

## PLANNING FOR FUTURE IRRIGATION LANDSCAPES

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### ABSTRACT

In the north of the state of Victoria (Australia), irrigation of agricultural crops accounts for 70% of total annual water use. These irrigation communities are concerned about the sustainability and efficiency of irrigation infrastructure, and the ability of existing infrastructure to meet the needs of future irrigation businesses. At the same time, the broader community is seeking a greater range of services from available water supplies for urban consumption and increased water allocations to improve river and stream health.

To address this crisis in Victoria, a partnership approach has been adopted to support strategic planning initiatives. The partnerships include representatives from: the irrigation community, catchment management authorities, the Victorian State Government and rural water authorities.

Innovative approaches have been developed and adopted to enable irrigation communities to improve water management practices and to formulate sustainable management options for future irrigation landscapes. The approaches have challenged established cultural, environmental, social and economic values and presented both threats and opportunities for irrigation communities and river environments.

This paper will discuss three planning initiatives for future irrigation landscapes:

(1) a regional pilot landscape change project, (2) State Government Legislative reform, (3) the development of reconfiguration plans. Goulburn Murray Water Authority (GMW), in northern Victoria, has offered support and leadership for these initiatives.

### BACKGROUND

The Murray Darling System is the largest river system in Australia with a catchment area in excess of 1 million square kilometers and crosses four state boundaries. The river basin begins in Queensland, crosses the length of New South Wales, and then forms the northern border with the State of Victoria and outfalls on the coastline in South Australia. The length of the River Murray from its source to its mouth is about 2500km.

The management of the Murray Darling Basin is underpinned by Commonwealth Government Legislation, namely the 'River Murray Agreement'. This agreement was ratified in the 'River Murray Waters Act' by both the Commonwealth and three State Governments in 1915. The agreement was in the nature of a peace treaty to resolve historical disputes over the use of water sourced from the Murray River.

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Today, the Murray Darling Basin Commission (MDBC), under the auspices of the original ratified agreement, establishes and implements works programs, and facilitates water sharing provisions between the State Governments. All decisions to implement basin actions and works are required to be achieved by consensus between all participating State Governments, including the Australian Capital Territory.

Today the MDBC is facilitating major initiatives in relation to salinity, environmental flows, water quality and biodiversity, to improve natural resource outcomes for the wider basin communities.

A recent and significant basin initiative adopted by the MDBC, 'The Living Murray', seeks to improve the health of the Murray River and its tributary rivers with additional environmental flows. This initiative is the end result of a partnership approach, which has negotiated the vested interests of irrigators, rural communities and the environment. The increased environmental flow allocations will reduce historic water entitlements available to the State Governments and irrigation communities.

In Victoria, the history of irrigation dates back to 1891. The early irrigation trusts, without headwork storages, were unable to guarantee water supplies. Landholders had no obligation to take water, if they did not want it, and were cautious to develop land for irrigation, unless supplies were guaranteed. Insufficient revenue streams for the early Trusts quickly resulted in them becoming insolvent. 'The Relief Act' of 1889 and the 'Water Act' of 1905 wrote off most of the liabilities of the Trusts and largely determined the future of Victorian irrigation for the next eighty years.

For many years, the States managed their respective water businesses without any significant change. However in 1994 all the State Governments agreed to implement programs to facilitate the trading of irrigation water at the farm level.

Irrigated agriculture in the Northern Victorian Region is underpinned by a strong combination of infrastructure and institutional arrangements. Farmers' irrigation water entitlements and associated rights are well established. The reliability of irrigation water is mostly secure and the supply and drainage infrastructure is distributed across all irrigation regions.

Water trading markets now exist for temporary and permanent trading of irrigation water entitlements. Water trading markets continue to provide irrigators with choice and flexibility to manage their water supply, especially at times when difficult drought conditions are present. Between 2002/03 and 2005/06 some 164,248 ML has been traded permanently within and from G-MW irrigation areas, and a further 1,293,000 ML has been traded temporarily across the G-MW region.

Victoria's relatively open water trading regime is resulting in more productive use of water and is generating new enterprises, investment and employment. At the same time, when water leaves an area, the extra delivery costs on the remaining irrigators and the flow on effects to wider communities are issues that need to be addressed.

Since 1994, large volumes of water have been traded from some localities, making it a financial burden on water authorities and their remaining customers, to maintain supply infrastructure and levels of service (Figure 1 – Permanent Transfers of Water Entitlements Cumulative Movement of Entitlements 1991/92 – January 2007).

In instances where irrigation communities are severely impacted upon by permanent loss of water resulting from water trade, water authorities will need to consider phasing out unviable irrigation supply services.

