Providing Environmental Flows Through Increased Irrigation Planning

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ABSTRACT

Environmental flow requirements of priority unregulated rivers and creeks in Victoria will be provided for by the development and implementation of Stream Flow Management Plans (SFMP). Meeting these requirements will mean that restrictions on the extraction of water will occur more often, limiting access to water, during Victoria's dry summers. In order to maintain current irrigation production, work on viable onfarm adjustment options is needed for irrigators, both to secure reliability of supply to targets through the planning process and to minimise potential socio-economic impacts to the viability of communities. Adjustment options that are likely to succeed are those which not only save water but, are affordable, maintain productivity and can be readily incorporated into existing farming systems. This paper looks at an irrigation trial within the Upper Yea River catchment in Central Victoria conducted with the irrigation community to assess the relative benefits of using drip tape irrigation against traditional sprinklers on high value horticultural crops. The aim will then be to build community confidence and aid the development of a co-investment package for affected users to maximise benefits for the environment, community and irrigators by providing for environmental flow requirements whilst also helping to address broader catchment planning objectives.

INTRODUCTION

The Yea River catchment is in Central Victoria and provides unregulated flows into the Goulburn River near the Yea Township, with a catchment size of approximately 907 km^2. A map of the catchment is provided in Fig 1 below. Flows are highly seasonal, with flows lowest during the summer months. Average rainfall in the Yea River catchment varies from 700 mm/year in the north to in excess of 1200 mm/year in the upper catchment (Ecos and Fluvial Systems, 2002). The endangered Macquarie Perch (*Macquaria austalisca*) is a key value of the Yea River which contains one of the few viable remaining populations of this species in Victoria. Agriculture within the catchment is predominantly grazing within the lower reaches, and intensive horticulture (strawberry runner's) within the upper reaches of the catchment.

In 2004, the Victorian Government released The White Paper, '*Our Water Our Future'*, the strategies formed in the document provide the Victorian Government's Stated policy positions in relation to water resource management across the state. The Yea River Catchment was identified within the White Paper, as a priority, flow stressed, unregulated catchment (flow not controlled by a storage) that required management intervention. This intervention for flow stressed unregulated rivers and streams is defined in the White Paper as Stream Flow Management Plans (SFMP), which aim to provide more water for the environment by restricting irrigators access to water at critical low flow periods.

A SFMP is a statutory document enshrined in the Victorian *Water Act 1989*. This process involves the Yea Catchment being declared a Water Supply Protection Area (WSPA) and aims to ensure that water resources within the WSPA are managed in an equitable manner to preserve the long term sustainability of the resource.

The SFMP aims to provide a balanced and sustainable sharing of streamflows between all licensed water users. The emphasis of the SFMP is on sharing water between consumptive uses and the environment during periods of low flows, which predominantly occur over the summer period corresponding with the high levels of irrigation demand exposing the environment to periods of flow stress exacerbated by dry years.

In 2007, the Yea Environmental Flows committee was formed with members of the Yea community, local council and government agencies. The Environmental Water Reserve (EWR) was determined by this committee by using the Victorian Governments FLOWS method (DNRE, 2002a), which determined the environmental flow requirements for the Yea River. This is the main focus of the SFMP as it provides for minimum passing flows for the environment. As flow in the system is unregulated, in order to provide greater provisions for the environment, G-MW must monitor diversions from the river so that environmental flow targets are adhered to. This passing of flows requires a greater level of management to accurately monitor the take and use of water by licensed diverters, particularly over the summer months, resulting in impacts to the historical reliability of access that diverters have built their enterprises around. This sharing of the resource is creating challenges for the locally significant high value horticultural industry.

The net result of providing for unregulated EWR requirements by restricting or suspending water use is a reduction in the reliability of access for consumptive water users during critical periods. It is recognised that significant costs, time delays, and changes to management practices will be needed in order to achieve the outcomes of a SFMP.

