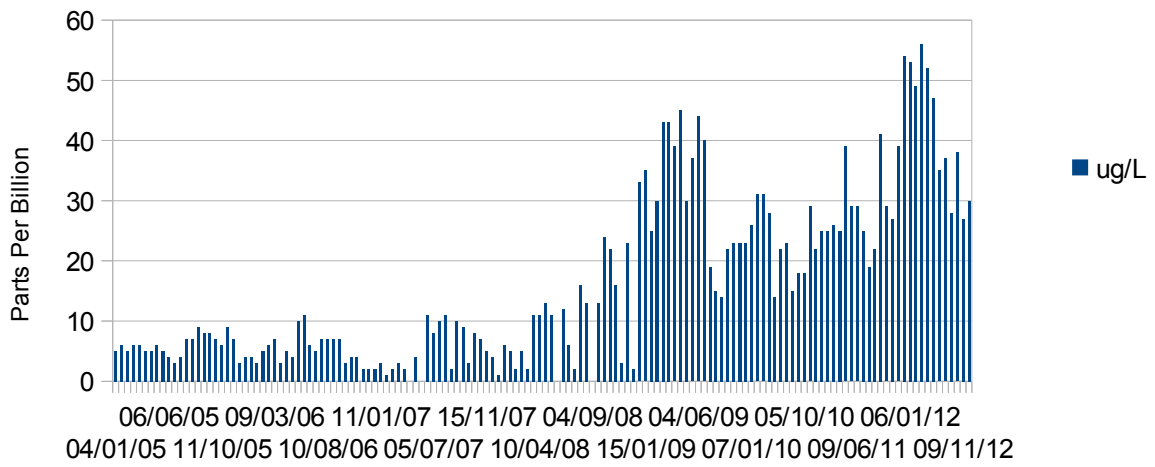
60ppb World Health Organisation Guideline



Airey's Inlet, located on the Surf Coast has recorded BDCM levels at an average of 51.4% of the World Health Organisation Guidelines since January 2005. Levels peaked in Airey's Inlet between April – June 2011.

Little River West Bromodichloromethane Detections January 2005 - December 2012

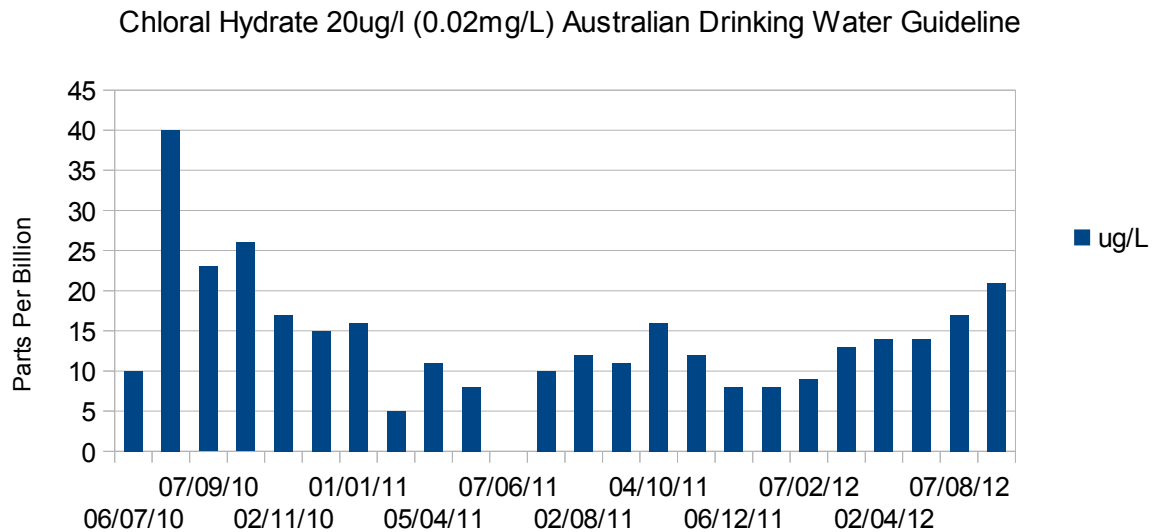
60ppb World Health Organisation Guideline



Little River West, recorded relatively low BDCM levels up to 2009. Levels peaked at Little River West between January – April 2012. On the 6th of March 2012, BDCM reached 93% of Australian Drinking Water Guidelines.