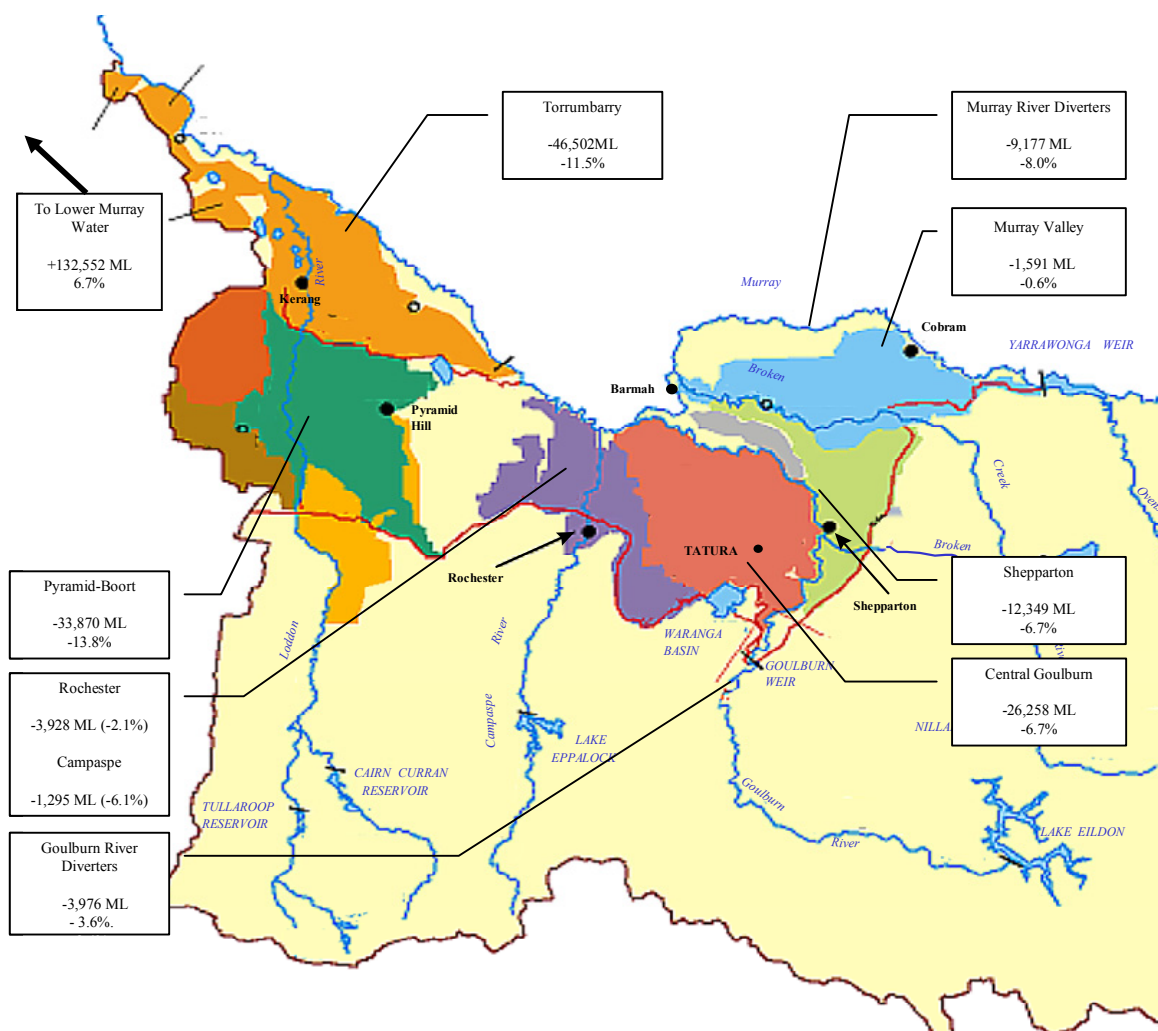


Figure 1. Permanent Transfers of Water Entitlements, Cumulative Movement of Entitlements 1991/92 – January 2007

## INTRODUCTION

The combination of temporary and permanent trade within and outside of the six Goulburn-Murray Water districts has already seen some localities trading away up to 40% of their water. Fig 2 graphically demonstrates further the non uniform spatial distribution of permanent water trade.

