OTWAY WATER BOOK 51

Review of Jacobs "Low Flow Recommendations for Boundary Creek"

Final Draft – 04

11 July 2018.

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In preparing this Otway Water Book 51, I have relied upon, and presume accurate, any information (or confirmation of the absence thereof) provided by Jacobs and/or from other sources. Jacobs has not attempted to verify the accuracy or completeness of much of the information presented in the Low Flow Recommendations for Boundary Creek. If my information is subsequently determined to be false, inaccurate or incomplete then it is possible that my observations and conclusions as expressed in this book may change.

Malcolm.

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March 2019. (Final Proof November 2021)
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Note: The Appendixes 1-29 for Otway Water Book 51 have been compiled as a separate volume.

APPENDICES.

INTRODUCTION

Barwon Water is currently working on a remediation strategy for Boundary Creek and the Big Swamp. Both these and other impacts are a direct result of the groundwater extraction from the Barwon Downs Borefield. As part of this restoration a Low Flow Recommendation for Boundary Creek will play an important role.

Otway Water Book 51 critically reviews the 2018 Jacobs "Low Flow Recommendations for Boundary Creek," commissioned by Barwon Water.[27]

The Barwon Water Groundwater Community Reference Group (CRG) had limited but significant input into this study going back five years. The amount of input is discussed later. The Low Flow Recommendations for Boundary Creek has been in final preparation mode for at least 3 years (see Appendix 1, page 103 - C5).

The finished report was requested on numerous occasions, promised and was finally made available on 3 January 2019 , five months after the report was finished (dated 11 July 2018), and after the CRG had been wound up.

Review of the Low Flow recommendations for Boundary Creek[27].

Page i.

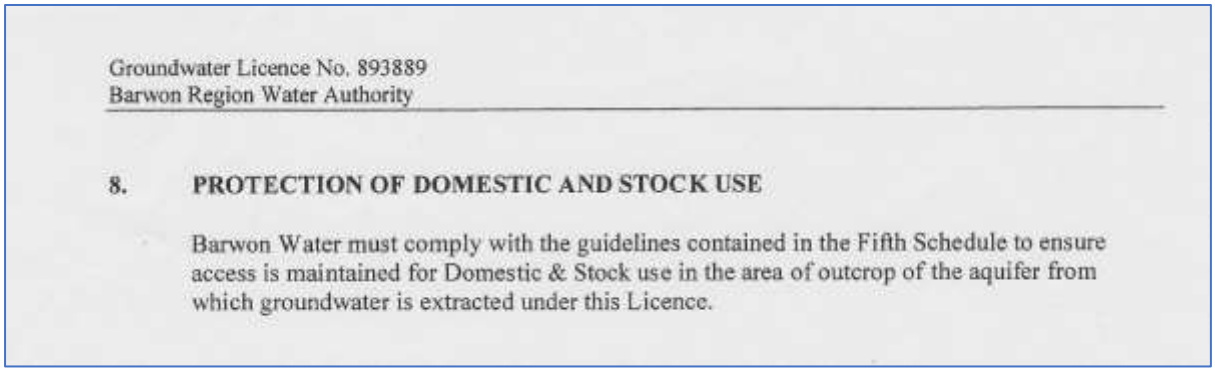
Six authors have been named as contributors to this report. On page 42 an additional person has been named as a contributor.
There is no evidence of any peer review or evidential verification having been done on this document. It would appear that the contents of Page 61 makes this unnecessary (see Appendix 3, page 112)

Page 1.

Since groundwater extraction started in earnest during the 1982-83 drought and with other extractions up to 1999, Boundary creek had been dry on 32 occasions. (see Appendix 4, page 113). The Jacobs' report states that Boundary Creek "*rarely stopped flowing.*" 32 occasions may be classed as rarely but the impact on farmers who had relied on a continuous flow for decades found these "rarely" times extremely disruptive to their farming enterprises.

It may also be the case that "***The pH recorded in the creek at the Yeodene gauge shows a steep change decrease over a similar timescale…*"** but the warning signs in pH readings of an acute problem, became apparent long before 1999 (see Appendix 5, page 114). The early warning signs were obvious back in 1990 but unfortunately ignored.

It would be an extremely tenuous argument for Jacobs to justify the statement "…***Barwon Water is required to provide supplementary flow (currently 2 ML/d) to Boundary Creek to mitigate potential impacts on stock and domestic users***…" The only time there is any mention of stock and domestic mitigation conditions in the 2004 licence conditions, has nothing to do with flows in relation to farmers needs or rights. Point 8 of the 2004 licence states…



Groundwater Licence No. 893889
Barwon Region Water Authority

8. **PROTECTION OF DOMESTIC AND STOCK USE**

Barwon Water must comply with the guidelines contained in the Fifth Schedule to ensure access is maintained for Domestic & Stock use in the area of outcrop of the aquifer from which groundwater is extracted under this Licence.

… and, the Fifth Schedule deals solely with stock and domestic **bores** not stream flows (see Appendix 6, page 116). Point 8 and the Fifth Schedule of the 2004 licence, contain the only mention of stock and domestic considerations. Not only is the Jacobs statement wrong there are two other problems inherent here.

1. Barwon Water has accepted the Low Flows report in its entirety and by implication this suggests Barwon Water also knows no better.
2. Stating the Artificial Supplementary Flows are designed to mitigate Stock and Domestic rights is a very fundamental misrepresentation and begs the question what other basic mistakes are made in this report.

Precise Summary Needed.

It is important that any Executive Summary include a precise summary so that the casual reader is not given the wrong impression. The text must portray an accurate picture. Things that should have been included in the Executive Summary of the Low Flows Recommendations for Boundary Creek are:

A. The data supporting the statement that not all supplementary flow is being passed through McDonalds Dam is post 2015 data (see page 16 of the Jacobs' Low Flow Recommendations for Boundary Creek). Pre 2015 passing flows information has not been sought.
B. The original and present owner of McDonalds Dam and downstream users of the flow have not been interviewed with the aim of determining past flow release history.
C. The three stream flow gauging stations above, in and below McDonalds Dam were decommissioned in the early 1990s and recommissioned in 2014 (See Appendix 7, page 117). These are not new stations.
D. The reasons for these gauges being decommissioned have not been investigated. The obvious question to be asked was the historical owner of the dam passing the flows on as expected, and therefore the need for the gauges was superfluous.
E. The 2ML/day Artificial Supplementary Flow is released into the Boundary Creek system a considerable distance above McDonalds Dam. The possibility has not been investigated or guesstimated what amount of this water is lost to evaporation, evapotranspiration, seepage and farmer use before reaching McDonalds Dam.

Page 2.

The objective of the Low Flow Recommendations for Boundary Creek[27] study is based on doubtful results of other studies. Page 2 of the Low Flow Recommendations for Boundary Creek refers to two such studies:

- Jacobs 2017c: Barwon Downs Technical Works Program – Yeodene Swamp Final June 2018.
- Jacobs 2017a: Boundary creek aquatic ecology investigation. March 2017.

Otway Water Books 42, 42B, 42C, 42D, 42F and 42G review the 2017c Final draft. These Otway Water books can be found on www.otwaywater.com.au and throw considerable doubt on the scientific and technical expertise applied to this 2017c report.

Otway Water Book 39, found on the same web site is a review of the other Jacobs' report and also discusses a multitude of concerns with this 2017a report.

These Otway Water Books question many aspects of the Jacobs reports. Concerns that have not been answered or resolved to any satisfaction. To base much of this "Low Flow Recommendations for Boundary Creek" report on Jacobs 2017c and 2017a puts into question how appropriate are these Low flow Recommendations. Dahlhaus[30] when conducting a literature review of 166 items reviewed these two reports. In regard to these 166 reports Dahlhaus had this to say… "***Most of the 166 items are unpublished government reports, consultant reports and community published reports, commonly referred to as 'grey literature'. None of the information or data in the items has been evidentially verified for this literature review, therefore the credibility of the literature is an important consideration.***" At Remediation Workshop 3 looking at the remediation of the Big Swamp and Boundary Creek, Barwon Water and Jacobs staff confirmed that none of the SKM/Jacobs reports written as a result of the 2013 Barwon Downs Monitoring Program,[1] had been validated or peer reviewed.

Also, on page 2 it is "***assumed***" that the ambient water is of suitable quality to support the targeted species and communities and relies on the remediation of Boundary Creek and the Big Swamp (Yeodene Swamp) as outlined in the 2017c report. Barwon Water Remediation Workshops 1 - 4 have found that the 2017c report has fallen well short of being capable of remediating the Big Swamp. Since the 2017c report extensive modification and additional recommendations and actions have been incorporated into the remediation plan. Filling the multitude of data gaps has been determined as the first step necessary to provide a comprehensive knowledge base on which informed remediation decisions can be made. It has to be determined how new knowledge will impact on the Low Flow Recommendations.

Delusional Behaviour.

Unfortunately, material not validated or evidentially verified can lead to the creation of a myth; that leads to a delusion which can finish up repeating itself as delusional behaviour.

- For various reasons conclusions and statements can be arrived at without supporting evidence.
- If the conclusion and or statement:
  - Sounds plausible,
  - if said often enough can become accepted as a fact,
  - may also morph from a possibility into a definitive statement, and
  - can be better accepted by having it piggy backing onto a common held belief. Then…
- the conclusion or statement becomes a plausible myth, and
- continuing to advocate this myth by word or action becomes a delusional behaviour.
- Knowingly doing this, can then be regarded as malpractice.

Appendix 8, pages 118-128 gives an example of this type of morphing.

Pages 42, 43 & 44.

At the bottom of page 2 and the top of page 3 a mention is made that the Low Flow Recommendations have been arrived at "…***using an approach adapted from the FLOWS METHOD***."

Pages 42-44 deal with this adaption in more detail and the content of these pages is discussed below. Page 42 states… "***The low flow requirements for the aquatic values of Boundary Creek have been determined for this study using a process adapted from the FLOWS method, which is the standard method used to define environmental flow requirements for Victorian waterways (DEPI 2013)***."

Page 42 also contains this statement "***While the current study has broadly followed the FLOWS approach, it has been adapted.***"

In 2012 when the Barwon Downs Monitoring Program[29] was being developed as a lead up to the renewal of the groundwater extraction at the Barwon Downs Borefield, the FLOWS METHOD was noted as the preferred method for determining environmental flows in Boundary Creek. The 2012 draft of the Barwon Downs Monitoring Program underwent considerable change but the 2013 Final report[1] still contained the recommendation that the FLOWS METHOD be incorporated into the list of studies to be completed.

The fact the FLOWS METHOD was to be used to determine environmental flows for Boundary Creek was welcomed by the Barwon Downs Groundwater Community Reference Group (CRG). However, things were not quite that straight forward.

- By October 2013 at the time of the first meeting of the CRG, the Barwon Downs Monitoring Program had been planned; developed; the agendas set and courses of action determined.
- In 2014 when the FLOWS METHOD was first discussed by consultants from SKM, a copy of the FLOWS METHOD was not made available.
- The CRG was being asked to accept recommendations to proceed with the suggested use of the FLOWS METHOD as outlined by SKM.
- Providing a copy of the FLOWS METHOD was rated as of Medium priority and in the mean time SKM proceeded with its investigations (see Appendix 10, page 149).
- A copy of the FLOWS METHOD edition 1, was finally gained through the Corangamite Catchment Management Authority.
- The acquiring of this copy and the reading of the FLOWS METHOD document took some considerable time and effort.
- Meanwhile CRG meetings continued and the local community CRG members were reliant on the summaries as presented by the SKM staff.
- Becoming aware that there was a revised FLOW 2nd edition, this had to be similarly obtained as Barwon Water was reluctant to provide any reports without going through the FOI process.
- Too often documents referred to at the CRG meetings had to be acquired through the FOI process (see Appendix 11 & 12, pages 151-162).

