

# **OTWAY WATER BOOK 44**

## **IMPACTS ON FARMING**



## Disclaimer

This book may be of assistance to you, but there is no guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaim all liability from error, loss or other consequence that may arise from relying on any information in this book.

This book has been prepared, and supporting documents used, with diligence. Statements within this publication that originate from groups or individuals have not been evidentially tested. No liability is accepted from any action resulting from an interpretation of this book or any part of it. The data in this book is arrived at from information sourced and available in the public domain at the time. The passage of time, manifestation of latent conditions or impacts of future events may necessitate further examination and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this book. This book has been prepared in accordance with care and thoroughness. No warranty or guarantee, whether expressed or implied, is made of the data, observations and findings expressed in this book. This book should be read in full. I accept no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this book by any third party. However, I do sincerely hope this book encourages you to enquire about and or further evaluate the material presented and diligently follow up on any aspect of Otway Ranges water resource management that may have been aroused in your mind but not answered.



[www.stopgroundwatermining.com.au](http://www.stopgroundwatermining.com.au)

7 April 2018

Malcolm Gardiner

Email: [otwaywater@yahoo.com.au](mailto:otwaywater@yahoo.com.au) [www.otwaywater.com.au](http://www.otwaywater.com.au)

## INTRODUCTION

Barwon Water has been extracting groundwater from the Barwon Downs Borefield in large quantities since the 1982-83 drought when the borefield provided 50% of Geelong's water supply.<sup>(1)</sup> During the Millennium Drought Barwon Water claims that the borefield provided 70% of Geelong's drinking water.<sup>(11)</sup> Up to this time Barwon Water has been able to justify the assertion that the borefield was a critical water resource for the greater region of Geelong. However, things have changed and this assertion is no longer applicable.<sup>(3)</sup> Unfortunately, the mining of the groundwater resources in the Otway Ranges at Barwon Downs have depleted the resource to such a degree that farming viability and resources within the area of drawdown influence have come under serious threat.<sup>(4)</sup>

At this stage there is every indication that Barwon Water intends to reapply, in 2019, for its extraction licence allowing up to 12,000 ML/year.<sup>(5)</sup> If granted this will allow similar pumping regimes and impacts to continue. This book attempts to outline the impacts already observable and describe what the likely future outcomes will be.

It needs to be clearly understood from the outset that landholder Stock and Domestic utilisation of water resources is a mere drop in the ocean compared to urban ground and surface water extraction. Part and parcel of successful farming enterprises is the sustainable use of the resources available and this most definitely does not include depletion of the water resources to such a degree that the extraction of groundwater outstrips the ability of nature to replenish the water extracted. However, there is an overwhelming amount of data proving that the past management and extraction practices of the Barwon Downs Borefield have been conducted in such a fashion that it is best described as a mining operation.<sup>(6)</sup> Also, it is extremely doubtful that any currently practising farming enterprise within the region has the capacity to carry out an operation where the extraction of groundwater outstrips the ability of nature to replenish this.

The Western District region of Victoria must continue as a significant food producing area. Extensive groundwater extraction from the Barwon Downs Borefield is one example of a threat jeopardising this ability.

## In 2008.

In 2008 Councillor Peter Mercer of the Colac Otway Shire, was cognisant of problems that were beginning to affect farming enterprises with the over and inappropriate utilisation of water resources in the Upper Barwon River Catchment. This insight was based on the fact that productive farmlands could not survive without a reliable water source. Issues within the Shire indicated a different approach to water management was required.

In the Geelong Advertiser 28 August 2008, it was reported that Cr. Peter Mercer had spoken at a Colac Otway Shire Council meeting regarding the water management issues that were arising in the Shire. He expressed the view that water management issues had to become part of the Shire's responsibility. He believed water harvesting for urban use was threatening the viability of the Shire.

*“Are we to watch our dairy farms, organic orchards, blueberry farms and other food producers have their viability threatened.”*

There was also an article in the Colac Herald 29 August 2008 headed, **“Big cities threaten production of food.”** As a civic leader Cr. Mercer echoed his opinion that *“...over pumping of the aquifers (at Barwon Downs) risked the environment, agriculture, people's health and economy.”*

How prophetic but even by 2008 it could be argued that things had already been left too late.