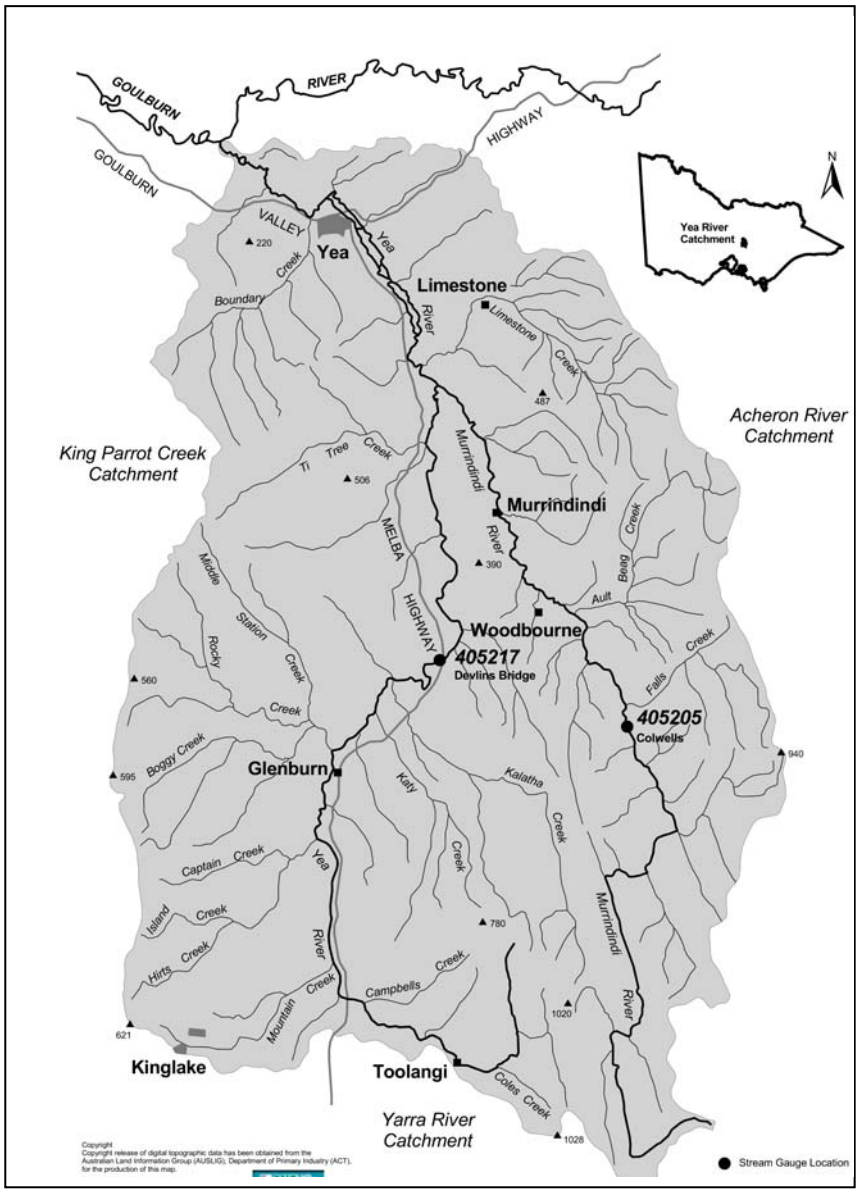

Figure 1 Yea River Catchment

COMMUNITY ENGAGEMENT

Following discussions with representatives from the key industry body in the Upper Catchment, it was identified that an intensive process of community engagement was needed with water users in the Yea River. A strategy was developed to run both a series of targeted meetings with water users and to provide the opportunity for individuals to meet on farm with a G-MW representative to discuss management issues. The engagement process provided an opportunity for two way communication between G-MW and customers.

The adopted strategy was to undertake on farm discussions, followed by a series of three meetings to progressively explore the issues in more detail. Feedback from users would be important to the development of the Management Planning process.

On Farm Interviews

Opportunity was provided to all licensed irrigators to have an on farm meeting with G-MW staff.