7. Chloral Hydrate (Trichloroacetaldehyde)

Purnim Trichloroacetaldehyde Detections July 2010 - November 2012



Chloral Hydrate is another by product of Chlorine disinfection. It has been detected at Purnim at an average of 14ug/L (70% of ADWG) between July 2010 and August 2012. There have been four breaches of the ADWG's in the same time period. There were also five other exceedences 30ug/l on 4 August 2009, 20 April 2010, 4 May 2010, June 8 2010 and 22 June 2010 outside of the reference dates from the information supplied to FoE from Wannon Water.

“Trichloroacetaldehyde, cyanogen chloride, chlorophenols were monitored at customer taps (and following disinfection) on a quarterly basis. Trichloroacetaldehyde was also monitored on a weekly basis in Cavendish and Purnim at the request of the Department of Health, as part of a research project on the prevalence of trichloroacetaldehyde in Victorian drinking water supplies. Of the 276 trichloroacetaldehyde samples collected for the year the only locality to exceed the 0.02 mg/L health related guideline value in the 2004 Australian Drinking Water Guidelines was Purnim. Four of the sixteen samples collected during 2009/10 exceeded 0.02 mg/L.” (Wannon Water Water Quality Annual Report 2009/10 p57).

“Levels of Chloral Hydrate in the Purnim water supply

During the reporting period several instances of elevated concentrations of the disinfection by-product trichloroacetaldehyde (chloral hydrate) occurred in Purnim at concentrations above the health guideline value in the Australian Drinking Water Guidelines. The health related guideline value is 0.02 mg/L. Results above the health related guideline value were reported to the Department of Health under the section 22 of the Safe Drinking Water Act 2003. The Department of Health's assessment was that short term excursions above the guideline value do not pose an unacceptable risk to human health, but that water corporations should take all reasonable steps to minimise the formation of chloral hydrate.

Purnim's water is disinfected only. Trichloroacetaldehyde is formed as a by-product of the chlorination of water containing organic precursor material. Wannon Water undertook a weekly monitoring program from April to June to determine the levels of Trichloroacetaldehyde being formed in the Purnim reticulation...”

Cavendish (recorded 0.025mg/L 2010/11)

A single exceedance in Cavendish resulted from incorrect chlorine to ammonia dosing ratio. A chloramines optimiser software package was created for this site and other locations to manage this risk at Wannon Water. (Wannon Water Water Quality Annual Report 2010/11 p46-7).

8. Arsenic Macarthur

Due to the level of Arsenic at Macarthur, an application was made to the Victorian Minister of Health to declare the Macarthur Supply regulated water (ie. Not fit for human consumption). On the 7th September 2006, the Minister of Health declared the Macarthur System a regulated water supply system. (Wannon Water, Water Quality Report 05/06 page 23). Arsenic was also an issue with the Merino water supply up to 2005 until a new pipeline connected that town to the Casterton supply.

Macarthur was omitted as a regulated water supply (it became drinking water) in the Victoria Government Gazette (S152 Wednesday 18 May 2011), taking effect on 1 July 2011.(Wannon Water Water Quality Annual Report 2010/11 p8).

“The water supply for the Macarthur system is sourced from a bore located near the water treatment plant. Elevated levels of naturally occurring arsenic occur in this aquifer, typically in the range 0.35–0.50 mg/L. Water is treated to reduce the levels of arsenic by the process of pre-chlorination (oxidation of arsenic to enhance precipitation), chemical dosing to aid coagulation and sedimentation (clarification). The water is filtered after sedimentation to remove iron which is precipitated from the ferric chloride (the coagulant). Although a significant amount of the arsenic is removed, it is still present in an elevated quantity that exceeds health-based guidelines after the treatment process. The arsenic concentration after treatment is typically within the range 0.020 – 0.030 mg/L. An undertaking with the Department of Human Services was entered into in relation to the level of arsenic. Modifications to the existing treatment process were undertaken in an attempt to reduce the level of arsenic in the treated water. These modifications have not been successful in reducing the arsenic level to below Australian Drinking Water Guideline (2004) levels. A community consultation process is currently being undertaken to determine the future of the Macarthur Water Supply.” (Wannon Water Annual Drinking Water Quality Report 2005/6 p64).