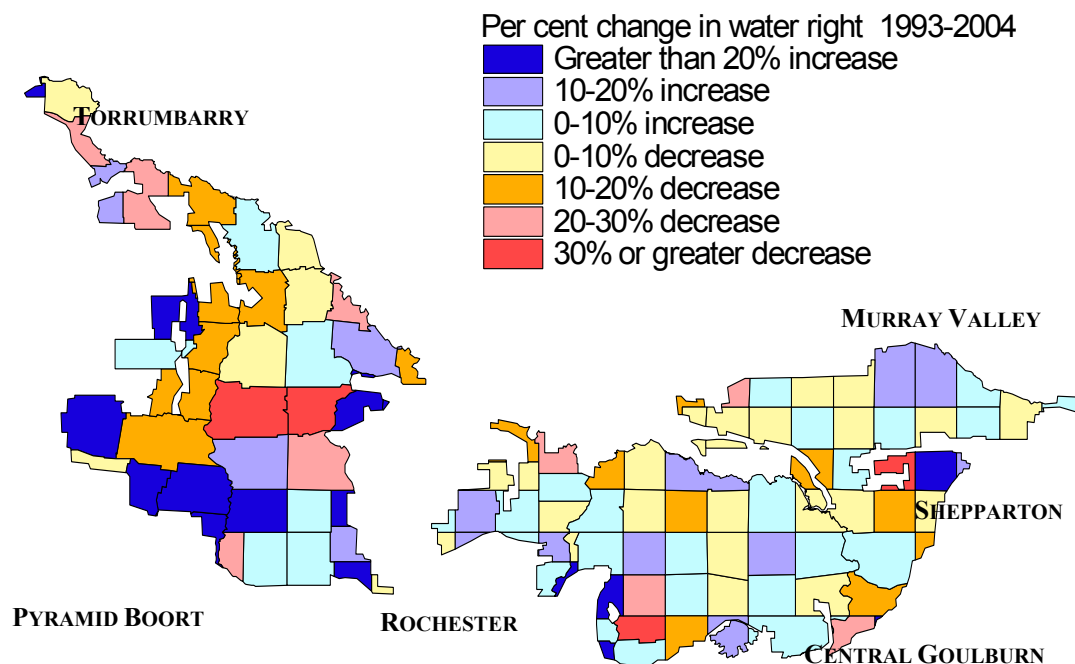


Figure 2. Percent Change in Water Right 1993 - 2004

The delivery of irrigation supplies is primarily undertaken through a large network of open earthen channels which are subject to evaporation and seepage losses, and variable annual maintenance costs.



Photo 1. Typical earthen irrigation supply channel



Photo 2. Typical earthen irrigation supply channel



Photo 3. Low use supply channel infested with weeds

The irrigation industry has been required to respond to significant water reform pressures such as: the increased importance of reducing off farm impacts on the environment, processing and marketing industry restructure, global market pressures and the current severe drought conditions.

In many irrigation areas, some irrigation supply infrastructure is nearing the end of its useful life. This fact, combined with the impacts of permanent water trade out of individual irrigation areas, results in a surplus of infrastructure, and a situation where the annual operation and maintenance costs are being paid by fewer irrigators.

In most irrigation areas, soil types are variable but highly suitable, for a range of irrigated crops and land uses. In many parts of the region, surface drains have been constructed to remove rainfall generated flows and to overcome salinity and water logging constraints. While irrigation property sizes are diverse, and enable the region to be attractive to different irrigated agricultural enterprises, the expansion of individual enterprises can often be constrained due to high capital values assigned to many of the 'close by' smaller holdings.

The diversity of irrigated agricultural enterprises results in the region being basically independent of the success of any one industry. Industries processing irrigation products and providing irrigation service support are located in close proximity to the major irrigation areas.

Partnerships between State Government, individual irrigation areas, their dependent communities, businesses and environmental stakeholders have actively commenced to work through the challenges and opportunities with which their regions are presented, in order to support sustainable irrigation landscapes and healthy river and wetland environments.

Consistent with the State Government's 'White Paper', it is proposed that any termination of supply services be done through an agreed process. This requires the water authority preparing, in consultation with affected irrigation customers and regional stakeholders, a 'reconfiguration plan'. Because of differences in scale and community interest, the 'reconfiguration planning' process is flexible.

### **KERANG-SWAN HILL FUTURE LAND USE PILOT PROJECT**

In 2000-2003, a community based working group, together with government agency stakeholders, was charged with the task of choosing a preferred strategic regional development program for the pilot project study area.

The area had been chosen as a 'Pilot' because it shared many of the resource management and landscape change issues that have arisen at the national scale. Those changes occurred as a result of:

- Changing community profiles;
- Agricultural viability and business scale needed;
- Water reform, and impact of water trade on infrastructure;
- Recognition of ecological services;
- Balancing multi-use objectives for waterways with high environmental values;
- Salinity;
- Flooding; and
- Regional development.