## 2018

### **Observable Impacts from Urban Groundwater Extraction.**

Soil health is fundamental to the viability and integrity of agricultural ecosystems and underpins the agricultural productive base for Victoria's well-being. Any decrease in soil health will affect agricultural productivity, devalue a natural asset and can be extremely serious. In some instances this deterioration can take an insidiously long time to manifest. Small changes over an extended period tend to be accepted just as changes in a growing child are not as noticeable to the parents as they are to an irregular visitor. Farm properties can change hands and the new owners accept the conditions of the recently acquired land as the way things have always been.

Adjustments are made to farming management as new problems arise. In some cases the underlying problems are not readily apparent and can go unnoticed for some time. For instance, Nellie Shalley would not allow her stock, in recent times, to drink from Boundary Creek, a tributary of the

Barwon River, until there had been a 100 – 125 mm rainfall flushing out of the system (pers. com). An upstream peat wetland that had been slowly drying out and leaching toxins into the nearby creek reached a critical point.<sup>(7)</sup> Once farm animals could drink from this creek all year round going back to 1912 but by the 1990s Nellie knew there was a problem and made necessary adjustments to her farming practices and could only guess at the underlying issue. By 2010 the water flowing down her creek was 1000 times more acid than the water entering the peat wetland upstream.<sup>(8)</sup> Urban groundwater extraction had created an Actual Acid Sulfate Soil site upstream of the Shalley farm.<sup>(7)</sup>



### **Spring, Creeks and Bores Drying up.**

Perhaps the easiest impact that can be observed from mining of groundwater is seen when perennial springs, creeks and rivers begin to dry up. In the summer of 2015-2016 the Barwon River stopped flowing for 124 days. This year, 2018, the Barwon stopped flowing at Winchelsea in January. Groundwater extraction impact has spread into the Gellibrand River Catchment and will continue to reduce flows until the depleted aquifers recover, if they ever do. As the area of impact spreads further and further out other catchment springs, creeklets and streams will also continue to deteriorate. Even though pumping was suspended in 2010 the outer area expands as water is sucked into the borefield void. Without water, farming and ecosystems in our region cannot survive.

Another insidious impact that slowly takes time to eventuate is the creation of Actual Acid sulfate Soils. As the pumping at the Barwon Downs Borefield, from 400 to 600 metres down, lowers the water tables and pressure heads, the complete dynamics of water movement through the earth's structures right up to the surface, begin to take place. Some

impacts may take decades to materialise. The springs and creeks drying up are a first sign of issues and the creation of Actual Acid Sulfate Soils (AASS) is one of the delayed problems. Desertification is one of the slowest to materialise and could take a hundred years.<sup>(2)</sup>

The creation of Actual Acid Sulfate Soils upstream of or within a property can be catastrophic and an extremely costly problem to overcome. Soils and pasture can be decimated and remain unproductive for eons.



These four photographs show three different sites impacted from AASS.



This particular site would require 513.4 kgCaCo<sub>3</sub>/tonne Dry Weight liming per hectare to bring this site back into production. (This site is Circle 1 on the data sheet found on page 9.)

This sheet includes five sets of data collected at five sites on the same property within the drawdown influence of the Barwon Downs Borefield. (Sites BOS 1-5 are results from an upland wetland.)



Treated pine posts have been eaten off at ground level.



Any wire coming in contact with the soil is corroded within months. Galvanised droppers suffer a similar fate.

Stock are unable to drink water originating from or passing across these soil sites. Neither can the water be used for domestic or garden purposes.

Adjoining, downstream properties are similarly impacted.

The acid and heavy metals generated in these sites decimates stream life and other downstream wetlands.<sup>(9)</sup>

Groundwater becomes polluted and downstream spring action results in acid burn of pastures.

