GIS – A TOOL FOR PLANNING THE FUTURE OF IRRIGATION

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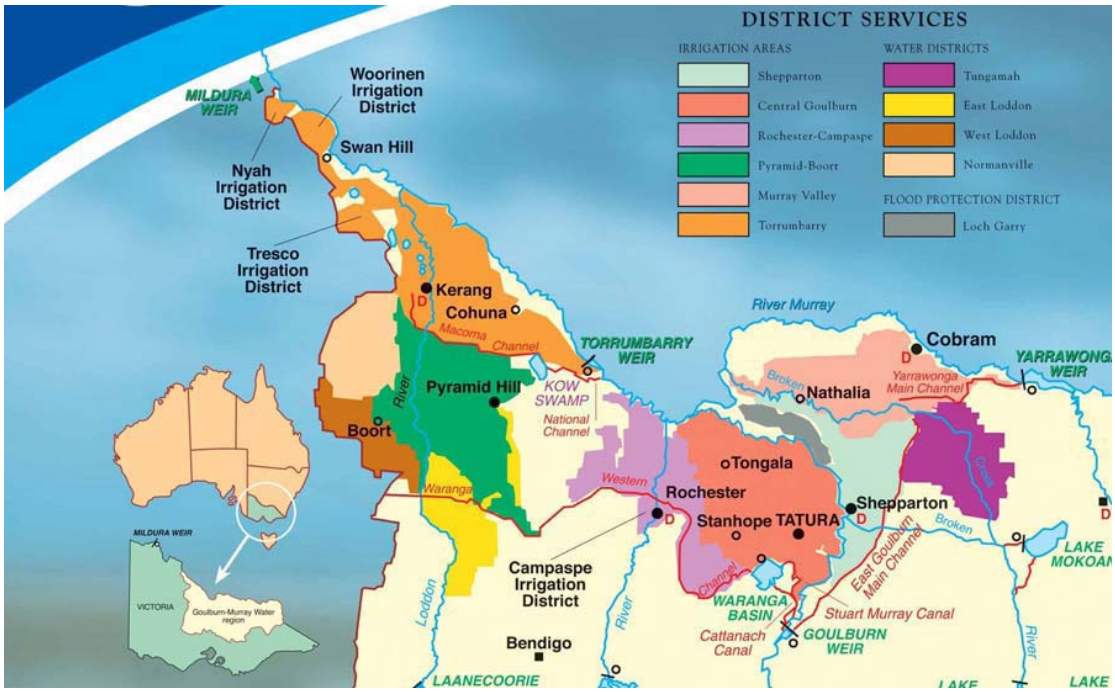
BACKGROUND

In 2007 the Victorian State Government announced that $1 billion would be invested in modernising the ageing infrastructure of Victoria's Goulburn-Murray Irrigation District (GMID) in order to generate significant water savings over the next 8 years as part of the Our Water Our Future – the next stage of the Governments Water Plan. Under this plan, 225GL of water savings captured as part of the modernisation of the GMID, will be equally split between irrigators, the environment and to secure Melbourne's water supply.

The GMID is one of Australia's most important irrigation region and is often referred to as Victoria's Food Bowl as it accounts for over a quarter of Victoria's agricultural production. Modernising the irrigation infrastructure is seen by the Government as an opportunity to guarantee the future of the region and create a world class irrigation system.



GOULBURN-MURRAY WATER

Goulburn-Murray Water (G-MW) manages water storage, delivery and drainage systems involving 70% of Victoria's stored water. G-MW harvest, store and deliver water, ensuring availability for all customers. G-MW manages water-related services in a region of 68,000 square kilometres, bordered by the Great Dividing Range in the south to the River Murray in the north, and stretching from Corryong in the east, downriver to Nyah. G-MW also operate salt interception works on the Murray downstream of Nyah, manage Mildura Weir, deliver bulk water to supply points outside the region and is the Victorian Constructing Authority for the Murray-Darling Basin Commission. The business services a broad range of customers across northern Victoria and G-MW continually strive to service their needs and provide quality customer service. The table below details our range of customers.

Table 1 - Our Customers (at 30 June 2007)

Gravity Irrigation and Drainage	13,644
Pumped Irrigation and Drainage	418
Domestic and Stock	1,025
Surface Water Diversions	11,280
Groundwater Diversions	4,840
Flood Protection	120
Other Customers	
Urban Water Authorities	4
Urban/Rural Water Authorities	2
Rural Water Authorities	1
Hydroelectric Power Companies	2
Lessees and Licencees	835
Houseboat Licencees	706
TOTAL	**32,886**

The irrigation system is more than 100 years old in several areas and is in need of updating as currently the system loses an estimated 30% or 900GL of water per annum through system inefficiencies. The Northern Victoria Infrastructure Renewal Project seeks to modernise the system by way of channel automation, piping, channel bank lining, channel remodelling, accurate metering and partial system rationalisation. This investment in the future of the Food Bowl region provides many engineering and planning challenges, especially in determining where these works take place and the priority they are given.

PLANNING PROCESS FOR MODERNISATION

Planning for the modernisation of G-MW's irrigation areas is a massive undertaking. The ability to analyse spatial and non-spatial information within a sound engineering and operational decision framework has provided a crucial overview of the current status of the GMID and a valuable insight to the future requirements of a modernised irrigation system. Applying a consistent Modernisation Analysis Methodology, whilst taking into account local factors, has enabled G-MW to develop the most suitable engineering and commercial options across the whole system.

To achieve this, G-MW has developed methodologies and decision support tools to assist with the development of a series of models within our corporate Geographic Information System and Oracle based database to create a spatial representation of our irrigation system. The models were then applied to this base spatial data to create a series of data layers that enabled our engineers to understand, analyse and predict the optimal modernisation outcome from a system reconfiguration and water savings point of view.