Why Have A FLOWS METHODology?

The reason the State Government developed the FLOWS METHOD was to gain uniformity across all environmental flows management studies and programs. In this way comparative work, terms, definitions and method used in various environmental flow research would be unambiguous.

A most significant point to note is that the 2002 FLOWS METHOD was researched, developed and completed by Sinclair Knight Merz (SKM – now called Jacobs), the Research Centre for Freshwater Ecology, Freshwater Ecology (NRE) and Lloyd Environment Consultants.(2) This project was completed for the Department of Natural Resources and Environment, Victorian Government.

The fact that SKM and Lloyd Environment were also major players in the development of Barwon Water's 2012-2013 Barwon Downs Monitoring

Programs,[1][29] one could expect that using the FLOWS METHOD for determining environmental flows for Boundary Creek, would be conducted as per the FLOWS METHOD. Serious doubt is raised that this was done.

The CRG rightly assumed the SKM personnel were developing the Low Flow Recommendations document using the FLOWS METHOD and knew what they were doing. Consequently the CRG agreed to things unaware that the method being implemented was not strictly following the State Government guidelines.

One cannot claim an environmental flow will be determined using the FLOWS METHOD unless the study being conducted actually follows the FLOWS METHOD procedure. Any adaption defeats the very integrity of the method.The following discussion raises considerable doubt that the 2013 SKM Barwon Downs Monitoring Program[1] report as explained to the CRG, was following the FLOWS METHOD strategies and procedures.

The fact that Barwon Water was reluctant to make an edition of the 2002 FLOWS METHOD[2] readily available, rang warning bells. CRG members had little if any knowledge of the FLOWS METHOD and were being asked to trust and act upon the summaries presented by SKM staff.

To make matters worse the SKM 2013 Barwon Downs Monitoring Program[1] document was not made available to the CRG until the last December meeting of 2013, long after the CRG had been asked to agree to actions being taken. The story of how this 2013 Barwon Downs Monitoring Program was eventually obtained is an interesting "story" (see Appendix 12, pages 152-162).

MINIMUM ENVIRONMENTAL FLOWS.

When reading this SKM 2013 Barwon Downs Monitoring Program 345 page document, regular reference in the report emphasised that the FLOWS METHOD was to be used for determining minimum environmental flows along Boundary Creek. The 2013 SKM Barwon Downs Monitoring Program[1] stated this method was chosen because it is the Victorian Government's approved method...

"...*the FLOWS method (DNRE 2002), which is the approved method for determining environmental flow requirements for Victorian rivers and streams,*" (page 92 SKM 2013[1]).

Also the SKM 2013 Barwon Downs Monitoring Program[1] "...*recommended that a new FLOWS study be conducted to determine the minimum flows that are required to maintain aquatic habitat and aquatic biota in Boundary Creek.*" (page 92 SKM 2013).

It is interesting to note that the FLOWS METHOD is not designed to recommend minimum flows and this point is emphasised on several occasions in the 2002 FLOWS METHOD manual.[2] This raised the first hint of doubt that perhaps the SKM people planning and implementing work under the banner of the FLOWS METHOD did not actually know what the method was all about.

The purpose of the FLOWS METHOD assessment scope of works is described in the 2013 SKM Barwon Downs Monitoring Program[1] as... "*To determine the minimum flows that are required to maintain aquatic habitat and aquatic biota in Boundary Creek to be able to assess and potentially manage impacts associated with the operation of the Barwon Downs borefield if it reduces the extent to which the recommended environmental flows are met.*" (page 99 SKM 2013).

The 2013 SKM Barwon Downs Monitoring Program[1] also outlines the risk if the FLOWS METHOD assessment is not undertaken... "***The minimum flows required to maintain aquatic habitat and aquatic biota in Boundary Creek will not be known.***"(page 100 SKM 2013). The use of the term minimum environmental flows continues throughout the 2013 Barwon Downs Monitoring Program.

There are numerous other occasions where the people implementing the 2013 SKM Barwon Downs Monitoring Program[1] appeared to have a very poor understanding how to use the FLOWS METHOD as prescribed. Even though the 2013 SKM Barwon Downs Monitoring Program often refers to this method as the preferred method of determining environmental flows, the SKM staff did not seem to have a firm grasp of the fundamentals how environmental flows should be determined by this method. In this instance the FLOWS METHOD makes it quite clear that any recommendation coming from applying the FLOWS METHOD does not recommend **minimum flows**.

The FLOWS METHOD manual[2] states..."*The method developed is called the FLOWS method and is based around the philosophy of describing flow components as part of a recommendation for an environmental flow regime, rather than a minimum flow recommendation.*"[2]

Also, "*The key requirement is that recommendations should be developed to describe the entire flow regime, not solely a minimum flow over a defined period.*"[2]

Also, "*The recommendations are designed to be more than a minimum flow recommendation...*"[2]

Period of Data Set.

As part of the environmental flows determination "*The data series should be for a minimum of 10 years, although a **30 year duration is desirable**.*"[2] Fortunately, there is observable data available for a 30 year period and there is the added bonus of oral history going back as far as 1912 (see examples Appendix 13, pages 163-167). Unfortunately, the majority of the data set and reference point used by SKM/Jacobs is taken from 2014 onwards. Examining the 2013 SKM Barwon Downs Monitoring Program it is difficult to find any indication that information from the earlier 30 year period was made use of.

Local Community Input.

The FLOWS METHOD also states that... "*Data sourcing and collation should not be limited to the data sources...*" and that... "*The method is modular, where additional components may be added to allow more detailed investigation of key issues...*"[2] A most natural addition would be the inclusion of local community input. Nellie Shalley, whose land Boundary Creek flows through maintains family history goes back to 1912. Between 1912 and 1984 Boundary Creek never ran dry (See Appendix 13, page 163).

"*A key issue that should be investigated would include historical information on the system. This may be in the form of data or photos or oral history that would present a picture of the original state of the system and any changes that have occurred.*"[2] SKM made a half-hearted attempt at this and any effort appeared to be designed so that the local community consultation aspect could be ticked off as done.

The 2013 SKM Barwon Downs Monitoring Program[1] states that local community input played an important part in the development of the Barwon Downs Monitoring Program. However, there is little evidence to support this. In fact the number of fundamental omissions and mistakes in SKM/Jacobs reports that could have been avoided is testament to a lack of local input. From the very first meeting in October 2013 of the Barwon Water CRG meetings, a request was made to provide the names of the local community members who contributed to the 2012 and 2013 Barwon Downs Monitoring Program. In January 2014 the request was made again (see Appendix 10, page 148). After numerous other requests the answer was given a medium priority rating (see Appendix 10, page 148).

When pressed it was disclosed that local input was obtained at one of the Colac Shows where Barwon Water had a display tent in 2011.

An effort to tap into the local knowledge was not really attempted until well into the FLOWS METHOD process. Advertisements in the local paper in 2015 (see Appendix 1, page 107, C13) could not replace the personal contact and other poorly conducted attempts to involve the local community.

- Nellie Shalley, an extremely high profile member of the local community was not accepted as an original member of the 2013 Community Reference Group (CRG).
- She was however, invited along to the January 2015 CRG meeting and given full participation rights and the status as a CRG member. (see Appendix 1, page 102, C1).
- However, Nellie was "kicked off" the CRG before the next meeting took place (see Appendix 1, page 108).
- John Day, a Boundary Creek landholder, was alienated (see Appendix 2, pages 109-110).
- Alan and Heather Shalley with 70 years of experience in the area were not contacted (see Appendix 2, page 110).
- Neil Stewart, the landholder directly below the Big Swamp, was kept in the "dark" (see Appendix 1, page 107, C14).

Perhaps, any flurry of activity to involve local participation late in 2014/early 2015, came about as a result of the 19-11-2014 CRG meeting deliberations and questions querying the manner in which the FLOWS METHOD was being conducted.

The Appointment of the Project Advisory Group.

Both editions of the FLOWS METHOD (2002 and 2013) placed a strong emphasis on local community involvement. Edition 2[19] page V of the manual had this to say:

"***additional opportunities for engagement and consultation with local stakeholders to provide input and feedback to the process and allow a level of community ownership of the outcomes.***"

Sadly the opportunities incorporating local community involvement as stated in the 2002 FLOWS METHOD edition were lacking throughout the program inception and development stage of the Barwon Downs Monitoring Program of 2013.[1] A Project Advisory Group (PAG) is one of the ***first*** things that should be set up. It is recommended that this PAG should include landholders, community and environmental group representatives etc.. "***Its role is to provide input and feedback to the process from a local viewpoint.***" And, the first meeting of this group should be "...***held during the project inception...***" The inception period in 2012 did not include local input.

The PAG group should include the stakeholders involved in any stream management plan that may eventuate. High on this list of participants are local community members. The 2018 Low Flow Recommendations for Boundary Creek[27] states this…"***Briefly, the FLOWS method involves the assembly of a panel of technical specialists, who in consultation with a range of stakeholders including local residents, define a set of management objectives for a waterway.***" On the next page 43 of this Low Flows Recommendations for Boundary Creek report it states this… "***For the current study, the Community Reference Group (CRG) formed by Barwon Water as part of the licence renewal process fulfilled the role of the PAG.***"

During deliberation of the 19-11-2014 CRG meeting, local community members of the group made certain suggestions that were considered by the Environment Flows Technical Panel (EFTP). "***For the current study, the members of the EFTP reviewed verbal reports provided by members of the CRG (at a meeting on 19-11-2014)…***" Page 43.[27]

This was/is pleasing to note. However, at a CRG meeting early in 2015 another phase of the FLOWS METHOD program was presented to the CRG and is reported in the Low Flow Recommendation for Boundary Creek report as a "*A crucial step of a standard FLOWS study is the setting of* ***management objectives*** *for the waterway. Following the initial desktop and site assessments, the CRG were consulted regarding the management objectives at a meeting on 17-02-2015.*" Page 43[27]

As a matter of interest at this 17-02-2015 meeting, I asked who were the members of the Project Advisory Group. The following quote is taken from Otway Water Book 27 "Fish Studies and Environmental Flows Along Boundary Creek 2015" March 2015, page 23.[32]

"***In response to a question during discussion at the February 2015 meeting of the Barwon Water Groundwater Community Reference Group, it was stated that the Community Reference Group was also acting as the FLOWS METHOD Project Advisory Group. This was the first I had heard of such a thing and having attended all meetings of the Community Reference Group, this was of some surprise. This was most definitely not a role of the Community Reference Group when set up. And, if a change of roles and responsibilities were to be undertaken then the Group should have been informed. The environmental flows component of the Barwon Downs Monitoring Program was muted way back in 2012 and if following the FLOWS METHOD, this is when the Project Advisory Group should have been formed, not three years later.***"

Having finished reading the FLOWS METHOD document over the 2014-15 Christmas break and considering the medium priority (see Appendix 10, page 148) seemingly being placed on local participation, the question of who was on the Project Advisory Group seemed a reasonable thing.
This quote can be found in Appendix 1, page 105, C12, of the 17-02-2015 minutes of the CRG meeting.

"***Malcolm asked if a project advisory group being set up. Josh advised the CRG is the advisory group, having had the objectives of each reach presented to them***."

It is most likely from this point in early 2015 that SKM/Jacobs realised that to claim the FLOWS METHOD as the method being followed, could no longer be justified. The best that could be claimed was that an adaption of the FLOWS METHOD was being used. Uniform, consistent approach of assessment as set out in the FLOWS METHOD was not being followed.

Fish Studies.

One aim set down by the 2013 SKM Barwon Downs Monitoring Program was..."...*to provide suitable habitat and flow conditions for the native fish that have previously been recorded or that could potentially occur in the catchment.*"
In a 1988 report Tunbridge[7] found that of all the tributaries of the Barwon River that he had investigated, Boundary Creek was the only one containing blackfish. Historically platypus (see Appendix 13, pages 163-167) and other large species also used to habitat Boundary Creek.