The pilot project area is located in the area between the Kerang Weir and Swan Hill (Figure 3), on the western extremity of the Riverine Plain, with Mallee dune fields to the northwest. The location provides a unique mix of soils: the riverine heavy grey and brown cracking clays, suited to pasture and crop growing; the Mallee sandy ridges are suited to horticultural development and dryland agriculture. The area has a diverse range of agricultural industries including: irrigated grazing, dairying, horticultural farms, and dryland grazing and cropping enterprises. The major land use of the study area is mixed irrigation farms (grazing and cropping).

The area is supplied with irrigation water from the River Murray via the Torrumbarry Irrigation System (TIS) which is a linked system of channels and natural carriers, lakes and streams. The TIS was developed from the efforts of many early Irrigation Trusts and expanded later by state water authorities. The legacy of TIS gravity irrigation supply system is that most of the irrigation



now undertaken is on the low lying heavier riverine soils, which are less suitable for higher value irrigation. Tresco, which neighbours the pilot area is an exception, and has been developed as a pumped district for horticulture.

The area, while being at the lower end of the Loddon and Avoca catchments, is also ‘mid catchment’ in the sense that it has significant impacts on downstream users on the Murray River.

The pilot project undertook a process of:

- Identifying current land use in the study area;
- Identifying key stake holders;
- Determining land use implications if existing trends continue;
- Identifying the key issues that need to be addressed, if existing trends continue;
- Developing management principles to guide actions or policy;
- Developing future visions and integrated packages to provide an alternative future rather than allowing existing trends to continue; and
- Strategically evaluating the social, environmental and economic consequences of each implementation package developed.

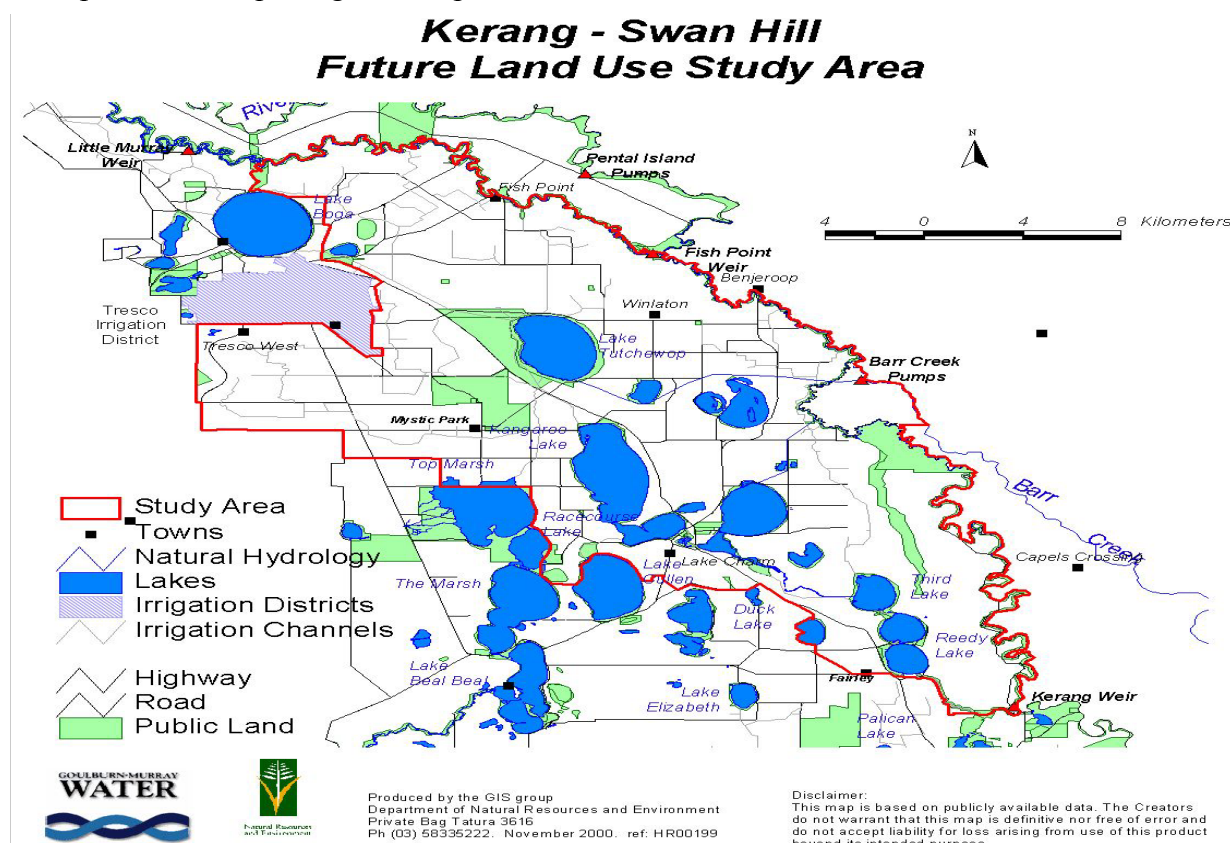


Figure 3. Kerang – Swan Hill Future Land Use Pilot Study Area

The community working group identified the following key management issues, and drivers for change, within the area:

- The economic value of irrigation, from parts of this supply system, is low and diminishing. Permanent water is being sold from the area at a rate of 6% per year and the MDBC cap on irrigation diversions, and introduction of interstate trade, is likely to accelerate this decline;
- Many farmers in the area have chosen to exit irrigation by permanently selling off their water right to higher value horticulture or dairying. This action results in a loss of economic activity to the study area. Those left have to bear a higher percentage of infrastructure costs because exit fees do not currently apply. People are becoming worried about what will happen to the area if this trend continues or accelerates;
- Some of the major components of the irrigation infrastructure are approaching the end of their economic life and will cost tens of millions of dollars to replace;
- The establishment of irrigation supply to a high value horticultural development, directly from the Murray River, has diminished the need to supply water from Torrumbarry Weir and through the key wetlands. The lower dependence on existing supply infrastructure will increase costs for remaining irrigators. The decreased irrigation flows passing through key wetlands have the potential to alter water quality and eventually impact on the Murray River;
- Ongoing expenditure to implement flooding and drainage strategies, to protect former areas of irrigated land from which irrigation water has been permanently traded away, was deemed unsustainable. An option to use some low lying land for increased flood pondage was supported;
- There is a huge concern that the overall health of the River Murray system is in decline and that additional environmental flows may be required to address the decline of ecosystems. Demand for environmental flows to satisfy ecosystem requirements, including those of the internationally recognised ecosystems of the Kerang Lakes, is likely to put more pressure on irrigation supply systems;
- Salt disposal throughout the Kerang Lakes Area has been a long standing issue. Changes to the Torrumbarry system provide new opportunities for improved salinity management such as new drainage reuse areas and salt harvesting operations;
- There is potential for new areas suitable for high value irrigation which are not currently supplied by the irrigation system; and
- Demographic changes are increasing demand for hobby farms and residential blocks of land, particularly near the lakes.

The development and implementation of a land use strategy would provide more certainty for future investment in the area. This is essential for the development of a sound regional economy



and a relevant irrigation supply system. With a sound strategy for land use, the area has a good basis for attracting investors, retaining water and growing its economy.

Land, water, environment and community cannot be managed independently of each other; change in one impacts on the other. This is especially true in the Kerang-Swan Hill area, where the lakes have many different functions. The result of this interconnection has been that any explicit plan to change land, water and environmental management is difficult to agree upon. It involves many different aspects, the consequences are difficult to predict and the default option, of maintaining ‘status quo’ is the path of least resistance.

Changes in land, water and environment are happening by default, without a plan and are unmanaged from a regional point of view. The consequence of this may be acceptable to some, but from a broader community perspective, opportunities are lost. Capturing these opportunities will require considerable courage, from diverse stakeholders, to embrace change and agree upon an explicit plan for the area.

The net result is that it is vital for the area to develop a vision for future irrigation and dryland land use. Also there must be active management of environmental assets in the area so that relevant, integrated and cost effective infrastructure is provided.

The key findings of the pilot project recognised this need, not just within the study area but also in other regions faced with similar environmental management issues and irrigation landscape change.

A brief summary of the management packages developed by the Community Working Group, which are not specifically addressed in reconfiguration programs, are listed below

Property Land Use and Development Package explicitly introduces the concept of paying landholders to provide environmental benefits for the wider community, for which, previously, they have not been adequately reimbursed.

The Regional Development Package was designed to create new opportunities for economic growth and help build community strengths. This would tap into the broader catchment and regional initiatives, including Local Government initiatives. It could cover initiatives for: business development, ecotourism, community development, industry innovation, and development of secondary industry.

The Environmental Services Package was designed to provide payments to landowners who create wider community environmental benefits. This can be for reducing River Murray salinity through using salty water, for creating floodplain storage, for creating carbon credits, for biodiversity assets or other ecosystem services where public benefits are created.

The Land Bank Package was designed to create viable units of land from fragmented under-utilised land parcels, which separately would be unviable. The Land Bank would take unused land offered to it and amalgamate it into viable units for businesses in the Study Area. The

package offered benefits those wishing to retire land from irrigation, and for those wishing to expand.