The purpose for this process was:

- To establish familiarity with the staff that will be involved in the SFMP development process,
- To increase awareness of the SFMP process
- To ensure that G-MW staff were up to date with relevant issues of concern to the community prior to entering into a public meeting schedule.
- To provide opportunities for participation in candid discussion by people who may not feel comfortable in a public meeting environment.

For G-MW to become further conversant with the issues within the catchment, and to target further extension to address these issues, irrigators across the catchment were sent letters providing them the opportunity to be involved in one on one interviews. These interviews were designed to achieve a better understanding of issues in the catchment, reliability of supply for customers and current farm practices. The majority of responses from the community came from the upper catchment irrigators as can be seen in Figure 2. These irrigators were members of the Toolangi Strawberry Runner Growers Co-Operative (TSRGC).

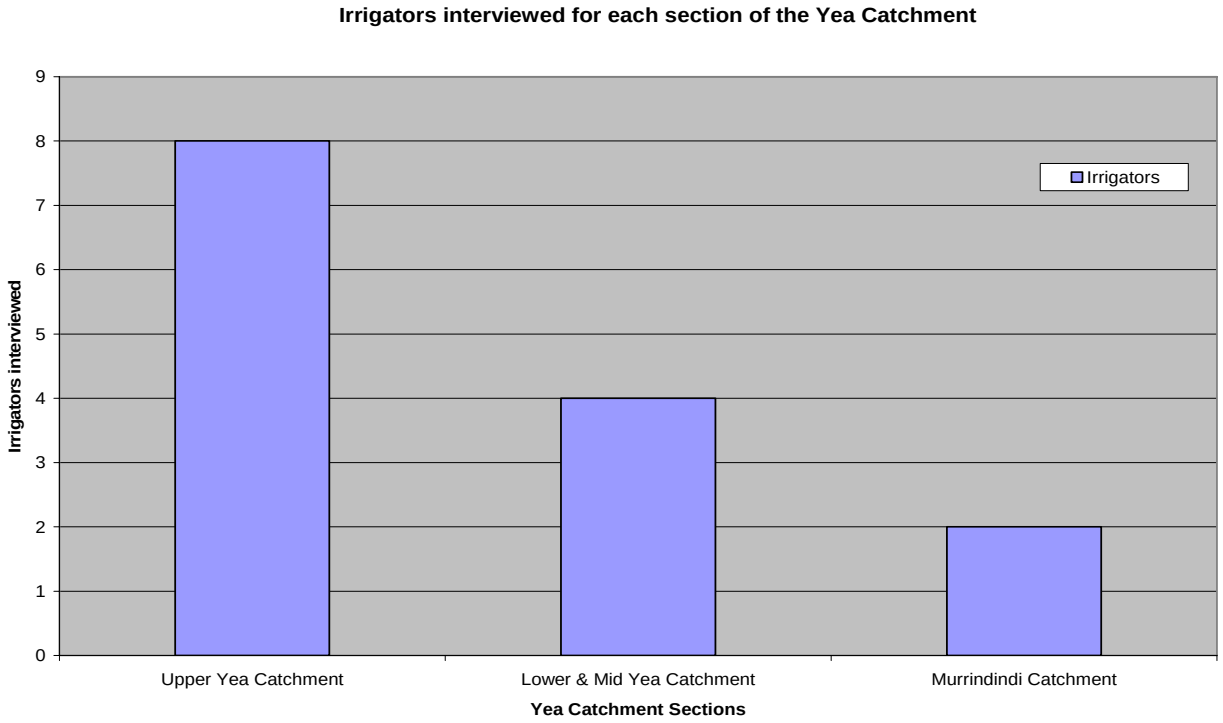

Figure 2. Number of people interviewed and location within the Yea Catchment.

The TSRGC are the largest irrigation industry group within the Yea catchment, and their reliance on the river flow during the summer months is highly important. The Upper Yea catchment makes up 65.5% of the total metered volume within the Yea catchment and TSRGC make up 40.9% of this (Figure 3). The industry is made up of 14 growers in the district with a total production area of over 75 ha and a total turnover of $8 million dollars annually (TSRGC, 2001).