Four other fish studies were conducted along Boundary Creek between 1991 and 2002 and even though these were commissioned by Barwon Water (see Appendix 14, page 168), no mention of these studies occurred until pointed out in November 2017 in Otway Water Book 39.[31] Inclusion of these missing fish reports were subsequently referred to (see Appendix 15, page 174).

Tunbridge also conducted another fish study along Boundary Creek in 2014 for LAWROC Landcare Group. It was suggested at the 17-02-2015 CRG meeting that SKM approach Tunbridge (See Appendix 1, pages 104, C9 and 105, C11). Tunbridge was not approached.

The failure to collect accurate, reliable and local knowledge of fish species found in Boundary Creek places added doubt that the adapted FLOWS METHOD has any credibility.

Data being used in a FLOWS METHOD, whether an adaption or not, needs to be accurate, pertinent and as far as possible based on observable data.

Why Use the 2002 Edition?

Why the November 2013 SKM Barwon Downs Monitoring Program was using the 2002 FLOWS METHOD document is most baffling as a revised method, FLOWS METHOD, Edition 2,[19] was completed in June 2013. However, this quote from 2013 Edition 2 is reassuring.

> "***The major steps in the implementation of the FLOWS method have remained largely unchanged over the last ten years. However, some minor modifications have been sporadically introduced over recent years in light of the new information on the hydrological requirements of the biota (especially fish and to a lesser extent vegetation) and in some cases, an assessment of flow component performance and prioritisation.***"
>
> But, it is not reassuring when it is known that SKM was one of the major "players" in the development and preparation of this second edition of the FLOWS METHOD. Until it was pointed out to SKM staff at a CRG meeting, they did not appear to be aware of the June 2013 edition. From this point the development of the 2018 Low Flow Recommendations for Boundary Creek adaption was loosely based on the second edition.

The Adaption.

It is strikingly apparent that the 2013 SKM Barwon Downs Monitoring Program being summarised and conveyed to the CRG in 2014, stating that the FLOWS METHOD was being adhered to, was not the case. The methodology as outlined in the 2002 and or the 2013 FLOWS METHOD was not following the script.

"***The FLOWS method was developed to provide a consistent statewide approach for assessing the flow requirements of environmental assets associated with waterways.***" However, after much discussion and challenging whether the FLOW METHOD was being strictly followed, the July 2018 Low Flow Recommendations for Boundary Creek has been described as ***an adaption*** of the FLOWS METHOD, and that second edition was the reference used.

"***The low flow volume required to support the aquatic values of Boundary Creek has been determined using an approach adapted from the FLOWS method, which is the standard method used to determine environmental flow requirements for Victorian waterways (DEPI 2013)***" (Pages 2-3 Low Flow Recommendations for Boundary Creek[27])

Unfortunately the way in which this report is written gives the impression that an adaption is an acceptable variation of the FLOWS METHOD. This is not the case.

Restoration of Natural Flows.

The 2002 FLOWS METHOD... "*Flow recommendations should be framed for individual reaches...*"[2] and "*Overall there is recognition that the health of aquatic ecosystems will be maintained by aiming to restore the fundamentals of the natural flow regime.*"[2] Local farmers consider the findings of Witebsky et al.[14] whereby Boundary Creek had an average daily base-flow of 3.2 ml/day, as a fairly accurate figure of a natural base-flow regime. And, an artificial supplementary flow cannot be regarded as a fundament of natural flow.

Edition 2 of the FLOWS METHOD[19] replaced the term "natural flow" with "unimpacted flow."

"***In this manual, and future FLOWS studies, it is recommended that the term 'unimpacted' flow be used instead***." The term unimpacted has been used once in the Low Flow Recommendations for Boundary Creek document.[27]

"Occasional rainfall driven high flows (which would be unimpacted by changes in baseflow conditions) may reduce tadpole survival, however, these flows would occur naturally and therefore the frog species in Boundary Creek would be adapted to occasional high flows."

The term "natural" can be found 11 times in the Low Flow Recommendations for Boundary Creek report with 6 of these being used in reference to natural flows. This is another example of how the "adaption" has moved away from the prescriptive FLOWS METHOD.

Page 7.

Figure 1-2 shows Lower Boundary Creek as being dry for periods during non pumping. This is a misrepresentation, especially when the reader is not told that up until the first period of extractions in 1982, Boundary Creek never ran dry during non pumping times (see Appendix 13,pages 163-167).

At the bottom of page 7 it states that "***The Borefield is a crucial back up source for Barwon Water…***" This may have been the case before the Melbourne to Geelong pipeline connection was put in, but this is no longer the case. As at the start of March Barwon Water has in storage 46 GL of water in the Yarra Thompson system that can be utilised at any stage. There is so much water available that Barwon Water has been able to sell 5 GL to Western Water. Approximately 1,350 ML has been pumped through to the Geelong system

between 2012 and 2017, although the figures are a little “rubbery” as shown in Appendix 16 pages 175 to 181.

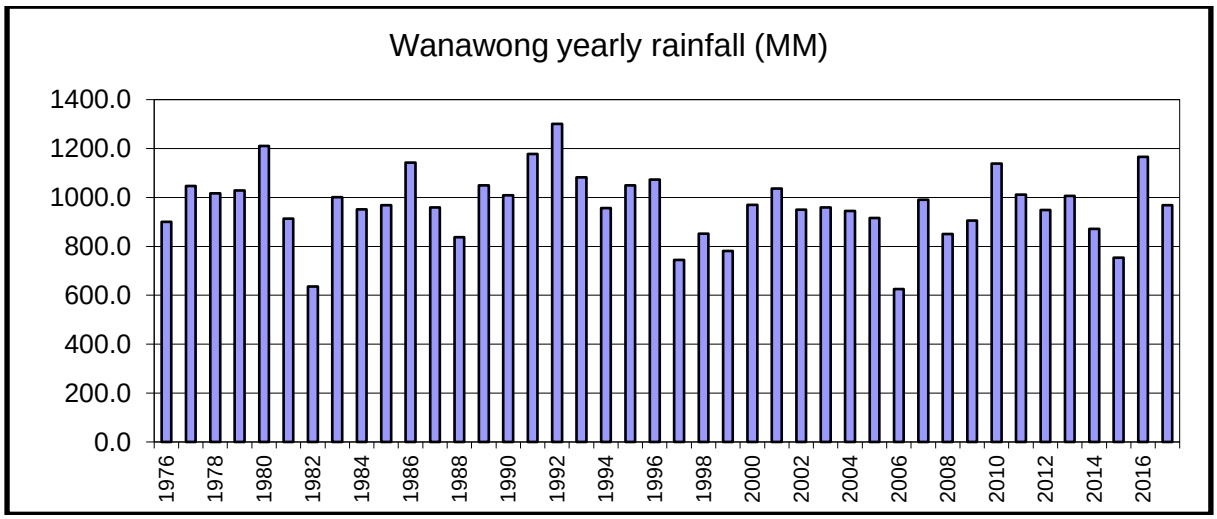
Page 9.

Figure 1-3 on page 9 states that 2016 was a record dry year with 3,449 ML being extracted from the Borefield. The mention of a dry year gives the impression that the extraction of 3,449 ML is justifiable. Is this the case?

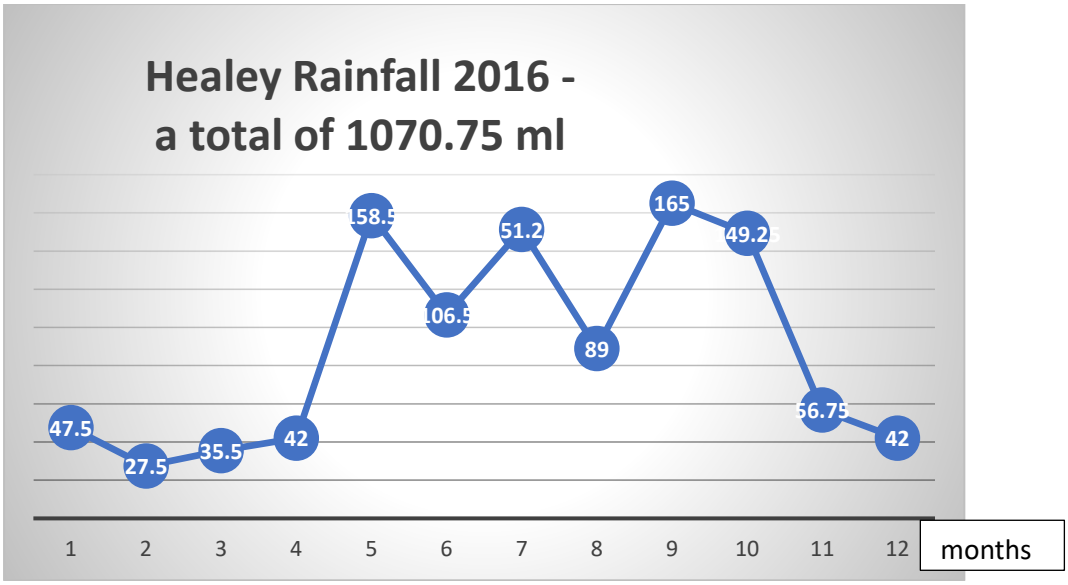
Colac was on water restrictions during this period even though the headworks of the Colac water supply experienced a wet year.

Geelong was not on restrictions. The borefield was only to be used by Geelong in extreme situations and as a last resort. Geelong was not in a last resort stage. Why the need to pump?

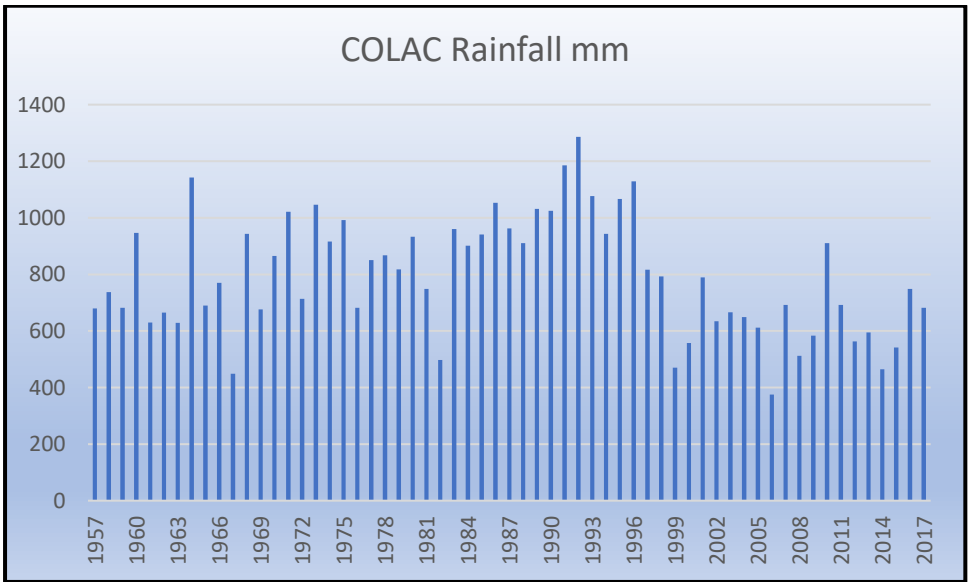
Looking at the Hopkins rainfall chart; the Healey rainfall and the rainfall figures supplied by the Colac Herald, it would appear that 2016 was anything but a record dry year in the recharge catchment area. Is this another example of myth creation?



The Wanawong rainfall station is at Burton Lookout – Hopkins property.



The Healey rainfall station is on the Barongarook High at Barongarook Road.



Figures taken from Colac Herald 2017 rainfall chart 1 January 2018 page 11.