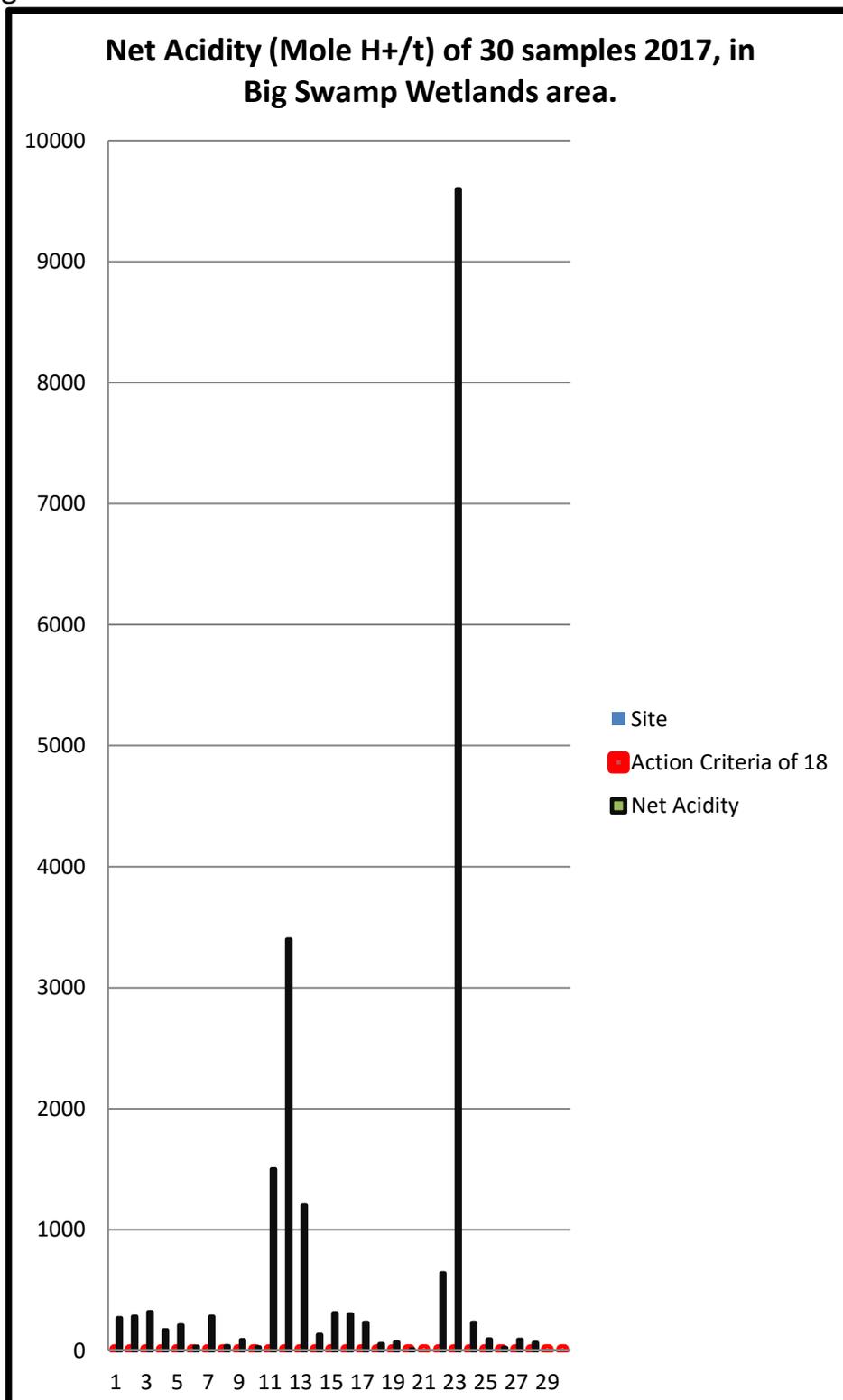


Pasture suffering from an acid spring below the Big Swamp Wetlands.



The Big Swamp Wetland peat caught fire in 1997 at this site because water tables had been lowered from pumping at the Barwon Downs Borefield. This photograph was taken in 2010 just before the site self combusted after smouldering below ground for 12 years.<sup>(10)</sup> Nothing had grown at the site in those 12 years.