Regenerating the Lakes Package is a combination of land use planning and water management change designed to create better water quality and services for horticulture, improved environmental outcomes, improved recreational values and possible significant savings in water.

The Floodplain Restoration Package is designed to create extra flood storage and reduce the impact of floods. This involves identifying potential floodplains, reinstating floodplains and the development of management regimes to enhance floodplain diversity. Private landholders would receive payment for environmental services and flooding benefits created.

### **VICTORIAN STATE GOVERNMENT WATER REFORM**

The Victorian Government has maintained a proactive approach to water management issues. The onset of drier conditions and the current serious drought has accelerated the State Government's commitment to both national water initiatives and the new water reforms for urban and rural water authorities. The reforms address growing metropolitan and regional population growth, water trade in irrigation areas, new irrigation developments, and commitments to providing water resources to improve the environment of key rivers and streams including the Murray River. The development of the reforms has been influenced by public opinion that climate change will result in less water being available for all water uses.

In August 2003, the Victorian Government released a discussion paper soliciting wide public comment on a number of proposals to better secure Victoria water resources. This was followed by the release, in June 2004, of the Victorian Government's White Paper that outlined over 100 actions to improve the way in which communities use water and manage water for towns and cities, irrigation and the environment. The White Paper outlined an extensive array of legislative reforms that would be enabled by amending the Water Act 1989

The key components relevant to irrigation landscapes would:

- Establish an Environmental Water Reserve- by reducing the (low reliability) irrigation sales pool available to irrigators by 20%;
- Improve water resource planning and management;
- Create a new unbundled irrigator entitlement to water –with a water share, a water delivery right and obligations and a water-use licence;
- Establish a State Water Register; and
- Establish a process for the reconfiguration of irrigation infrastructure systems.

The legislative reforms have provided irrigators with a level of water supply choices, and irrigation communities have a framework to address landscape change as follows:

- Irrigators to have choice about securing high and medium level water resource shares (formerly called sales). These can be increased or decreased via water trading processes;
- Irrigators to determine the distribution capacity share required for their enterprise;
- Irrigators to have choice to remain attached to an irrigation system in the event that permanent trade away from their land holding is a short term management option; and
- Irrigation communities can develop and implement Irrigation Reconfiguration Plans with Water Authorities and include in those plans, sustainable levels of irrigation infrastructure, subject to appropriate recognition being granted to environmental assets.

The White Paper states that Reconfiguration Planning should proceed as part of a strategic overview of the water authorities' infrastructure assets. The purpose of the Strategic Overview is to provide for a planning framework for making decisions about the relative importance of works being proposed for the different customer areas. The overview will focus on service levels, condition of assets, delivery and maintenance costs, current water usage and trends and future customer expectations.

Subject to the Ministerial approval there is a process to be followed by the water authority in preparing a Reconfiguration Plan. This includes the communication obligations, the development of options, the consideration of stakeholder submissions, and the final recommendations, in those situations, where a water authority is unable to obtain customer agreement with regard to changing irrigation infrastructure and or customer water delivery services. The process is outlined in Figure 4.

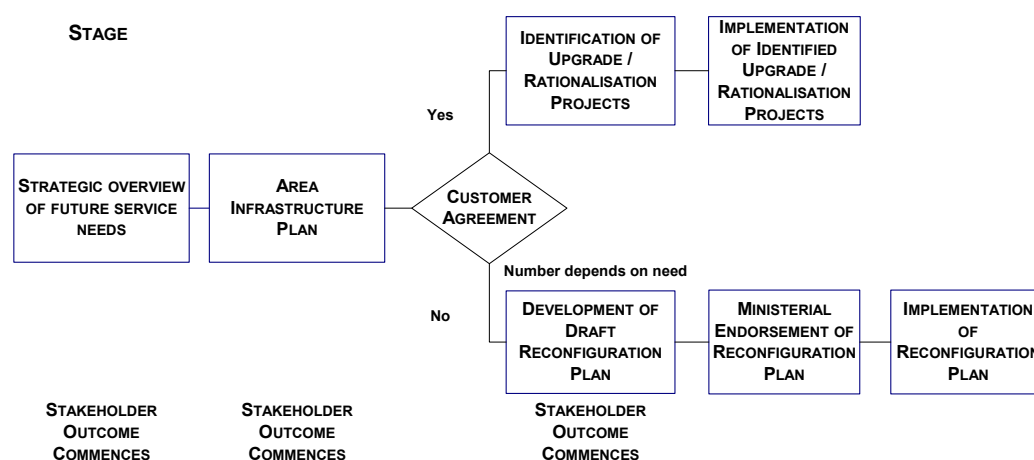


Figure 4. Reconfiguration Process

In return for reducing the sales pool available to irrigators the Government has agreed to fund \$6.0M towards the development of six reconfiguration plans and has requested that G-MW commence the development of reconfiguration plans.