“MACARTHUR residents have been told to stop drinking the town’s water due to potentially unsafe levels of arsenic. This week Wannon Water informed residents that the Minister of Health could declare the town’s water as regulated water – or unfit for human consumption – due to the current arsenic levels in the water. And if approved, signs will shortly go up in the small town warning residents and travellers not to drink the water. The finding has sent a ripple of confusion through the town about why they were not informed earlier about the ‘dangerous’ levels of arsenic in their water and how it could affect their health. Yet Wannon Water chief executive, Grant Green, said the finding should not alarm residents. He said Macarthur’s water supply had been well below arsenic health regulations until Australia had adopted a stricter standard for drinking water. “Macarthur’s water is sourced from a local groundwater bore, and this bore has always contained elevated levels of arsenic at approximately 400 to 500 micrograms per litre of water. “(Through filters) Macarthur’s water treatment plant reduces arsenic levels down to 25 micrograms, and this level was compliant with the 50 microgram limit set down by the World Health Organisation Guidelines (1984) for arsenic in drinking water. “This is still the standard for many countries throughout the world. But this changed overnight when Australia adopted its own drinking water guidelines in 2004, and under Victoria’s Safe Drinking Water Act (2005) the regulated level is now seven micrograms of arsenic per litre.” Spectator-Observer Partnership 20 Jul 2006

“MACARTHUR resident and business woman Marilyn Cook says she will not even wash her clothes in the town’s drinking water, despite Wannon Water’s announcement that the mains supply is

now drinkable. People are not dancing in the streets about this announcement,” Ms Cook said. “The quality of the water hasn’t actually changed; it’s not a good quality for domestic use. She said she believed only one house in Macarthur was without a rainwater tank, with most people preferring to do without the town supply.” <http://www.spec.com.au/blog/2011/07/05/water-row-residents-refuse-to-use-macarthur%E2%80%99s-supply/>

Arsenic problems have also been recorded at Merino and Darlington. “MERINO residents will no longer have to worry about arsenic problems in their water supply after gaining a new one worth nearly \$1 million. A pipeline from the Casterton water supply was brought online in Merino on December 1, 2005... In November 2003, it was reported that Merino’s arsenic level was between 50 and 75 micrograms per litre. The allowable limit at the time was 50 MPL. However, new drinking water guidelines from July 1 2004 saw the allowable limit drop sharply to just seven MPL – putting the town’s water supply well above the legal level. Then Glenelg Water chief executive, Kevin Safe, said there were long-term effects with arsenic in the water supply – but it had to be consumed at a level of 300 MPL for between five and 25 years..” <http://www.spec.com.au/blog/2005/12/13/no-more-arsenic-new-merino-water-supply-opens/>

Merino

Merino was previously sourced from the Mocamboro bore supply. Water from this aquifer contains naturally high levels of arsenic. To reduce the level of arsenic, a new pipeline was constructed to supply Merino from the Casterton Water Treatment Plant to the Merino Service Basin. Residual arsenic in the Merino Service Basin and subsequent recontamination of the supply necessitated the construction of a new temporary enclosed tank at Merino. The new tank allowed for the decommissioning of the Merino Service Basin.

The implementation of these solutions has seen the arsenic level in Merino locality dropped well below the Australian Drinking Water Guideline value of 0.007 mg/L. The non-compliance was only evident for the first four weeks of the reporting period.