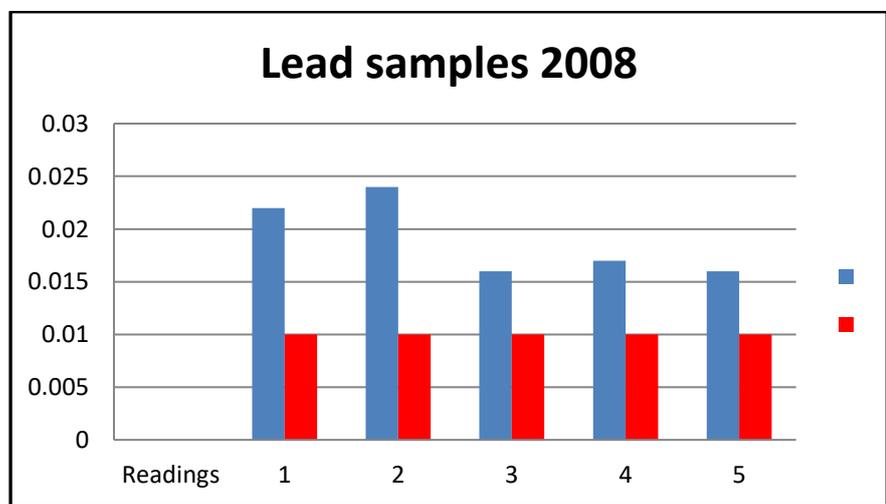
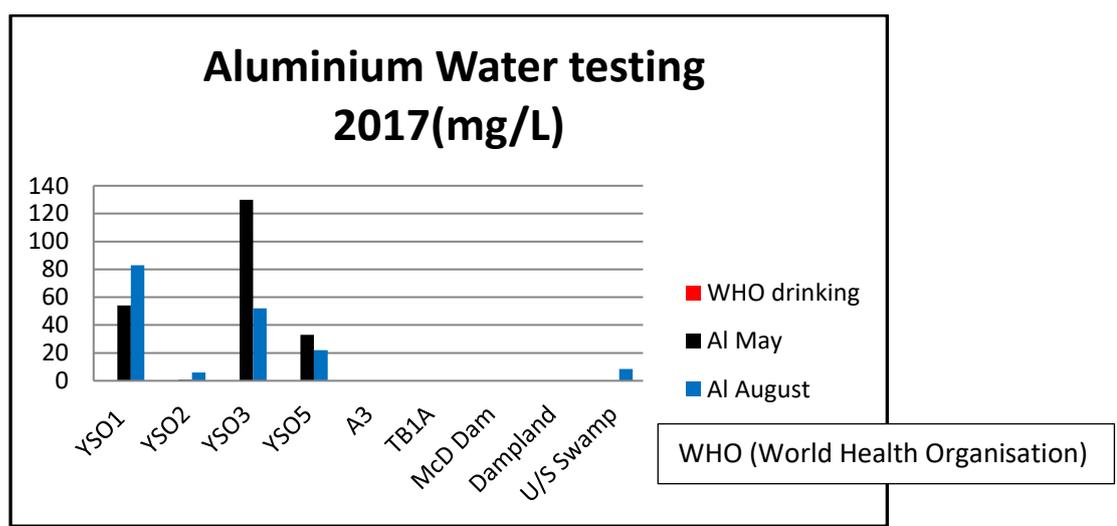
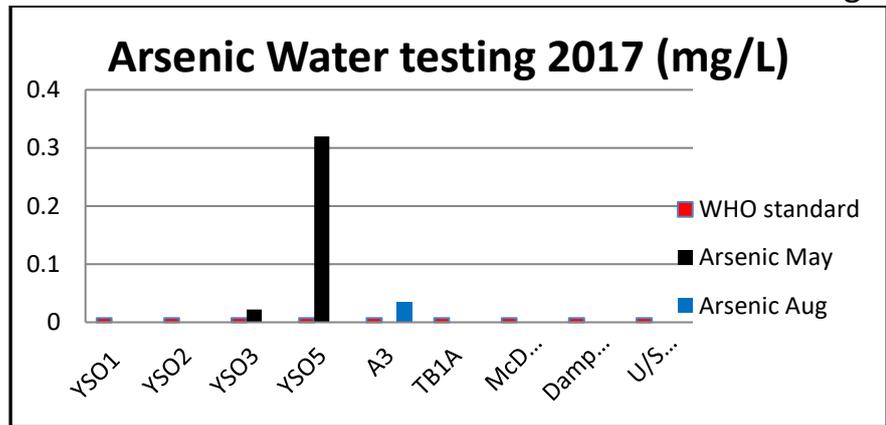
However, massive amounts of acid and heavy metals have been generated.<sup>(11)</sup>



If the acidity in the top one metre of the Big Swamp Wetlands could be mobilised, it has been estimated that there are 134 million moles of acid that can move off site.

The annual amount leaving the wetlands is estimated to be 55,000 moles, and if the current conditions in the wetlands remain the same, this situation could persist for **several hundred years**.<sup>(11)</sup> Downstream and aquifer pollution will continue.

Heavy metal contamination of water samples collected coming out of the Actual Acid Sulfate Soil site areas included the following analysis.<sup>(11)</sup>





This is water flowing from the Actual Acid Sulfate Soil site of the Big Swamp during the first flush of autumn rains. This water flows through farmland into the Barwon River approximately two kilometres downstream.