These models take into account information including Land Use, Land Suitability for Irrigation, Asset Types, Irrigator Commitment and Entitlements and develop treatment types and aid in identifying opportunities for rationalisation.

DECISION SUPPORT SYSTEM

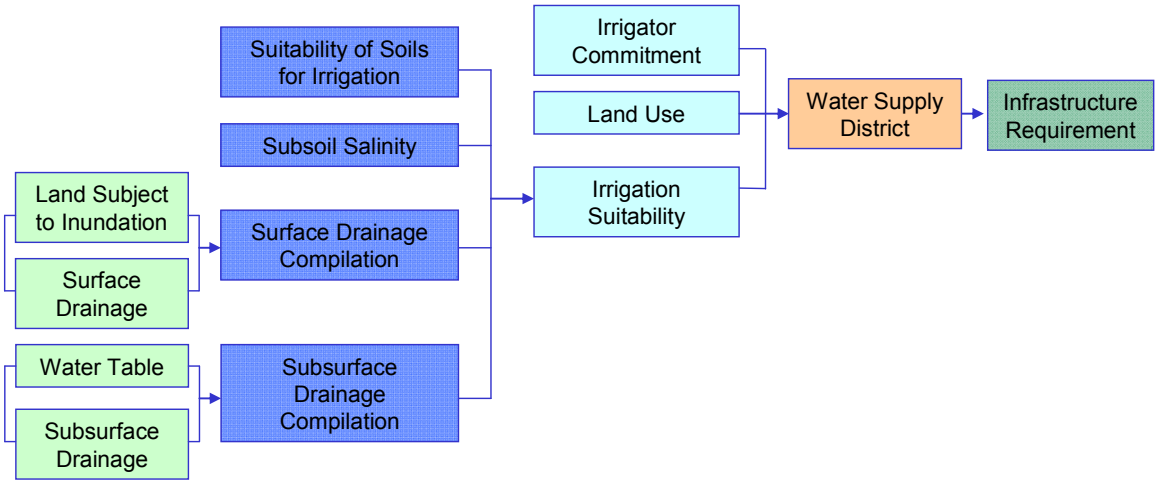
The extent of automation and remediation has been determined by applying the methodology developed to support G-MW's modernisation program. The methodology draws together the extensive works completed to date in compiling the regional atlases, additional G-MW data and the knowledge gained through planning the modernisation at a more local level.

The methodology recognises that the concept of modernisation affords the opportunity to analyse future infrastructure requirements against tailored water supply services. In the future it is anticipated that water supply services will include gravity and pressure irrigation, domestic and stock supplies and some areas where service is withdrawn. These services will most likely be a blend of public and private infrastructure.

The methodology follows that by assessing Land Suitability for Irrigation, Land Use and Irrigator Commitment, tailored water supply services are identified which then lead to service specific infrastructure requirements.

Figure 1 summarises this approach and represents the decision logic associated with determining the water districts.

Figure 1 – Modernisation Analysis Methodology



For the purpose of this analysis the three primary inputs, Land Suitability for Irrigation, Land Use and Irrigator Commitment are weighted equally. Land Suitability for Irrigation and Land Use were analysed at land parcel level. Irrigator Commitment was analysed at pod (local area) level.

The make up of each is as follows:

- Land Suitability for irrigation is a compilation of soil suitability, subsoil salinity, subsurface drainage and waterlogging. Subsurface drainage is a compilation of subsurface drainage and water table; water logging is a compilation of land subject to inundation and surface drainage.
- Land Use is a compilation of Bureau of Rural Science in conjunction with commonwealth and state agencies land use digital datasets to group the land use into seven categories.
- Irrigator Commitment for the purpose of this analysis has been determined as the use in ML per area in hectares – in essence Irrigation Intensity. The thresholds adopted are partially aligned with the Regional Guidelines for Irrigation Development.

The prioritisation of investment under modernisation has been determined by focussing on the irrigation intensity. For the purpose of this analysis and the requirement to prioritise based on limited funding the following has been adopted:

- For those pods with water use intensities of ≥ 4 ML/ha only channels > 50 ML/d have been selected for modernisation (Option B.1); and
- For those pods with water use intensities of ≤ 4 ML/ha only channels > 100 ML/d have been selected for modernisation (Option B.2).

The base data used within the analysis should be viewed as conceptual as in no instance have designs been completed.

PRIME DEVELOPMENT ZONES

It is noted that the analysis at this point does not specifically address those lands previously identified as prime development zones.

HORTICULTURE

Horticulture has been identified as it is considered that there is an opportunity to implement an alternative infrastructure solution, in the form of a pressure based supply, where there exists a significantly large enough cluster of horticulture enterprises.

It is considered that the higher cost of pressure solutions could be offset through government investment for the water savings associated with converting from an open channel system to a piped system. Interestingly in several of the horticulture clusters, namely the Cobram and Lake Boga-Swan Hill horticulture areas, there may be a greater opportunity for water savings by supplying these areas from a river rather than the G-MW channel system. These options will be further investigated in the future.

CONCLUSION

Planning for the modernisation of an area as large as G-MW's irrigation area as a single task is a massive undertaking. Traditional delivery approaches would have been incredibly manual and require considerable staff and time inputs which were not available. Further the output would be exposed to great risks associated with consistency of approach and data management.

The application of the decision support system through the GIS tools has empowered G-MW with the ability to draw together existing corporate databases, in a consistent manner, across G-MW's entire area. The output has been to recommend and cost a number of modernisation options, a task which has been completed within a matter of days. The added benefit, the ability to visually present these options, has been invaluable in the engagement of stakeholders.