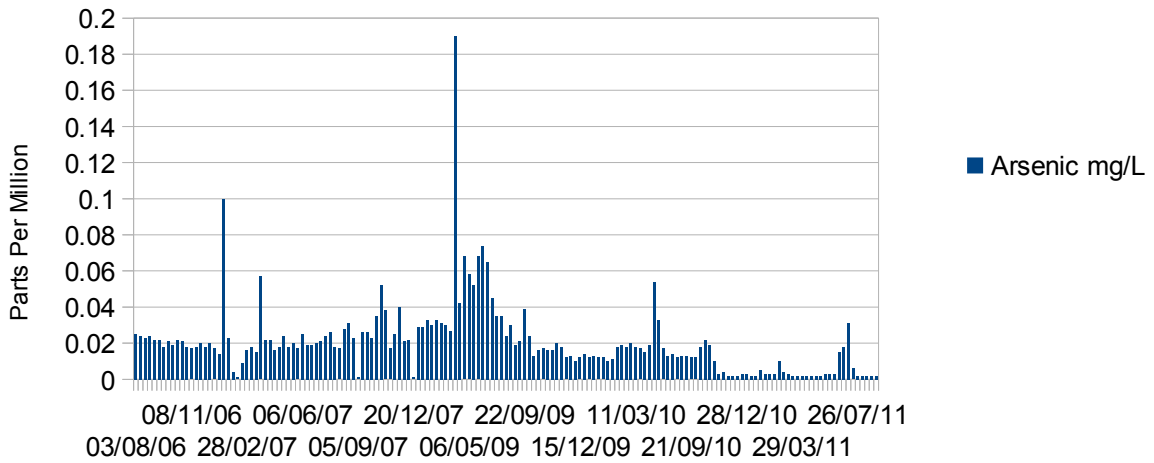
Darlington

The quality of water produced by the Darlington is poor. It fails to meet Australian Drinking Water Quality guidelines in relation to health based limits for E. coli and arsenic.

Due to health concerns, Darlington was previously declared by South West Water as a non potable water supply zone, that is, the water is supplied with the intention that it not be used for drinking or consumption. Extensive community consultation was undertaken in relation to this issue. The Darlington supply was declared a Regulated Supply on 6th September 2006.” (Wannon Water Annual Drinking Water Quality Report 2006/7 p22).

Macarthur Arsenic Levels August 2006 - September 2011

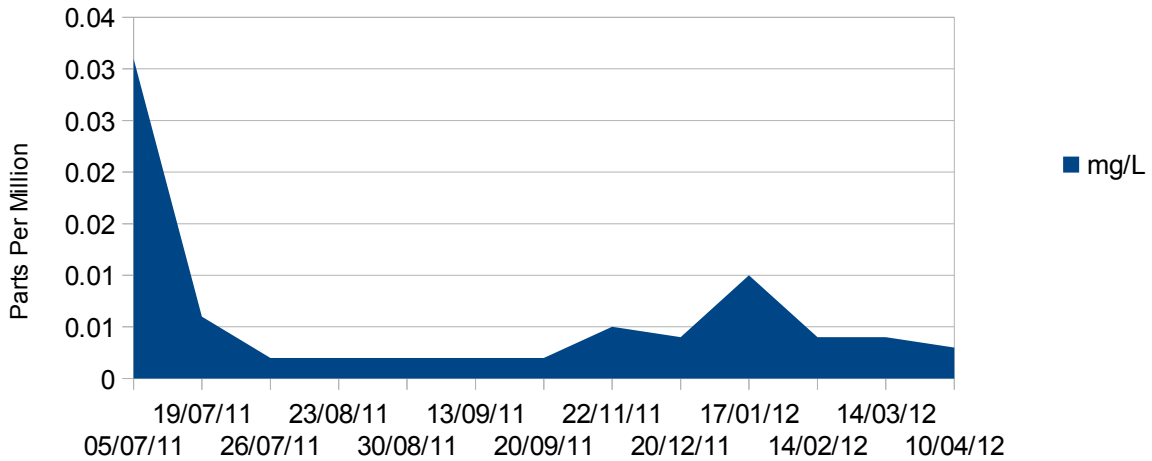
Australian Drinking Water Guideline 0.01mg/L



Graph highlighting high levels of arsenic recorded at Macarthur between August 2006 and late 2011, most of which occurred when the water supply was regulated and not recommended for drinking water. Highest level recorded was 0.19mg/L on the second of February 2009 (19 times above Australian Drinking Water Guidelines).

Macarthur Arsenic Detections July 2011 - April 2012

Australian Drinking Water Guideline 0.01mg/L



Average arsenic levels at Macarthur since water became omitted at being a regulated water supply 0.0059mg/L, 59% of the Australian Drinking Water Guidelines, with one breach in July 2011.