**SOME of the KNOWN IMPACTS include.**

**A. Fish Kills**

In 2016 there was a 30 kilometre fish kill down the Barwon River that originated from the Big Swamp Wetland Actual Acid Sulfate Soil site.<sup>(9)</sup>

**B. Vegetable Production**

For extended periods the use of water flowing out of the Big Swamp and down Boundary Creek is no longer suitable for vegetable production, domestically or commercially.

**C. Bore Water**

As levels in the aquifer drop, properties and characteristics of the hydrology of the area change. The use, reliability and quality of bore water is seriously threatened.

#### **D. Scalding**

Acid from springs and stream overflow can scald and kill the pasture.<sup>(14)</sup>

#### **E. Animal Health**

Stock grazing this pasture and drinking the water can lead to unhealthy animals reducing productivity, reduction in income and an increase in costs. High levels of aluminium, iron, zinc and manganese can affect the biochemistry of animal cells leading to signs of sickness, ill health and poor growth. Arsenic and lead are very toxic to most animals. Lead is a cumulative poison and can cause diarrhoea, dizziness and chronic debilitating ill health. Arsenic can be absorbed quickly into the body and can also be rapidly excreted and released from stock by way of urine and in the case of dairy cows in the milk. In this way arsenic can enter the human food chain (pers. com Michael Rhodes- Veterinarian).



#### **F. Infrastructure**

Farming infrastructure such as pumps, bridges and piping can be seriously affected from corrosion (See below, page 16).

#### **G. Pastures**

Pastures on river flats on most occasions remain green and provide a summer food source for stock and act as a fire retardant. However, reduction in water tables put this safe guard and food source at risk.

#### **H. Fire**

With summer green pick disappearing the chances of occurrence and intensity of fire episodes markedly increases. Smouldering and or self combusting peats become a reality.<sup>(10)</sup>



#### **I. Pollinators.**

Soil health deterioration, gases and dust from the drying or burning peat represent a potential threat to the populations of pollinators so necessary and critical in the agricultural industry.

#### **J. Food Tainting.**

Drying and burning peat brings about chemical and bacterial reactions and microbial oxidations that can produce a range of toxic gases and dust. Toxic gas and dust emissions present a potential threat to above ground produce such as grapes and vegetables, not to mention the human impact. Unfortunately little is known about the gaseous components of the sulfur cycle in Australian inland wetlands. Initial work measuring ambient air in wetlands indicates that hydrogen sulfide may not be the main gas responsible for foul smells and that hydrogen sulfide may even be a minor component of a gas cocktail produced.

It is one thing to know exactly the range of dusts, noxious and toxic gases that are produced in saturated, drying, dry and burning peat wetlands, and quite another to know how these individual and or mixtures of gases, affect human health. The answer to the first part of this statement is that there are a very limited number of laboratories in the world with the expertise to measure sulfur gas emissions from wetlands, let alone all of the other dust and gas possibilities. The three main sulfur gases emitted are hydrogen sulfide, volatile organic sulfur compound gases and sulfur dioxide. In regard to the affect of these gases and dust on human health, one can only speculate.