Page 10.

It is all very well to state what the 2004 licence was designed to do but there should also have been a comment on whether the conditions achieved what they were set out to do. The conditions as set down in the licence conditions, most definitely did not protect the flows in Boundary Creek. They did not protect riparian vegetation and they most definitely did not protect stock and domestic use.[4][5][6][11][12][15][22][31][32][36][39][44]

To state that "*... **the relationship between cause and effect is fully understood**...*" is a classic example of continuing to extract groundwater despite

a multitude of observable impacts. Also, any regard for the Precautionary Principle was being ignored. If extraction was to continue in a similar fashion then any recommendations made in this report would never be achieved.

"***A prolonged period of unprecedented drought (known as the Millennium drought) saw a sustained dry climate average from 1997 to 2011. In 1997, many region's water storages were close to capacity...***" What is not told here is that in 1997 the top end of the Big Swamp was so dry it caught on fire. This was unprecedented and happened after one of the wettest periods on record. Hydrograph impact (see Appendix 28, pages 213 to 217) shows that the 1986-1990 stress test pump conducted at the Barwon Downs Borefield is the most likely reason for the Big Swamp drying out after such a wet seven year period. (see Colac Herald rainfall chart, page 20).

Colac to Geelong Pipeline?

As pointed out to Barwon Water and Jacobs on previous occasions the statement that a pipeline has been constructed between Colac and Geelong, is wrong and has not been corrected. The "new" pipeline has been constructed between Barwon Downs and Colac service basin 5.

At the very bottom of this page the statement that Barwon Water is compliant with the monitoring program associated with the 2004 licence does not even hint at Barwon Water's inability after 30 years monitoring to adequately demonstrate impacts that have resulted from groundwater extraction (see Appendix 17, pages 182-185).

Page 11.

"***This review took into account both the social and technical issues that needed to be addressed to inform the licence renewal process in 2019 and was initiated early to allow sufficient time to establish a comprehensive monitoring program***."[(27)]

At the very first meeting of the Barwon Downs Groundwater Community Reference Group in October 2013 the subject of implementing a social effects investigation into impacts that were a result of groundwater extraction at the Barwon Downs Borefield, took up a considerable amount of time. In the end it was decided that to do this successfully had limited value, was expensive and required expertise well outside the CRGs' experiences of the present members. As a consequence the CRG placed a very low priority on conducting a social

impact study (see Appendix 18, page 186). How the above statement can be justified has not been included in this current report.[27]

Also, page 11 attempts to outline details of the community concerns. Unfortunately little notice has been taken of what the local community regards as important concerns and Jacobs has failed to describe them in any detail on this page. Appendix 19, pages 186-188 does a much better job of doing this.

Page 12.

The Technical works monitoring program scope refinement has failed to:

1. differentiate between groundwater extraction and climate effects on the regional groundwater system (see Appendix 8, PAGES 118-128);
2. recognise past impacts and risks of acid sulfate soils (see page 12 of Low Flow recommendations for Boundary Creek);
3. recognise the impact and risks associated with groundwater dependent ecosystems that has happened pre 2014 (see page 12 of Low Flow Recommendations for Boundary Creek);
4. accept local community knowledge that the supplementary flows have never achieved what they were planned to accomplish (see page 12 of Low Flow Recommendations for Boundary Creek); and failed to
5. have anything like a comprehensive data collecting program to establish how groundwater extraction is impacting across the aquitard (see Appendix 20, page, 189-192).

Page 12 in the Low Flow Recommendations for Boundary Creek clearly shows that the modelling has been programmed to make predictions of what could possibly happen in the future. Past experiences, observable data and impacts created before 2014 play a very minor, if any part, in the input into the conceptual and numerical models. Pre 2014 "history" and data in most instances, does not appear to have been recognised to any degree.

Past Modelling Has Failed.

The 2003-04 Groundwater Licence No. 893889 Gerangamete Area Report makes mention of the international recognised model used to determine the long term sustainable yield of the Barwon Downs Borefield. The model also provided the potential behaviour of the aquifer system in response to pumping and the extract from this report finishes with… "***The model shows that the proposed licence extraction can be supported by the aquifer.***" Unfortunately, it has transpired that the model has proved wrong on all counts (see Appendix 27, pages209 to 210).

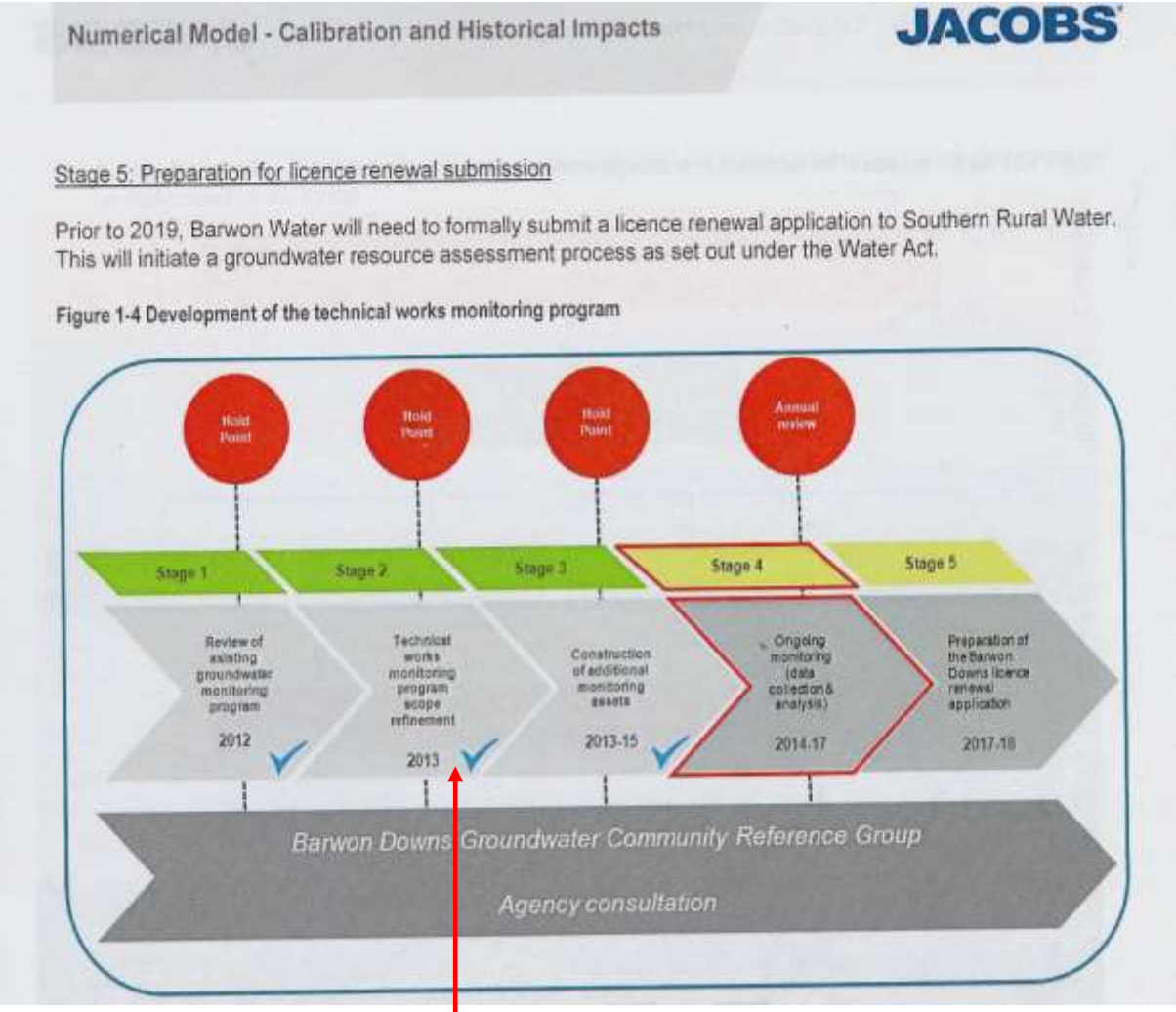
In 2018 Principal Research Fellow Peter Dahlhaus[30] when reviewing SKM/Jacobs' reports leading up to the licence renewal of the Barwon Downs

Borefield 2019, throws considerable doubt on the five or so models used in the mean time. His summary can be found in Appendix 27, pages 211 to 212 & Appendix 29, pages 218-220.

Page 13.

This page highlights once again, how incorrect some of the Jacobs' work can be, and when asked to have it corrected it is done in such a way that only half of the story is portrayed to the reader.

Figure 1-4 (see figure below) found in the June 2017 Numerical Model report[41] continues to portray the myth that local input has been involved and been part of the development of the 2102 Barwon Downs Monitoring Program since its inception. All such figures round this period portrayed the same mistake. Other reports continued to have a similar mis-representation even after the mistake was pointed out to Barwon Water and Jacobs.



The first meeting of the Barwon Downs Groundwater Community Reference Group was 13 October 2013, not as the grey arrow portrays – from inception development stage pre 2012.

Whether this was a purposeful continuation of the myth that local community input had been sought and listened to from the very beginning, one will never know. However, other reports that could have been rectified continued to contain the same mistakes. Eventually, the figure above was modified, and recognition placed on the figure acknowledging that the CRG was first established in 2013. But, no mention was made that it was at the end of 2013.

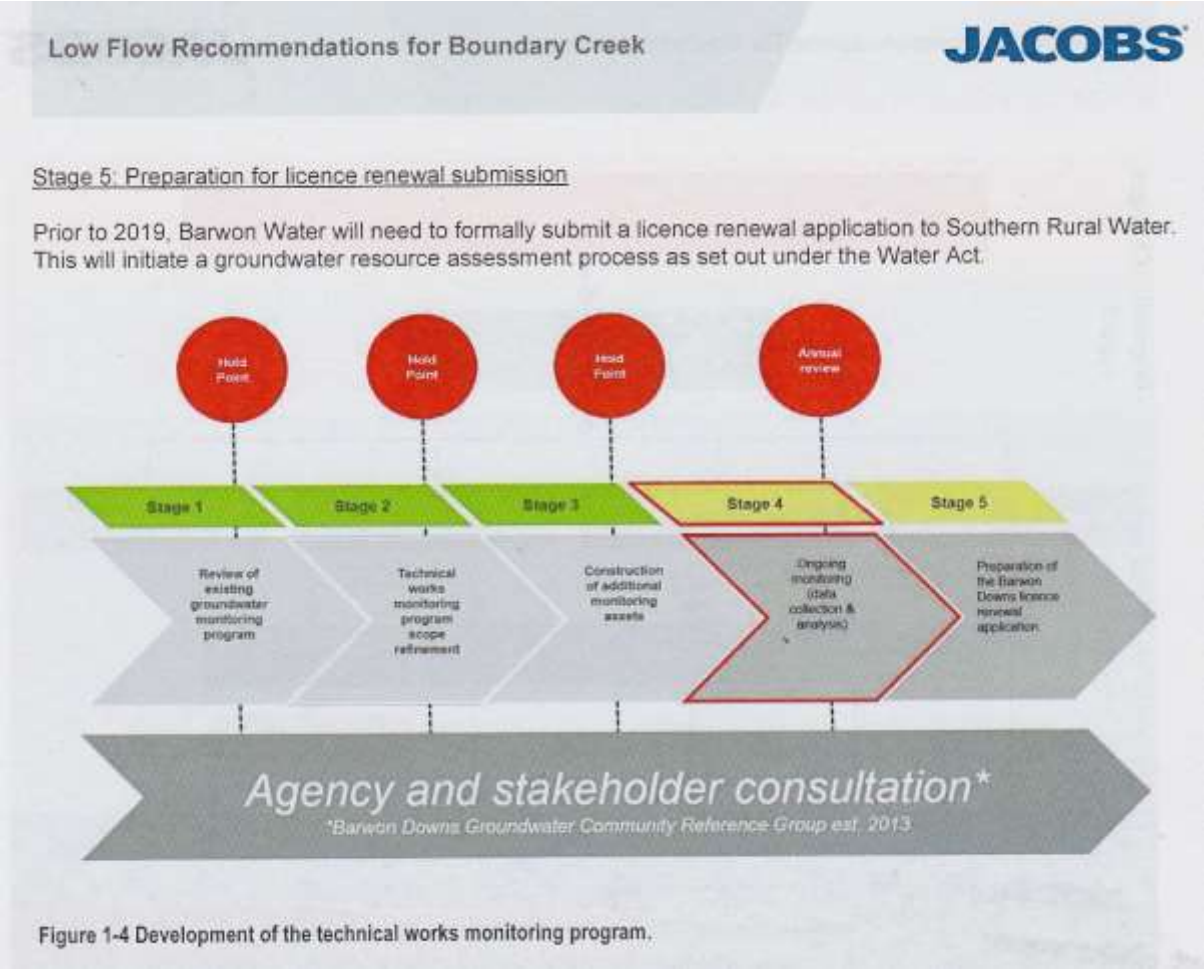


Figure 1-4 Development of the technical works monitoring program.