In addition, the Government has agreed that it will co-invest in irrigation reconfiguration programs to recover water for the environment in those areas where this will provide clear benefits to the community and to industry. The initial offer from State Government is a \$50M contribution to recover 25.0 GL of water savings.

Two irrigation areas in Northern Victoria have commenced the development of reconfiguration plans. The Pyramid Boort Reconfiguration Plan is the most advanced.

### **PYRAMID BOORT FUTURE MANAGEMENT STRATEGY**

The Pyramid Boort Irrigation Area, located on the floodplain of the Loddon River, was originally developed with an irrigation supply from the Loddon River in 1886. Some of the existing irrigation supply assets were constructed prior to 1920. The irrigation supply system serves areas of commanded land, on irrigator holdings, via a supply point which records the delivery to each holding.

Currently there are 737 irrigation services (managed as 583 businesses) in the Pyramid Boort Irrigation Area, which is some 150 less than seven years ago. This trend reflects an agriculture-wide trend where economies of scale and increased farm productivity are used to offset diminishing terms of trade impacts. At this time 25% of water rights, tied to original land parcels in the Pyramid Boort Area, have been traded outside the irrigation area or to other lands within the area.

External perception, that parts of the irrigation area should be shut down has diminished the confidence of some irrigators and has curtailed irrigation investment in some areas. In other areas, significant new areas of irrigation have been established with high value enterprises. In combination, these issues drove the need to undertake the 'Future Management Strategy' to address the reduced customer base, the spatial shift in demand for irrigation water, stranded irrigation assets, and a need to accelerate asset maintenance works.

While it now appears there is a growing mismatch between the location of irrigation supply infrastructure and where water is needed, the need to change is not driven to any large extent by existing users. However there are opportunities to be captured including distribution costs remaining competitive to attract new development, avoiding expenditure on low use assets, keeping irrigators abreast of technology changes and capturing technology to improve water management efficiency.

Ironically the delivery charges in the Pyramid Boort Area are low compared to other G-MW irrigation delivery businesses. To analyse this anomaly, the Future Management Strategy has identified and partitioned infrastructure costs more accurately by dividing the irrigation supply system into three distinct components i.e. Carriers, Trunks, and Pods (Figure 5)

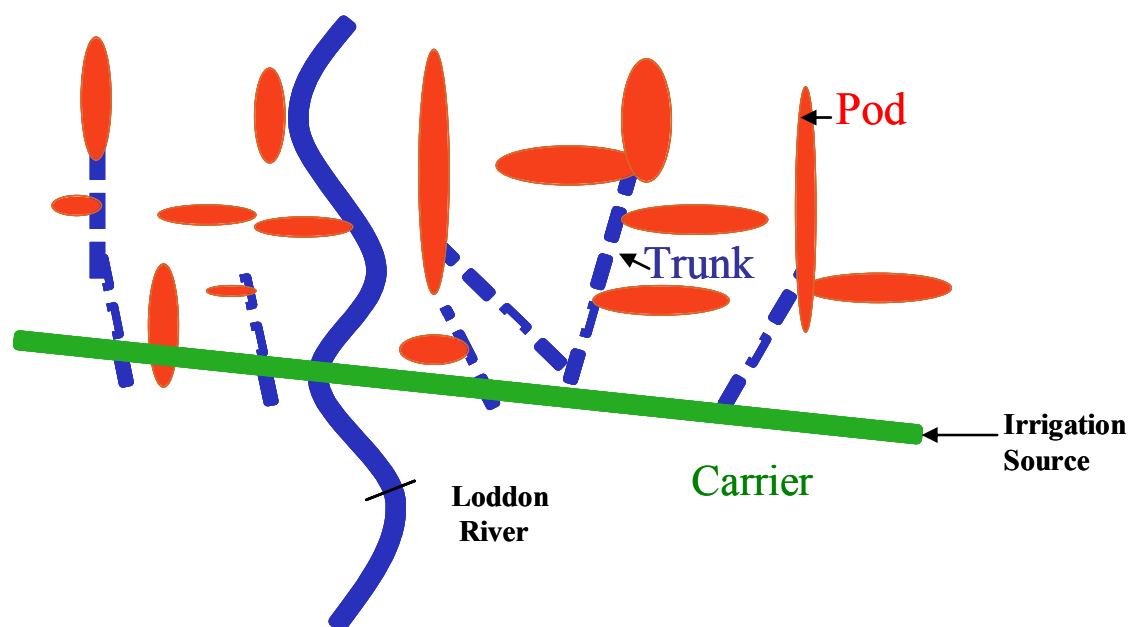


Figure 5. Model of Carriers, Trunks and Pods

It was found that the operational costs of carriers and trunks were reasonable and that these assets could remain as the framework of any new irrigation reconfiguration plan. Within the 32 identified pods, a significant range of operational costs were identified. A key challenge is to reduce the delivery infrastructure costs within the pods.