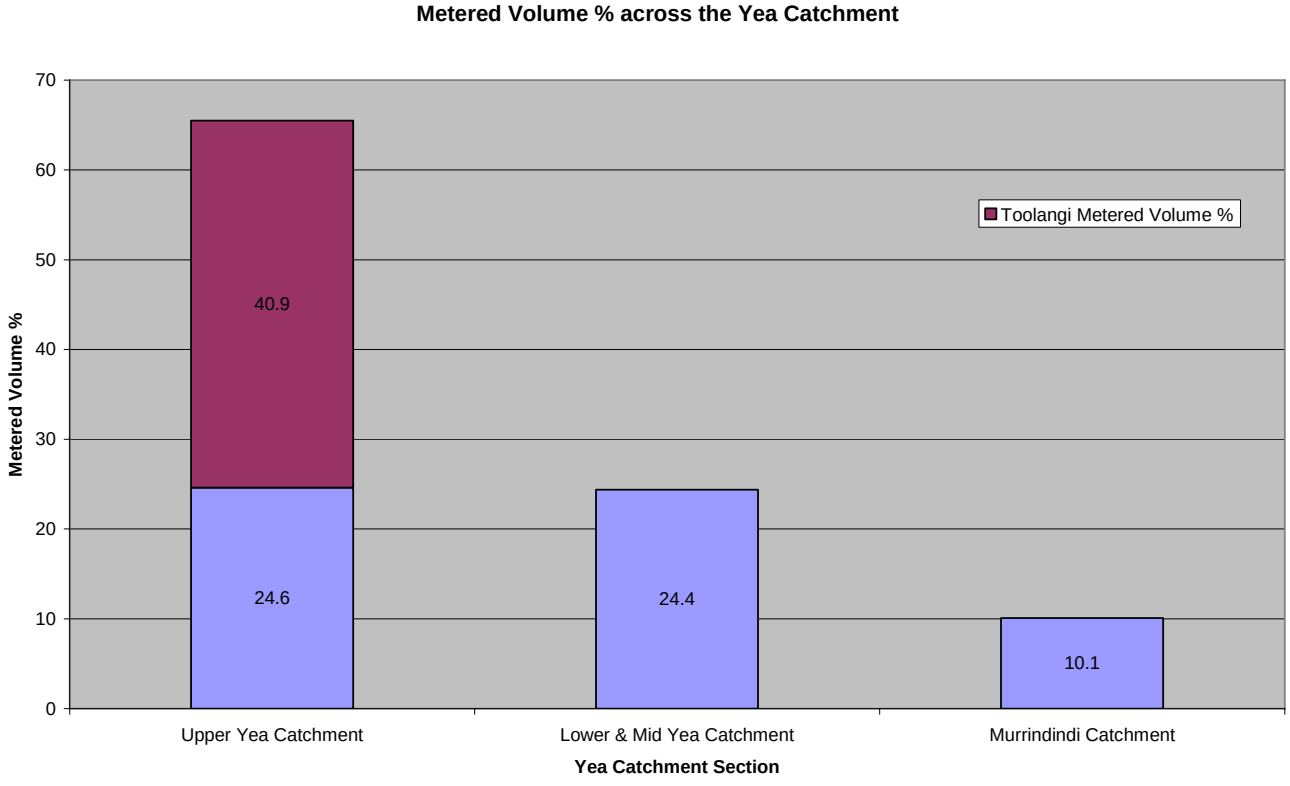

Figure 3. Metered Volume percentage across the Yea Catchment.

In total, fourteen irrigators were visited in a series of one on one farm visits which collated a range of information relevant to the development of a Stream Flow Management Plan for the Yea River Catchment.

Irrigator Meetings

A series of three meetings were held with irrigators between April and September 2007. These meetings were conducted between G-MW and its customers and covered a wide range of issues.

Meeting 1
Dealt with management rules, a review of the management restrictions imposed in the previous year and an opportunity for feedback on operational issues, SFMP development over view and introduction.

Meeting 2
Targeted the Toolangi Strawberry Runner Growers Co-operative to look at management issues specific to the intensive upper catchment community.