Page 15.

This page makes reference to Jacobs' March 2017a, "Boundary Creek aquatic ecology investigation."[42] The material collected in this report was used in the development of the Low Flow Recommendations for Boundary Creek. Otway Water Book 39 (Draft)[31] contained 49 pages critically reviewing the Jacobs' 2017a report. Although, Barwon Water requested to use material found in Otway Water Book 39 (see Appendix 15, page 174) there has been little if any change or modification regarding other mistakes found in Jacobs' 2017a report. Unfortunately if this is not done these mistakes remain and may be used influencing future natural resource management decisions.

Page 16.

No data has been presented to justify the statement that Reach 1 is gaining from the basement aquifer. It would also need to be demonstrated how the Supplementary Flow impacts on Boundary Creek flows in this reach. Is Reach 1 gaining from a basement aquifer or the Artificial Supplementary Flows? Also, what is a basement aquifer supposed to mean? No explanation is given to this.

Reach 2c comments need to be modified. One thing that has become abundantly clear to me as a frequent visitor of the Big Swamp are the following things that are not covered in any report.

- That between 2008 and the 2010 fire in the swamp, the northern channel of Boundary Creek would flow the lowest of flows and would not dissipate any water across the swamp until there was ample Rainfall.
- During non rainfall periods all that was left of the Artificial Supplementary Flows that reached the Big Swamp's northern boundary would disappear into the bed of Boundary Creek approximately half way round the swamp.
- There were no visible flow paths through the centre of the swamp.
- After the 2010 fire dramatic changes began to take place.
    - The bed of Boundary Creek on the northern boundary no longer flowed the same way as before the fire.
    - Water began to flow into the swamp at its western end even in low flow periods.
    - Depending on the amount of rainfall the flows would disappear into the swamp and flow underground.
    - In many sections one could walk from one side of the swamp to the other, across the southern fire trench and cross Boundary Creek on the other side of the swamp and see no water what so ever.
    - However, water would be flowing in Boundary Creek above and below the swamp.

The whole dynamics of the swamp and flowpaths in Boundary Creek seemed to be continually altering from one visit to another. Local community input such as the experiences stated above have not appeared to have any impact or influence on the manner in which the Low Flow recommendations for Boundary Creek report has been compiled.

What is not explained on this page is the fact that the conditions in Reach 2c have been dynamic since the 2010 fires and it has become quite evident that a definitive statement cannot be made about what is actually happening or appears to be happening. A factual statement made from an observation on one

day may well have changed by the very next day. It is also very evident that regular visits should have been carried out by Jacobs staff in an effort to look into these observations, especially when these changing events had been brought to Jacobs' attention.

Page 18.

Stock & Domestic Rights.

It would appear that Jacobs is not aware of how Stock and Domestic rights do not have to be registered with Southern Rural Water. The figures presented on this page does not tell the full story. The 2 ML/year Stock and Domestic right per landholder along Boundary Creek adds up to considerably more than 5 ML.

Millennium Drought Impact on Base Flows.

It is true that the Millennium drought impacted on stream flows down Boundary Creek? However, this once again is only half the story. Pre groundwater extraction (1982) there was an extremely large buffering capacity of the Lower Tertiary Aquifers to maintain *base flows* even through a Millennium drought. Groundwater extraction at Barwon Down eliminated this buffering capacity by dropping the water table level from metres above the Big Swamp to metres below the swamp (see Appendix 21, pages 193-194 & Appendix 28, page 213). The consequences being when ever Boundary Creek stopped flowing the Big Swamp was impacted, eventually drying out in the surface metre or so. The top end dried out first resulting in the 1997 fire.

Page 19.

The reference to the source(43) of this statement saying the supplementary flows were "***… provided since at least 2003…***" would have been more accurately reported if this statement read "***…70 ML of supplementary flows were released into Boundary Creek between November 2003 and March 2004.***" The words "*at least*" gives the impression there had been releases made pre 2003. No data or records have been produced to support such a notion. Another half truth, just sloppy research or intentionally portraying the wrong picture? This same type quote is repeated again on page 27.

See Appendix 25, pages 203-204 for extracts taken from the 2003-04 report.

Stock and Domestic Flows.
On both pages 18 and 19 there is the insistence that the Artificial Supplementary Flows have been released as mitigation for Stock and Domestic reasons. This has already been discussed and shown to be incorrect.

Flowing Through Agricultural Land?
Figure 2-1 found on page 17 completely contradicts this following statement regarding Reach 1 … "***There are some sections of the creek in Reach 1 that have been cleared for agriculture, but most of the reach has a continuous and vegetated riparian zone.***" Figure 2-1 shows the majority of Reach 1 to be flowing through agricultural land not a vegetated zone.

Page 24.

Figure 2-9 has been acknowledged as not to scale and for illustrative purpose only. However, this figure should not portray incorrect or doubtful information. For example to show that the aquitard is present under the entire length of the Big Swamp has never been established. In fact this is one of the data gaps that has to be determined to assist in the restoration of the Big Swamp and Boundary Creek (see Appendix 22, pages 195-197). Appendix 22 contains pages from Appendix C taken from the Scope of Works submitted to Southern Rural Water, 20 December 2018. At the bottom of page 6, question 4 and the follow on discussion on page 7, clearly shows that no work has been undertaken to find out whether the Big Swamp is directly connected to, or is separated from the Lower Tertiary Aquifers by an aquitard. Figure 2-9 below is a misrepresentation.

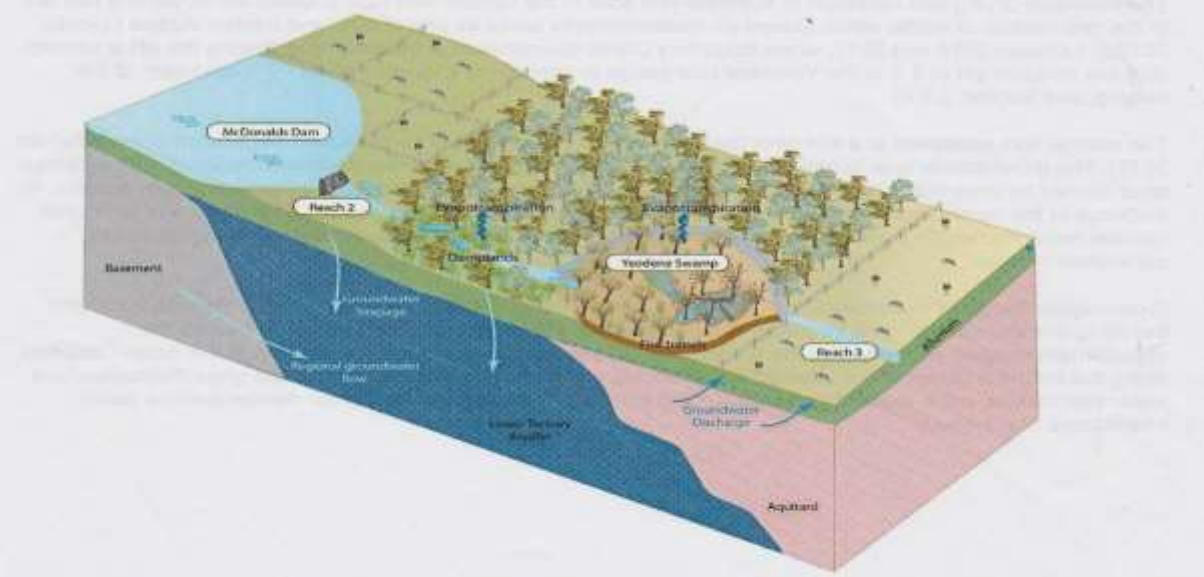


Figure 2-9 Conceptual model of Boundary Creek from "McDonalds Dam" to the confluence with the Barwon River, showing the "damplands" and Yeodene Swamp. Diagram not to scale and for illustrative purposes only.

Page 23.

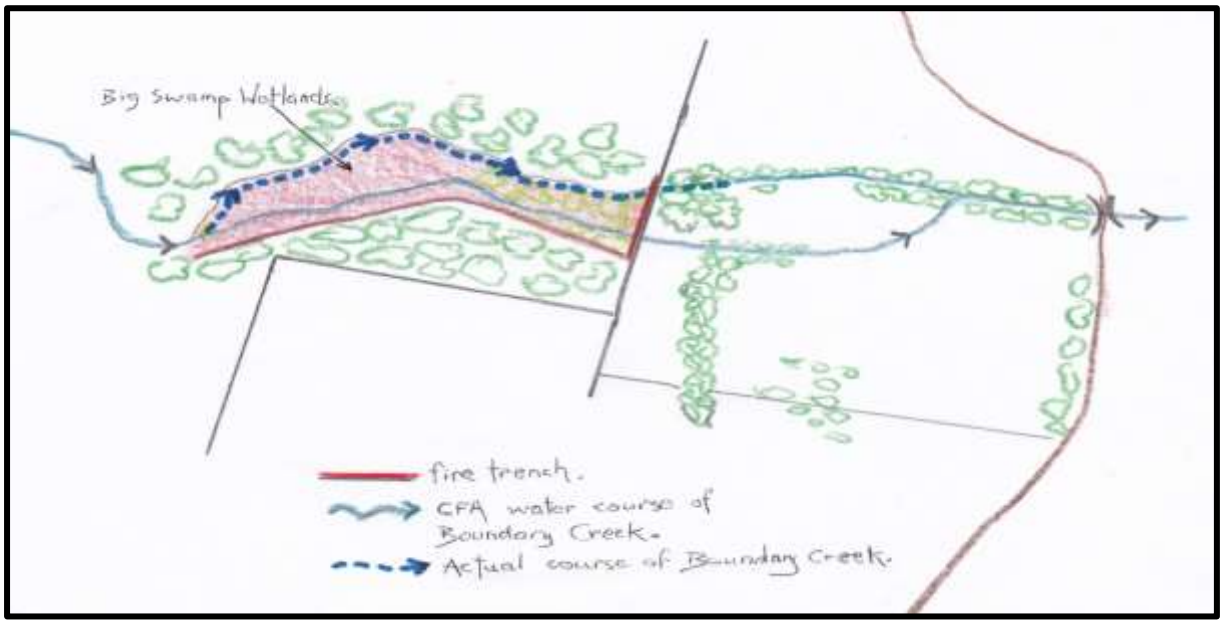
The Fire Trenches.

This statement demonstrates the degree of accuracy that Jacobs employs.