The Pyramid Boort Future Management Strategy is very much ‘a work in progress’ and the agreed Vision includes:

- A significant reduction in infrastructure whilst supplying water to those who want it;
- Modernising the supply system with increased efficiency and with operational technology enhancements;
- Encouraging further irrigation development on suitable soils and with due regard for environmental assets;
- Defining and establishing different irrigation delivery service levels; and
- Marketing and communicating the strategy package.

Extensive stakeholder and irrigator customer consultation has occurred throughout the development phase.





The development of Reconfiguration Plans has included specific requirements for G-MW that include:

- Communications obligations;
- Developing and analysing options;
- Dealing with stakeholder submissions; and
- Developing a draft Reconfiguration Plan.

Part of the preparation work has included the development of ‘a regional atlas’ containing various layers of information (Geographic Information System format) presented in a hard copy to planning participants.

The atlas layers for each irrigation area are divided into the categories of carriers, trunks and pods, irrigation supply asset condition and replacement costs, changes in irrigation activity 1996/97 to 2003/04, enterprise land use, soil groups, important environmental assets, and sites of biological significance.

G-MW has also developed and undertaken a range of asset ‘modernisation’ projects that have resulted in significant benefits, to improve customer service delivery, and secure water savings for the environment.

With information sourced from the ‘regional atlas’, an irrigation ‘modernisation’ proposal has been developed for the Shepparton Irrigation Area, utilising unit costs for a variety of refurbishment works including pipelining channels, channel automation, asset rationalization, and modernised supply metering. The ‘modernisation’ business case indicates that 47,000ML will be saved at a capital cost \$174M. This information will be an input to the reconfiguration plan process for the Shepparton Irrigation Area.

## SUMMARY

The informing aspects from the planning processes include:

- Permanent water trade activity indicates that some serviced irrigation lands are not capable of generating sufficient income returns for irrigators. The consequence is that irrigation delivery infrastructure is underutilized and thus financially supported by a cross-subsidy from other irrigators;
- Regional irrigation communities must change to secure both a sustainable level of irrigation infrastructure, and the delivery of water savings to maintain and enhance the health of environmental assets;
- The effective timing of change is relative to the fact that nothing is likely to be achieved if there is not ‘a shared state of discontent’ between stakeholders;

- Strategic planning and the development of reconfiguration plans are essential, as the ‘do nothing’ approach will guarantee the delivery of sub-optimal outcomes;
- Pilot landscape change projects and planning programs provide support for the development of legislative change and enable the change actions to develop and progress in a confident and orderly manner;
- Rural Water Authorities must be prepared to determine, analyse, and communicate the key business elements of their irrigation delivery charges including the aspects of operation, maintenance, delivery and replacement, and the spatial variances of these within irrigation supply business areas;
- Government, communities and agencies can achieve desired outcomes when working in partnership and with commitment to a common goal. The planning of change must address both needs of irrigators and legislative issues with respect to water management;
- Strategic reconfiguration planning takes considerable time and resources. However the outcomes achieved will probably cost less in the long run to implement and be more aligned to desired social economic and environmental outcomes than a ‘no plan’ scenario;
- Communities need to be given time, support and the tools to effectively participate in planning, the changes required to implement desired reconfiguration outcomes. Furthermore the capacity of communities to participate in change programs must be recognised;
- Information must be presented in spatial formats to improve interpretation and understanding by those participating in the planning process;
- Reconfiguration programs needs to explore concepts whereby irrigation delivery infrastructure enhancements can be integrated with on-farm distribution improvements;
- Where the capital cost of securing water savings from infrastructure upgrades and/or ‘modernisation’ is likely to increase above \$5,000/ML, it would be reasonable to expect reconfiguration plans to establish priorities as to where and how any investment strategy could secure multiple benefits (social, economic and environmental) from the delivery of reconfiguration outcomes; and
- For G-MW customers, the future irrigation infrastructure of carriers and trunks is likely to be, within a framework of continuing water trade, servicing suitable irrigation land with minimal off site environmental impacts. This configuration enables expanding irrigation enterprises and larger developers to take advantage of affordable delivery costs, and shorter term agricultural investment opportunities.

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