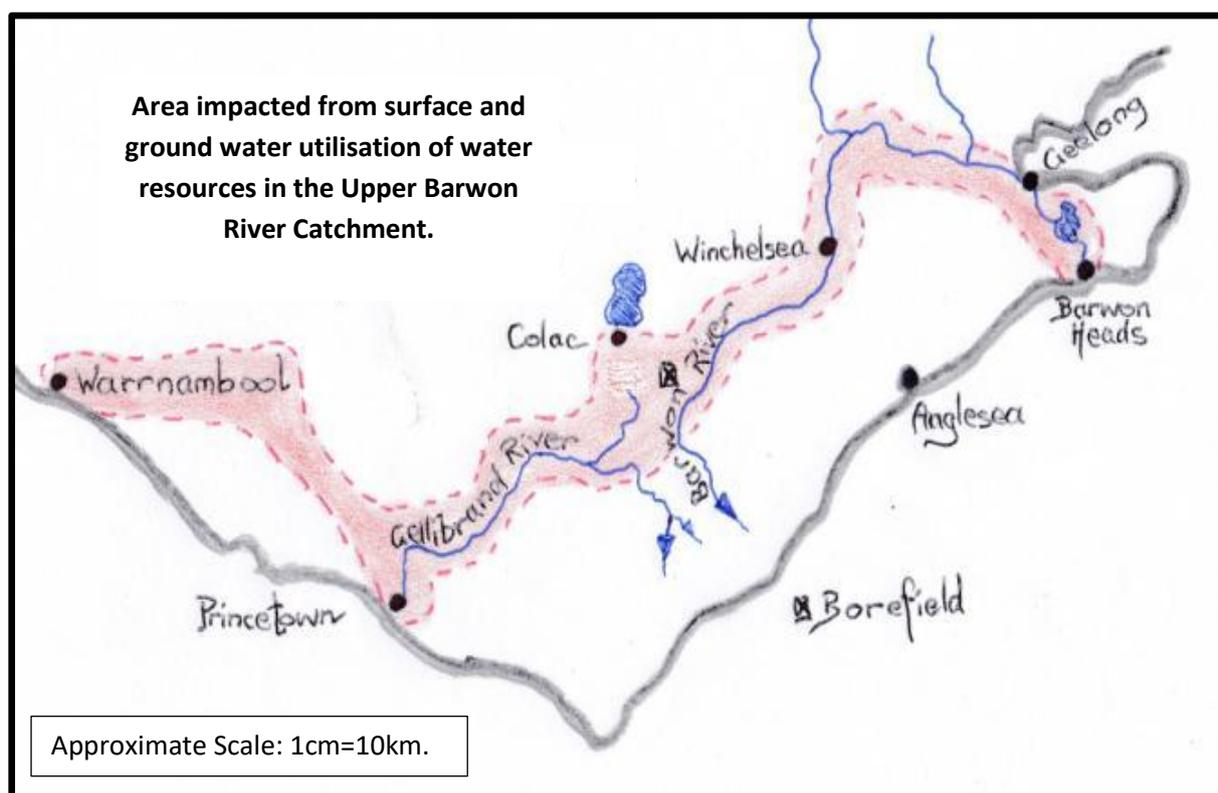
#### **K. Resale Value**

As water resources dwindle so will asset and land values.

## L. Area of Impact

The area of impact from the extraction of groundwater at the Barwon Downs Borefield is profound and will continue for some time despite extraction being temporarily suspended in 2010. The health and viability of the Barwon and Gellibrand River catchments rely on the constant overflow from naturally occurring aquifers. The list of Beneficial Uses affected across this area is extensive:

- Recreation
- Farming
- Potable water – rural and urban (Western District-Wannon Water)
- Wetlands
- Instream biota
- Fire prevention , fighting and reduction
- Natural balance – no aquifer pollution



## **CONCLUSION**

Ten years later and many of Peter Mercer's fears have been justified. Fire in the Big Swamp Wetlands in 2010 saw the township of Birregurra and district enveloped in noxious gases for months; grapes tainted; at least three more Actual Acid Sulfate Soil sites have been created; springs, spring fed dams and creeks have dried up; the Barwon River has stopped flowing on more than one occasion and the period of no flow has increased each successive time; a 30 kilometre fish kill down the Barwon River has been witnessed; aquifers are being polluted; the Gellibrand River Catchment is being impacted with decreasing and intersected groundwater flowpaths; groundwater dependent ecosystems have been decimated and farming enterprises have been placed under hardship.

There is only one course of action that has any chance of turning this degradation around; the cessation of groundwater extraction from the Barwon Downs Borefield and remediation measures taken to reverse those impacts that can be remediated.

## BIBLIOGRAPHY

1. Malouf M., Interview Victorian ABC Stateline 10 October 2008
2. Evans R., April 2007: The Impact of Groundwater Use on Australia's Rivers – Exploring the technical, management and policy challenges. Product codes PR071282. Land & Water, Australia, Australian Government. (Based on the Land and Water Senior Research Fellowship Report by Dr. Richard Evans, Principal Hydrogeologist, Sinclair Knight Merz.)
3. Barwon Water Web Site 10 September 2016. Q & A section Barwon Downs Borefield.
4. Otway Water Books @ [www.otwaywate.com.au](http://www.otwaywate.com.au) as at March 2018.
5. Barwon Downs Groundwater Community Reference Group Minutes 2017.
6. Otway Water Book 38 – section by Roger Blake.
7. Otway Water Book 8.
8. Otway Water Book 11.
9. Otway Water Book 32.
10. Otway Water Book 15.
11. Jacobs 9 November 2017: 2016-2017 technical Works Program, Yeodene Swamp. Final Draft, Barwon Water.
12. Otway Water Book 14