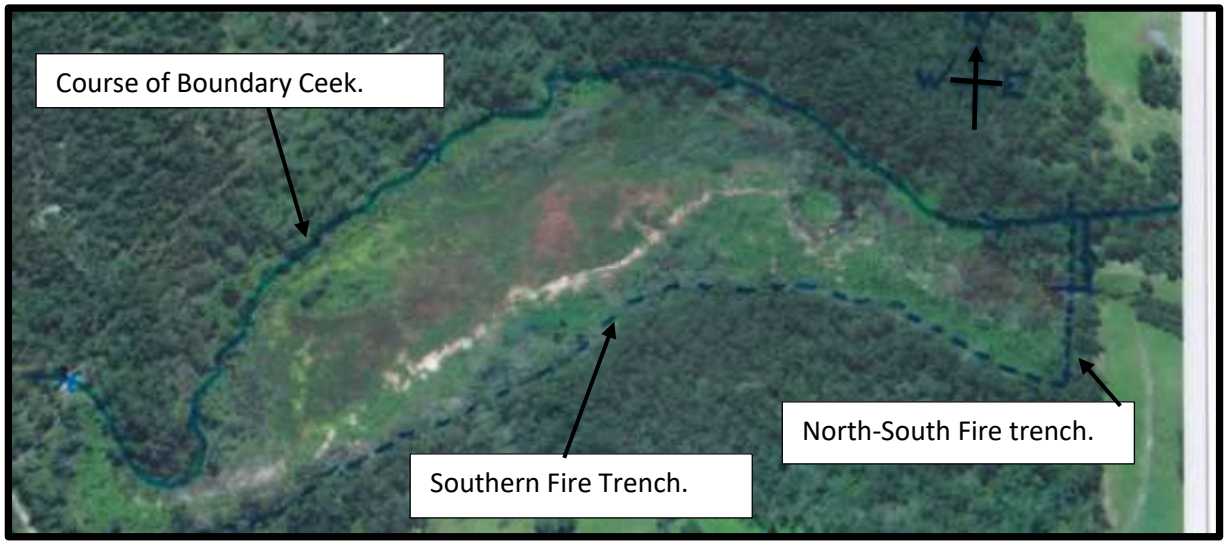
"***This diagram*** (Figure 2-9) ***illustrates the approximate location and extent of the fire trenches in Yeodene Swamp***…" No problems with this.

However, this statement is wrong… "***There is one trench along most of the southern margin of the swamp and another that is orientated east-west near the downstream extent of the swamp***."

Actually, the southern trench runs in an east-west direction and the trench at the downstream extent of the swamp runs in a north south direction.



These two diagrams have been taken from Otway Water Book 39.[31]



To further emphasise how Jacobs have got so many things wrong with their work and why basing any Low Flow Recommendations upon this work is flawed can be seen in one of the replies to a criticism of one of Jacobs earlier work. The criticism was not answered and perhaps it is not important for it to be so, but what cannot be easily explained away, is the reply. This memorandum below was the reply.

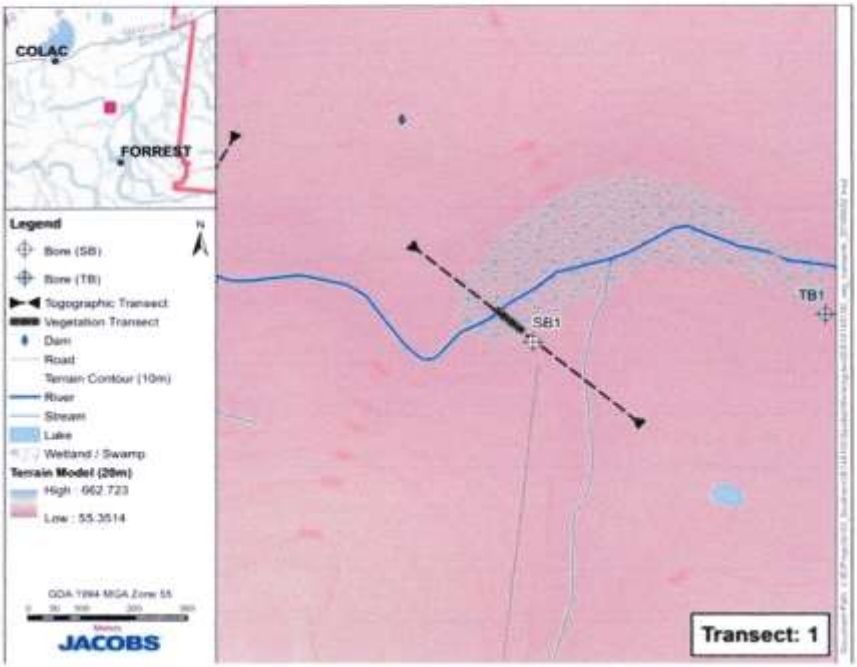
JACOBS

Memorandum

Response to feedback provided on the Barwon Downs Vegetation Report 2016 by LAWROC

Recent field work completed in April 2016 after heavy rain highlighted that flow in Boundary Creek enters the Swamp via a channel at the eastern end, and flow then spreads across the swamp flowing through a braided network of small channels before eventually discharging at the western end via a drainage line and the main creek line. The channel that runs along the northern boundary of the creek was dry in April 2016.

Jacobs will continue to monitor water movement through the swamp and the northern channel over the next few months to improve our understanding of surface water flow movement through the swamp.



5. References

Jacobs (2015) Barwon Downs Vegetation Monitoring Report 2014/15. Unpublished report for Barwon Water prepared by Jacobs Australia

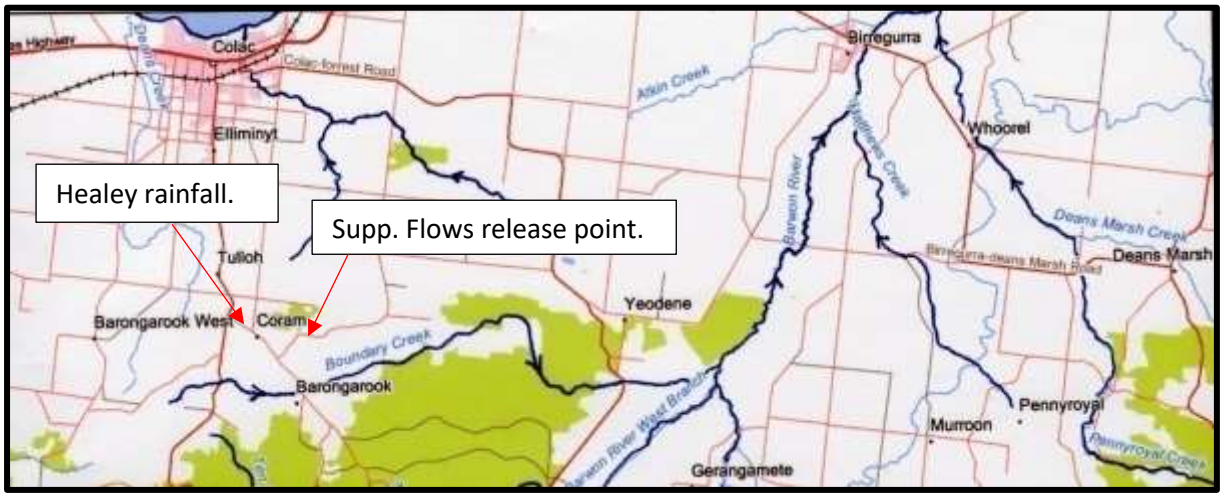
Jacobs (2016) Barwon Downs Vegetation Survey 2016. Final report 31 January 2016

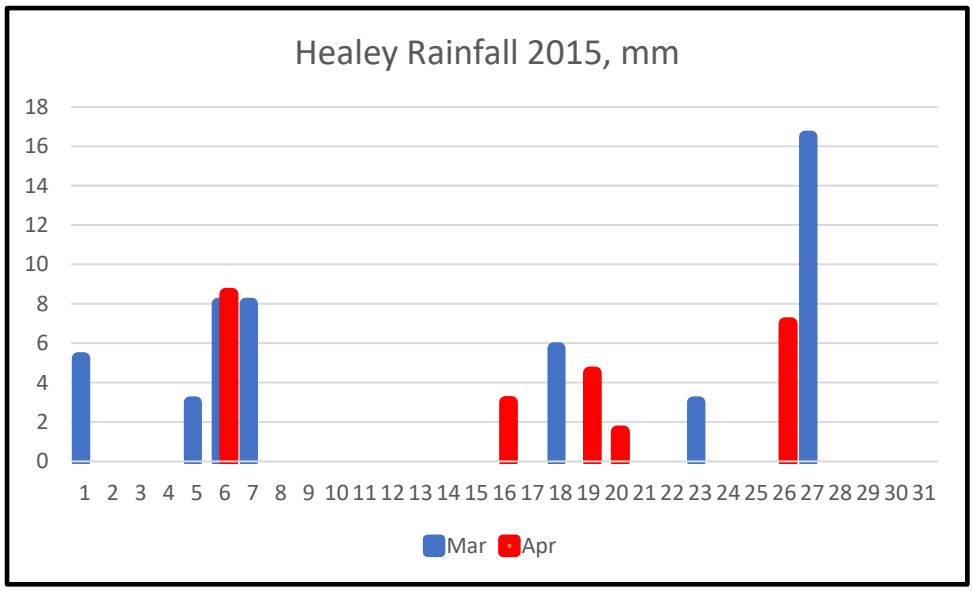
SKM (2013) Barwon Downs Monitoring Program - STAGE 1 Field Investigations and Monitoring Program Scope', Unpublished report for Barwon Water prepared by SKM.

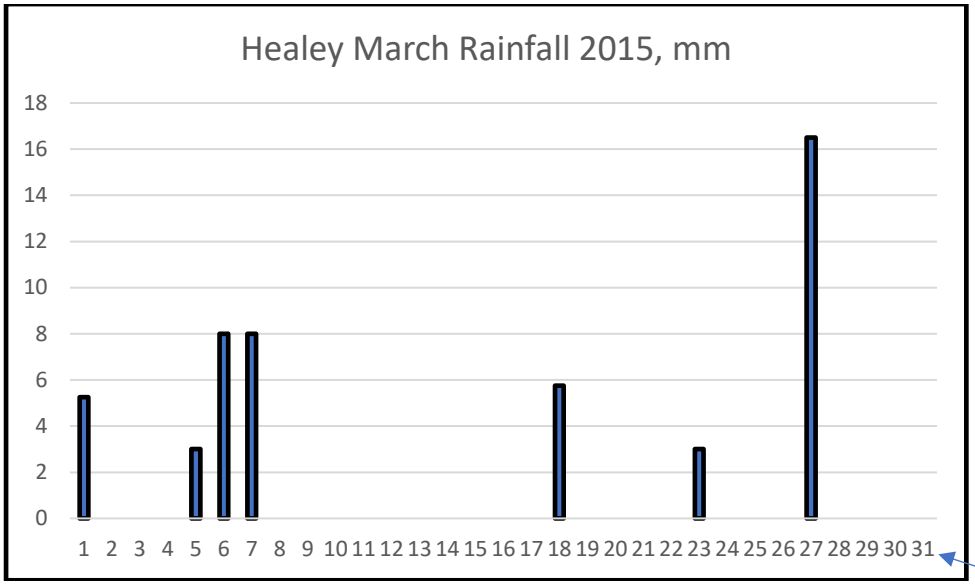
Besides other mistakes in this answer the important thing to note here is the fact that the explanation has the water flowing up hill and in the wrong direction. Boundary Creek water flows from a westerly direction towards the Barwon River in the east. Otway Water Books deal in detail with the multitude of other critical mistakes found in SKM/Jacobs work.