Meeting 3
Public meeting/forum involving irrigators, G-MW, Government representatives, the Goulburn/Broken Catchment Management Authority and Irrigation Consultants.

The openness in which meetings and issues were developed allowed for both irrigators and the relevant authorities to be conversant on a range of issues that were likely to be faced in the development of a management plan, providing a platform for informed discussion from all parties.

An important outcome was the general acknowledgement that adjustment options that are likely to succeed in managing reliability are those which not only save water, but are affordable, maintain productivity and can be readily incorporated into existing farming systems.

Irrigators from the local TSRGC, expressed their interest in investigation into the viability of efficient irrigation development, as it is a more cost effective process than dam building due to impractical soit types. The drip tape can also be phased into their current irrigation infrastructure. A few irrigators were trialling drip tape on their farms and expressed interest into further investigation into integrating drip tape into their agricultural systems, to find what water savings could be achieved, and the effectiveness of the tape in maintaining production.

A key outcome from the meetings was a commitment from Government and Goulburn-Murray Water to work with farmers to undertake a field based assessment of farming systems incorporating the use of drip tape and to provide an objectively derived indication of the potential use of this technology in strawberry runner production as a means of providing cost effective adjustment.

It was seen that if the adoption of this technology could be objectively demonstrated to maintain productivity in a cost effective manner that could be readily incorporated into existing farming systems this may significantly reduce the implications for irrigators agreeing to higher Environmental Water Reserve outcomes.

The results of the trial to investigate the potential use of this technology are included below.

DRIP TAPE FEASIBILITY STUDY

In negotiations with the Toolangi Strawberry Runner Growers Cooperative, Goulburn-Murray Water managed the establishment of an irrigation trial to examine management implications and potential water saving and cultural and economic issues associated with the use of drip tape.

A more efficient means of irrigation was seen as an avenue in which to put in water savings across these heavily irrigated areas. The drip tape feasibility study aimed to find if water savings could be achieved and if the system could be integrated with their current practices.

A previous trial had been done by members of the TSRGC which were conducted during the 2006/2007 season, achieving approximately 30% water savings when used in conjunction with the overhead sprinkler. And trials conducted within the potato industry near Daylesford using the drip tape in comparison to sprinklers, showed water savings of 50-65% (HAL, 2006). As these previous trials were showing water savings, G-MW considered the feasibility of the drip tape and proceeded with a trial. The need for further study is to find if the drip tape can maintain productivity of strawberry runners without the use of the traditional irrigation practices.

Members of the TSRGC agreed to provide access to the required land, and management support to the trialling of the integrated use of T-Tape technology. Members agreed that a trail would help establish objective information in relation to the management and performance of their irrigation systems, and if further research into the drip system would be worth following in the future.

Experimental design was developed and implemented in partnership between Goulburn-Murray Water, the Department of Primary Industries and the Toolangi Strawberry Runner Growers Cooperative. The site incorporated multiple replicates on two separate properties, with metered use, and remote GSM soil moisture monitoring.

Experimental treatments on each property were designed to provide control (traditional sprinkler only), sprinkler and drip tape and drip tape alone which would use three tapes across the growing mound (triple tape). Data was collected from the 12 December 2007 to the 16 February2008. The triple tape had been put in place in the first week of February and was beginning to show signs of not being able to wet the soil sufficiently as runners expanded out from the mother plant. Up to this point the single tape site was maintaining yields as well as the sprinkler and the double tape sprinkler plots. Table 1 shows the usage at the study site up to the 16 February 2008.

Date	Meter 1- Tape & Sprinklers (17 rows)	Meter 2- Triple tape (20 rows)	Meter 3- Sprinklers (10 rows)
12/12/07-16/2/08	0.4052 ML	0.3460 ML	0.5024 ML
Area (ha)	0.34 ha	0.413 ha	0.22ha
Ml/ha	1.19 ML/ha	0.84 ML/ha	3.41 ML/ha
Water Saving for the 2 month period	65.1%	75.4%	

Table 1. Water Meter reads across the 3 sites, measuring water savings achieved over the initial growing period. (G-MW, 2008)

The T-Tape wets a surface area of approximately 30 centimetres, which for the initial growth of the plant, easily services the plant roots and the initial runners. This is shown in Figure 4. By

early January the mother plants are starting to send out runners across the surface, as seen in Figure 5.

Figure 4. Date 30/11/07

Figure 5. Date 10/1/08

By the end of January the runners are beginning to spread across the surface moving away from the area covered by the single T-Tape (Figure 6), and by the first week in February the extra two tapes are put in place for the triple tape section. Figure 7 shows the beds in early March, having completely covered the three tapes, at this point it was found that the tape was not wetting the soil sufficiently for runner growth and sprinklers were put in place. This trial shows that up until the first week in February the single T-Tape was managing the growth of the strawberry runners, so water savings could be made up to this point.

Figure 6. Date 29/1/08

Figure 7. Triple Tape, Date 12/3/08

Water savings achieved over this initial growth period were between 65 and 75%, but with further growth of the plants, sprinklers will be needed to retain runner growth. So water use would return to normal irrigation use for the remaining length of the season. With the initial plant being planted in September-October and sprinklers not being needed to maintain plant growth until early February, water savings can be achieved as shown in this investigative study. With extractions generally at their highest, when stream flows are at their lowest, these water savings if achieved across the entire strawberry runner industry in Toolangi could prolong minimal restrictions while retaining production, and meeting the minimum environmental flow levels. With large water savings initially found within this study, further research would be worthwhile to find where additional savings can be found, and what other benefits are possible.

PACKAGE TO MAINTAIN RELIABILITY WHILE IMPROVING ENVIRONMENTAL MANAGEMENT

For irrigators to maintain their reliability of supply while achieving the set minimum passing flow for the environment, changes in their practices and in some cases additional or integrated infrastructure will be needed. To maximise the benefits of any package within the irrigation community and to maintain their reliability of supply, a multi tiered transitional package has been put forward taking into account the feedback from the community engagement. This program will cover planning and design, irrigation development, dam development and improved environmental management. The drip tape feasibility study was conducted in preparation for the transitional package as an avenue to show local irrigators that on farm changes can be made to maintain reliability of supply.

The package put forward, not only aims to help maintain reliability but is aiming to increase the environmental benefits to the Yea catchment by the inclusion of current agency programs. Programs such as the Regional River Health Strategy, which is managed by the GBCMA aims to address the priority threats within the Yea Catchment which will have additional benefits apart from protecting the notable high value assets (GBCMA, 2005). By working this program and package together and also including all local and government agencies, multiple benefits can be achieved.

By packaging these funding activities together and providing appropriate extension services, water users can maximise Government investment by under taking environmental and productivity related work helping to achieve objectives set out in the SFMP.

CONCLUSION

Goulburn-Murray Water has engaged local water users on the Yea River Catchment and worked with the community to raise the awareness of future challenges that are likely to face the irrigation community.

The drip tape feasibility study was undertaken to gain community support and to demonstrate that options are available, to foster acceptance and confidence, and to show that irrigators can maintain their reliability of supply which is important in securing agreement to a meaningful EWR outcome.

With the integration of tape into the current irrigation systems and the water savings achieved during the initial growth period, planning and infrastructure changes can be made. With reduced water use a smaller volume dam can be used during restrictions, therefore saving money on construction costs. If groundwater is being used, this will reduce the reliance on this resource, saving pumping costs. The benefits to improved water use efficiency are that costs associated with compliance of minimum environmental flows can be minimised, productivity maintained and if integrated with an appropriate restriction policy, reliability of supply can be maintained.

The community feedback which was gained over this period was not only useful for gaining acceptance and participation in the preparation of the SFMP, but also in establishing a foundation for co-operative management of plan outcomes between G-MW and the catchment community, beyond the plan development and implementation process.

By engaging the community and working with them to develop a transitional program to maintain the viability of irrigation in the Yea Catchment confidence has been improved to negotiate a suitable environmental flow management regime to ensure that the environmental and economic sustainability outcomes can be realised.

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