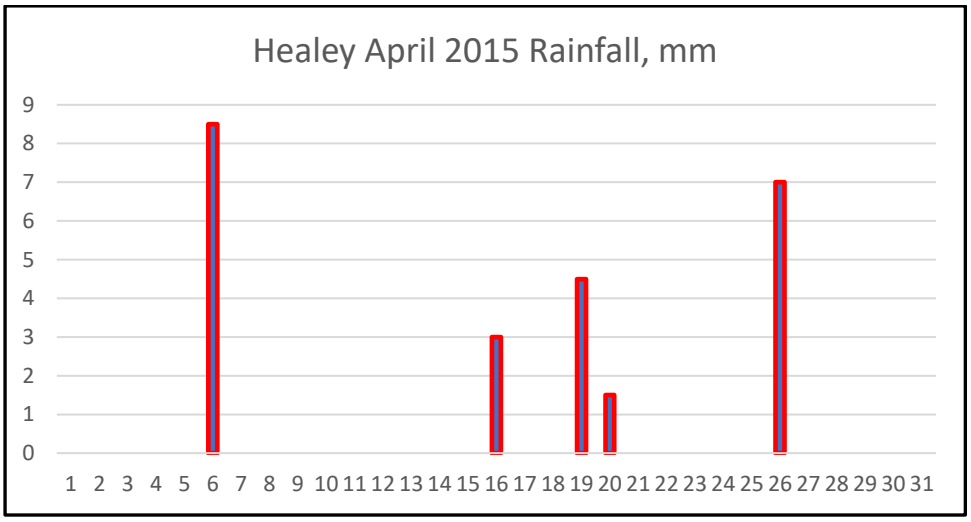
Page 27.

The Healey rainfall for March/April is included below and is recorded within a kilometre of the release point of the Artificial Supplementary Flows. The rain during the period under discussion on page 27, was insufficient to have any impact on stream flow.









However, and what ever influence the rainfall had during the April period that the supplementary flows were turned off, the following statement has to be another case of presenting half the truth.

"***As shown in Figure 2-13 the 2 ML/day release contributes significantly to the baseflow in Reach 1 during the summer months. This is most clearly seen in April 2015, when the supplementary flow was ceased for maintenance…***"

Firstly, it is extremely difficult to "clearly" see what is being pointed out in the April 2015 flow patterns – the Jacobs' graph does not show the fine detail needed.

Secondly, when the flows in Boundary Creek completely stopped during this period it can be clearly demonstrated that the supplementary flows ***<u>are the only reason</u>*** why there is a summer baseflow during summer months in this reach of the creek. "***…Boundary Creek at Barongarook ceased to flow.***" The use of the

words “contributes significantly” should be replaced with “is the only reason there is a baseflow.”
The half truth of the current situation is repeated in the last sentence on the page. “***The evidence from these gauge sites suggest that the supplementary flow makes up a reasonably large portion of the baseflow in Boundary Creek in the summer months.***”

It should also be noted this statement is referring to data collected since 2014. No statement has been made as to what the historical data and studies indicate. If Nellie Shalley and many other local community members are to be believed pre-groundwater extraction and pre-Artificial Supplementary Flow releases, caused summer baseflows in the upper reaches to stop. In the lower reaches the flows continued even during the worst of droughts going back 100 years.

PAGE 28.

This page highlights the reluctance to refer to data collected before 2014, data that should have a place in the determination of the present recommendations. This is another example of a half truth.
“***However, there are two gauges that have been installed recently, one located upstream and one located downstream of the dam.***” These two gauges were ***reinstated*** having been in operation back in the past (see Appendix 7, page 117).

The impression being portrayed by Jacobs’ “…***high quality data…***” collected during the 4 month period February to May 2016 is, that over the history of McDonalds Dam passing flows have always been much less than the flows entering the dam. There has been no apparent effort to determine a historical record of passing flows. What conclusions can be made from the data collected before the Stream Flow Gauging Stations above and below McDonalds Dam were decommissioned? What impact did the ownership of McDonald Dam have on the regulation of passing flows in earlier years? It must also be pointed out that the responsibility ensuring the inflows are being passed down the creek is that of Southern Rural Water. It would appear that SRW have not being doing their job and this fact should also have been factored in to the Low Flow Recommendations for Boundary Creek. No mention of this has been made in the Jacobs’ report.

Page 31.

The contents and discussion on this page suggests that there are one or two questions that need to be investigated and answered. Things that should have been done as part of the Low Flow Recommendations report.

Questions that should have been answered as part of this Low Flow Recommendations report.

Q. Do the Artificial Supplementary Flows mask any drawdown response in observation bores emanating from the Barwon Downs Borefield?

Q. Why hasn't the early 1990s data collected from the Stream Flow Gauging Stations above and below McDonalds Dam been analysed regarding the gaining/losing scenario and the impact being experienced in the observation bores?

Q. Were these observation bores within the area of drawdown influenced back in the 1990s before the Artificial Supplementary Flows were introduced?

Q. What does this mean? No explanation is given… "***Reach 1 hydrogeology is locally variable…***"

Q. Why haven't the reports and studies that do more than "***suggest***" that Reach 2 was a gaining part of Boundary Creek been cited?

Q. What data and argument is there to support the notion that the work done by Witebsky et al.[(14)] in the 1990s, is wrong?

Q. Does this page suggest the 2004 licence condition trigger level set for the Yeo 40 observation bore, at 158.5 m AHD, was based on doubtful research? If so the reasons and data supporting any such assertion should be quoted.

Q. Why has the discussion been restricted to only downward vertical leakage?

Q. Why has the vertical leakage been restricted to data collected in the last few years?

Q. Why hasn't there been any investigation or discussion given to pre groundwater extraction *upward* vertical leakage?

Q. Why hasn't it been explained how this upward vertical leakage would have buffered any impact from climate change and severe drought?

Q. What were the potentiometric levels of the Lower Tertiary Aquifer along Boundary Creek pre groundwater extraction?

Page 32. Updates and Corrections.

It is pleasing to see on this page recognition of mistakes made.
However, it is important to look at how mistakes were made.

1. The Boundary Creek Aquatic Investigations referred in the Low Flow Recommendations document, is noted as Jacobs (2017a). The Jacobs (2017a) report was a Final report. The report missed five of the six fish studies completed along Boundary Creek. The Tunbridge report of 1988 (see Appendix 23, pages 198-200) was part funded by Barwon Water and

referenced. The next four fish studies were fully funded by Barwon Water and not even mentioned. These studies should not have been missed.

2. There is continual reference being made to how much local community participation is sought and used going back as far as 2012, when the 2012 Barwon Downs Monitoring Program was being developed. Not so, or these fish study mistakes would not have been made.
   Yes, "***…understanding of the catchment has been improved by additional surveys and the contribution of long term residents.***" but only when the long term residents' information put forward cannot be disputed, such as the fish studies missed. Other anecdotal information, comments and or contributions fall by the way side as unreliable, not worth checking or lacking any evidentially proven credibility.
   Ignoring local long term resident knowledge brings about basic mistakes by people not resident in the area, people with limited local experience.
3. Local knowledge has been ignored regarding the dynamic nature of the Big Swamp. The way the Big Swamp is portrayed gives an impression that it is in some form of equilibrium. Any local comment made in regard to the dynamic nature of the swamp has not been taken seriously and is not reflected in the 2018 Low Flow Recommendations, or, in any follow up work from the Jacobs 2017a report. Otway Water Book 42[(40)] discusses this issue and indicates that the Big Swamp is so complex and so dynamic that trying to understand the changes that appear to continually manifest in the swamp, is even difficult for "locals."

Page 33.

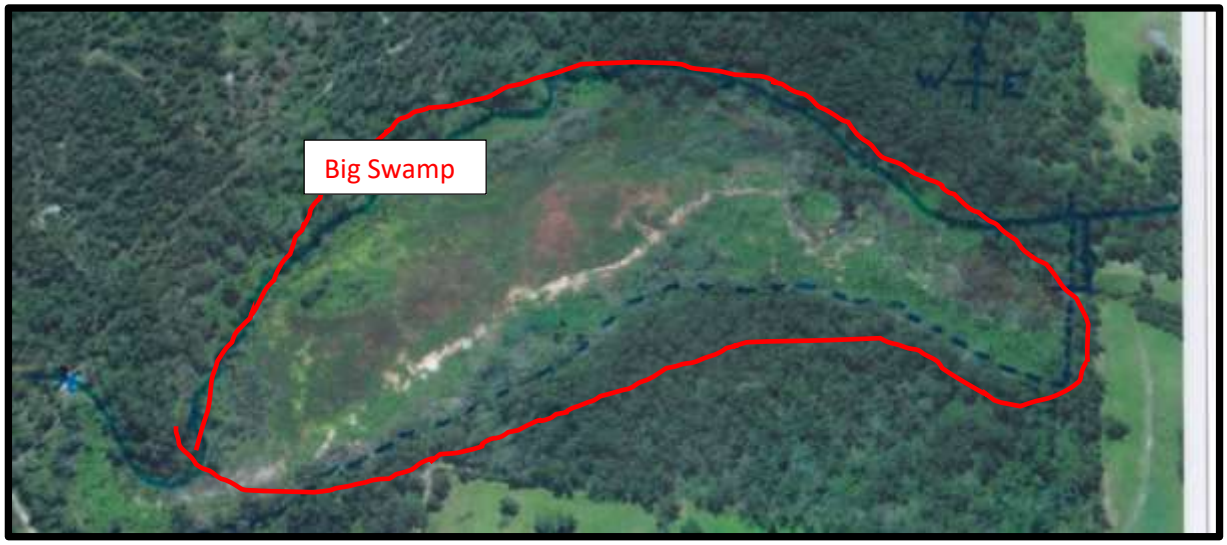
Another classic example of sloppy research can be found in this quote… "***Observations from 1997 or 1998 described in Gardiner (2017), however, confirm that Southern Pigmy Perch were supported by habitat in Yeodene Swamp.***"

Gardiner (2017) actually states this...

> ***"During the 1997 or 1998 Big Swamp fires a large hole was dug adjacent to Boundary Creek[(19)] in an effort to have a quick fill spot for fire fighting purposes (see page 14 for location). During a dry period in early 2016 Boundary Creek was dry at this point, that is above the Big Swamp, and the quick fill fire-fighting hole was also all but dry. In amongst the mud and struggling to survive at the bottom of this hole were several native pygmy perch. Over twenty perch were rescued from this mud hole."***

The page 14 referred to in the extract above shows a Google map overhead of the Big Swamp. This is the map.

Page 14 extract.



Area of the Big Swamp – downstream of the quick fill hole.

The quick fill hole where the Southern Pigmy Perch were found in 2016 is well above the Big Swamp and is clearly stated in the quote taken from Book 39. No reference has been made in Book 39 stating Southern Pigmy Perch have ever been found in the Big Swamp (Yeodene Swamp).

Southern Pigmy Perch are extremely resilient as evidence in the number that could live in an almost dry muddy hole. Also, Southern Pigmy Perch have been found in the Damplands just above this quick fill hole in 2018. These fish are easily caught in this vicinity and places considerable doubt on the veracity of Jacobs' comment that conducting fish studies along Boundary Creek would be too expensive and labour intensive (see Appendix 14, page 169), and that it is doubtful fish could survive in the Damplands.

Page 35.

The mis-quote on page 33 is reiterated on page 35 reinforcing a completely wrong impression.

"***The lack of surface water in the swamp for large parts of the year reduces its suitability for fish species, although the habitat is known to be, or has been, suitable for small bodied species such as Southern Pigmy Perch (Gardiner (2017).***" No where can such statements be attributed to Gardiner (2017).

Page 23 of the Low Flows recommendations states "***The swamp was assessed at a site near the middle (Site T 1 from the Barwon Downs Vegetation Survey Jacobs 2016).***"

Based on this assessment, page 35 states this "***Yeodene Swamp (Reach 2c) supports a complex mosaic of fully terrestrial, inundation-tolerant and inundation requiring plants species.***"

Unfortunately, there are two things wrong with this assessment.

- The assessment has been made in a very small area of the swamp, at the extremes of the swamp and is not representative of ALL areas of the swamp.

- The assessment and or assessments have been made in very specific areas and within limited timeframes, showing little regard to the dynamics and ever changing profile and conditions happening within the swamp.

It is doubtful that the entirety and breadth of the swamp has been "walked," let alone examined on more than a few occasions. The swamp is complex, diverse and presents different challenges and conditions every time it is visited.

Page 53.

I skimmed over quite a lot of the remaining sections of this Low Flow Recommendations for Boundary Creek but one thing that caught my eye is found on page 53.

"***The low flow requirements of the swamp cannot be determined using a hydraulic model due to the unsuitability of hydraulic models in this reach…***"

And, "***In Reach 3, downstream of Yeodene Swamp, the creek flow across a shallow alluvial aquifer and the watertable is close to the surface."*** (page 31 Low Flows Recommendations doc.)

These statements are particularly relevant and highlights the fact how much of the Low Flow Recommendations document falls well short of a thorough scientific and technically sound report.

The Victorian State Minister for Water, Lisa Neville, initiated the serving of a Section 78 Notice of the Water Act, whereby Barwon Water has been directed to remediate impacts caused by the extraction of groundwater at the Barwon Downs Borefield. This includes the remediation of Boundary Creek and the Big Swamp. As part of this s78 a scope of works was submitted to Southern Rural Water in December 2018. This scope was then scrutinised by a Southern Rural Water Technical Review Panel. This Technical Review Panel had this to say regarding the exclusion of alluvial aquifers in Jacobs' modelling reports… "…***minor alluvial aquifers are indeed not represented in the groundwater model, but they should be, to justify the claims of a Class 3 model confidence level, and thus it has not yet been established to what degree the alluvium may mitigate drawdown effects.***" (See the front page and the comment this quote is taken from, in Appendix 24, pages 201-202).

Conclusion.

As with making any decision and hoping to present an accurate and meaningful set of recommendations it is critical that the basis on which these things are determined is sound. It is my belief that the recommendations presented in this Low Flow Recommendations for Boundary Creek report cannot claim to be anything other than a poorly researched compilation of assumptions, half truths and mis information.

The following extract is taken from the Foreword of Otway Water Book 21 written by Quentin Farmar-Bowers in June 2013.

When I wrote my report on the Barwon Downs groundwater program in 1986 I had been in the Victorian public service for 13 years working on public land planning and environmental and social issues associated with water programs in rural areas. I was aware of the enormous range of attitudes within the water industry to environmental issues, attitudes that were not necessarily related to the person's age. So, on meeting an engineer, planner or manager for the first time, there was no way of knowing whether or not they would be supportive of social and environmental investigations and be willing to follow through on relevant recommendations.

Because of this, my approach at the time was to do my job and trust that the system (the bureaucratic process) would ensure a follow through to secure compliance with the spirit and letter of public policy.

I knew however that many middle and senior bureaucrats were influential enough to ensure that their own interpretation of public policy prevailed. So, the success of environmental work depended to a large degree on who was in charge. It is not that the bureaucrats who were inclined to give environmental issues a very low priority were anti-public interest; they just interpreted public interest as the very specific goal of 'water supply' and thought that 'any means' to achieve that goal would be deemed legitimate.

There were two failings in the bureaucratic process at the time that I think allowed this single mindedness to prosper. The first failing was the paucity of debate and evaluation processes. There was no in-depth debate about projects and no independent review process to question

what was being achieved and how it was being achieved. Environmental work, like the work I was doing tended not to be taken too seriously. I felt that senior public servants had the perception that as professionals, they knew best what to do, how to do it and should be left to get on with it. The second failing was senior people's interpretation of neo-liberal philosophies. To me, it seemed that senior bureaucrats believed that water supply was 'a good' that was necessary for economic growth that benefited everybody so everyone should pay for it. In contrast, environmental issues were seen as items of value only to 'greenies' and that as such only 'greenies' should pay for them. Somehow the logic was that if you wanted a river that supported native biodiversity then you should buy your own river system. This meant that when the budget for the whole water project got tight (as it usually did) works to protect the environment were the ones that got axed; enabling the project would come in 'on budget'. The logic being that the decision to axe the environmental works and the consequences would only disadvantage a minority of the population.

What else needs to be said?

REFERENCES

1. Barwon Water, 26 November 2013:Barwon Downs Monitoring Program, Stage 1, Field Investigations and Monitoring Program Scope. Prepared by Sinclair Knight Merz.
2. Victorian Government, February 2002. The Flows Method, A method for determining environmental water requirements in Victoria. Prepared by Sinclair Knight Merz, Cooperative research Centre fir Freshwater Ecdology, Freshwater ecology (NRE) and Llyod Environmental Consultants.
3. Corangamite Catchment Management Authority, February 2006: Environmental Flow Determination for the Barwon River; Final Report-Flow recommendations. 64 Dennis Street, Colac, Victoria, Australia.
4. Gardiner M. J., February 2010:Otway Water Boundary Creek and the Big Swamp Book 11. www.otwaywater.com.au
5. Gardiner M. J., December 2012:Groundwater extraction and the Drying Out of the Big Swamp Book 19. www.otwaywater.com.au
6. Gardiner M. J., February January 2013:The Boomerang Swamp Book 18.
7. Tunbridge B. R., March 1988: Environmental Flows and Fish Populations of Waters in the South-Western Region of Victoria. Technical Report Series No. 65. Arthur Rylah Institute for Environmental Research, Victoria.
8. Geelong and District Water Board, September 1992: Contract Brief. Inventories and Assessments of the Flora and Fauna Values of the Barwon Downs Aquifer Outcrop Areas and the Streams Draining Them.
9. Carr G. W., Muir A.M. 1994: Inventory and Assessment of Flora and Faunal Values of the Barwon Downs Aquifer Outcrop Areas and Associated Streams, Otway Ranges, Victoria. Ecology Australia Pty., Ltd., Clifton Hill, Victoria.
10. Sinclair Knight Merz, 14 April 2009: Barwon Downs Flora Study 2008. Final 1. Barwon Water, Victoria Australia.
11. Carr G. W. May 2002: Barwon Downs Aquifer Flora Re-Survey. Report Prepared for Barwon Water. Ecology Australia Pty., Ltd., Flora and Fauna Consultants, Fairfield, Victoria.
12. Gardiner M. J., September 2009: Otway Water – Barwon Downs Borefield Flora Studies 1986-2009. Book 9. www.otwaywater.com.au
13. Farmar – Bowers Q., October 1986: Environmental Issues Barwon Downs Groundwater. South Western Region Water Management Strategy.
14. Witebsky S., Jayatilaka C. and Shugg A. J., November 1995: Groundwater Development Options and Environmental Impacts. Barwon Downs

Graben, South-Western Victoria. Department of Natural Resources and Environment.
15. 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.)
16. Barwon Water, 26 July 2000:Barwon Downs Groundwater Modelling Scoping Study, Specifications of Groundwater and Subsidence Modelling. Final 2 Sinclair Knight Merz.
17. HydroTechnology, June 1994: Observation Bore Instillation report, Kawarren Groundwater Resource Evaluation 1993/94. Government Service Contract, CC/30410.001A/3.
18. HydroTechnology, May 1994: Delineation of the Barongarook High Recharge Area, Kawarren Groundwater Resource Evaluation, Government Service Contract, CC/30410.001A/2.
19. Victorian Government, Department of Primary Industries, June 2013. The Flows Method, A method for determining environmental water requirements in Victoria. Edition 2. Prepared by Sinclair Knight Merz, Peter Cottingham and Associates, DoDo environmental and Griffith University for the Department of Environment and Primary Industries, Melbourne.
20. State Rivers and Water Supply Commission, Victoria, March 1981:Evidence to Parliamentary Public works Committee, Gellibrand River enquiry.
21. Corangamite Catchment Management Authority, 2012:Corangamite regional Catchment Strategy 2012-2018, Community Draft for Comment. Colac Victoria.
22. Tunbridge B.R., 2013:Assessment of the Envionmental Condition of Boundary Creek 1987-2013. LAWROC Landcare Group.
23. Eamus D. Froend R. 2006:Groundwater dependent ecosystems: the where the what and they why of GDE's. Australian Journal of Botany. Special Issue. Volume 54 Issue 2, pp 91-96.
24. MacKay H. 2006:Protection and Management of Groundwater-dependent ecosystems: emerging challenges and potential approaches for policy and management. Australian Journal of Botany. Special Issue. Volume 54 Issue 2, pp 231-237.
25. SKM May 2001:Brarwon Downs Groundwater Flow and Subsidence Modelling Project. Report on the Groundwater Flow Model, Draft D, for Barwon Water.

26. Gardiner M. J., June 2013:An Aquifer Divide Shift & Study of Observation Bore Hydrographs of the Eastern View Formation (EVF) Aquifers in the Gerangamete and Gellibrand Groundwater Management Areas. Book 21. www.otwaywater.com.au
27. Jacobs 11 July 2018: Low Flow recommendations for Boundary Creek. Final Draft – 04, Barwon Water.
28. Gardiner M. J., April 2014: Review of SKMs 2012 and 2013 Barwon Downs Monitoring Program. Otway Water Book 26a and 26b.
29. SKM, Ecology Australia and La Trobe University2012:Barwon Downs Monitoring Program – Monitoring Review. Sinclair Knight Merz VW06692 for Barwon Water.
30. Dahlhaus P., 14 December 2018:Barwon Downs Borefield: Review of literature and identification of issues. Prepared for Southern Rural Water.
31. Gardiner M.J., November 2017: Review of Barwon Water's Boundary Creek Aquatic ecology Investigation of 2017. Otway Water Book 39.
32. Gardiner M. J., March 2015: Fish Studies and Environmental Flows Along Boundary Creek, 2015". Otway Water Book 27.
33. SKM, 18 December 2013: Barwon Downs Community reference Group. Aquatic Ecology Monitoring and Assessment Program. Prepared by Dr. Andrew Sharp for Barwon Water.
34. Saddlier S.R. 1992a: Survey of Fish, Crustacea and Habitat of the Colac Region. A consultants report, prepared for the Geelong and District Water Board. October 1992.
35. Saddlier S.R. : Survey of Fish, Crustacea and Habitat of the Colac Region. A consultants report, prepared for the Geelong and District Water Board. June 1993.
36. Freshwater Ecology section Arthur Rylah Institute for Environmental Research Department of Natural Resources and Environment, Heidelberg, Victoria. November-December 2001: Boundary Creek Fish Fauna Survey.
37. Raadik. Tarmo A. December 2014:Revision of the Galaxias Olidus Complex. Fifteen from one: a revision of the Galaxias olidus Gunther, 1866 complex (Teleostei, Galaxiidae) in south-eastern Australia recognises three previously described taxa and describes 12 new species. (Zootaxa 3898)
38. Gardiner M. J., December 2018: Dracula Once Again Being Given Keys to the Blood Bank? (One Hopes Not). Otway Water Book 42 C.
39. Gardiner M. J., June 2017: Flowpaths, Drawdown, Recharge, Vertical Leakage, Perched Swamps & Sustainability within the Boundary Creek and the Big Swamp.

40. Gardiner M.J., December 2017: Response to Jacobs' Draft Report 2016-2017 Techical Works Program Barwon Water Yeodene Swamp Study Final draft, 9 November 2017.
41. Jacobs 16 June 2017: Barwon Downs Hydrogeological Studies 2016-2017. Barwon Water. Numerical Model – Calibration and Historical Impacts. Draft.
42. Jacobs 17 March 2017: Boundary Creek aquatic ecology investigations. Barwon Water.
43. Barwon Water 2004: Groundwater Licence No. 893889, Gerangamete Area, 2003/2004 Report.
44. Gardiner M. J., 7 April 2018: Impacts on Farming. Otway Water Book 44.