Shepparton Irrigation Region Implementation Committee

Water, Land and People

Annual Report 2001-2002

GOULBURN BROKEN
CATCHMENT MANAGEMENT AUTHORITY

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Department of Sustainability and Environment
Department of Primary Industries

Disclaimer

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OUR REGION - OUR PEOPLE

THE SHEPPARTON IRRIGATION REGION

The Shepparton Irrigation Region (SIR) covers over 500,000 hectares and occupies approximately one third of the Goulburn Broken Catchment, the eastern area of the North Central Catchment and forms part of the Murray-Darling Basin.

The SIR includes the municipalities of City Of Greater Shepparton, Moira Shire and Campaspe Shire and the major rural centres Shepparton, Cobram, Echuca, Mooroopna, Numurkah, Tatura, and Kyabram. The townships of Rochester, Nathalia, Stanhope, Lockington, Murchison, Colbinabbin, Tongala, Strathmerton, Katamatite, Undera, Girgarre, and Katandra also lie within the SIR boundary.

The irrigated area within the SIR is 317,000 hectares. This land utilises approximately 1.5 million megalitres of water each year and in 2000-2001 produced the gross value of production calculated at approximately $6 billion. The main primary industries are horticulture, dairying, cropping, viticulture, wool, forestry and grazing.

The SIR is the centre for major food processing industry that contributes a major percentage of Victoria's export earnings. Companies include Kraft, Bonlac, Snowbrand, Cedenco, Simplot, Nestlé, Unifoods, Henry Jones Foods, Tatura Milk, Murray-Goulburn, Meiji-MGC Dairy, SPC, Ardmona, Campbells and Girgarre Country Foods.

OUR PEOPLE

The SIR population is over 110,000 people and includes over 7000 rural properties, with over 20% of those being of a multicultural background.

Our region is home to the largest indigenous population outside of metropolitan Melbourne. Cultural and linguistic diversity is a feature of the region where well established communities, primarily as a result of Southern European post-war migration, co-exist with more recently arrived communities from countries such as Iraq, Iran and India.

WHAT DO WE DO?

The SIR is part of the corporate and business management structure of the Goulburn Broken Catchment Management Authority (GB CMA). The GB CMA also is directly responsible for the management and implementation of the Biodiversity, Floodplain and River Health and Water Quality programs in the SIR Catchment Strategy. The SIR Implementation Committee (SIR IC) has representatives on Coordinating Committees in each of these programs.

The SIR IC has the prime responsibility to deliver the program of natural resource objectives of the SIR Catchment Strategy. The SIR Catchment Strategy is a 30-year strategy that provides the framework for land, water and biodiversity management and aims to improve the condition of natural resources in the SIR for current and future community. The SIR Catchment Strategy has been underway for over 10 years with the whole community working hard to achieve goals.

Under the Catchment and Land Protection Act 1994 the SIR Catchment Strategy is reviewed every five years with an extensive review of natural resource management programs

engaging in consultation with community based committees, State agencies, partner organisations and Local Government. This review is under way.

Issues

Salinity

Salinity has increased in the SIR through rising watertables and salt mobilisation, resulting in significant environmental, social and economic losses. Clearing of land and inefficient application of irrigation water has increased watertable levels. Annually 260,000 tonnes of salt is exported to the River Murray with adverse impacts to downstream communities in the Murray-Darling Basin. In 2001, 23.5% of the SIR had a watertable within 2 metres of the surface (this varies from year to year depending on seasonal conditions). The rise was very rapid until 1995 when a peak of 47% was reached with the watertable levels surpassing the levels predicted for the year 2000 in the 1990 Shepparton Irrigation Region Land and Water Management Plan (SIRLWMP). A combination of dry seasons and progress with salinity works led to the reduction since 1995.

Without active management, 65% of the SIR will have a high watertable by 2020 and there will be severe salinisation, resulting in significant loss to economic assets and irreversible degradation of most major wetlands within the Shepparton area. The onground works undertaken by the Farm, Sub-surface Drainage and Surface Water Management programs are the major thrust against Salinity under the SIR Catchment Strategy in reducing accessions to groundwater and other salinity threats. Research and Development is a major component of the strategy to address this issue.

Water Quality

In addition to salt, the Catchment generates 360 tonnes of phosphorus and 2,854 of nitrogen each year. Some 289 tonnes of phosphorus and 1,951 tonnes of nitrogen are exported from the region. The Goulburn Broken Catchment contributes 33% of the River Murray water flow above the Murrumbidgee, but 58% of the turbidity.

Because of the nutrient and chemical loads, the risk of algal blooms is high and they occur frequently in and downstream of the Catchment. The increased nutrient loads affect many native species. Major sources of nutrients include irrigation drainage (57% of the phosphorus discharged from the catchment in a normal year), sewage treatment plants, sediment mobilisation, urban stormwater and intensive animal industries such as fish farms. The management of these contaminants is being addressed under the Farm, Surface Water Management and Waterways programs within the SIR Catchment Strategy.

Native Biodiversity

An improvement in information available has led to a stronger understanding of the importance of biodiversity both to the natural and productive systems. All actions that impact on land and water impact on native biodiversity. The SIR Catchment Strategy aims to ensure that all impacts are considered in decision-making and that biodiversity needs are an integral part of all the natural resource management programs in the SIR.

Riverine Health

Storing and delivering water for urban and agricultural use has dramatically altered flow patterns of our rivers and creeks and had a direct impact on the regional aquatic biodiversity, quality of water and the waterway environment. The SIR Catchment Strategy programs target threats to stream health: erosion, sedimentation and salinisation; effects from agriculture, land clearing and urbanisation; and changes to stream environment including introduction of exotic flora and fauna, de-snagging, construction of dams and barriers, river regulation and water extraction and poor river frontage management.

Pest Plants and Animals

Pest plants and animals have a negative impact on biodiversity ecosystem function and the productive capacity of the land and water resources. The SIR Catchment Strategy targets state prohibited, regionally prohibited and regionally controlled weeds. Priority pest animal species are foxes and rabbits and in the waterways European Carp are a major problem, causing turbidity, damage to stream habitat and depletion of native fish populations.

Climate Change - Greenhouse Gas Emissions

Climate change has implications for the long-term sustainability of our economy and community. There are opportunities to assist the reduction of greenhouse gas emissions that are consistent with salinity, biodiversity and water quality programs. Through revegetation programs and enhanced agricultural practices multiple benefits can be achieved.

WHO PAYS?

Annually, the SIR IC attracts funding of close to $20 million from external sources. The majority of this funding, together with the direct contribution from the catchment community is invested directly into onground works projects. The SIR Catchment Strategy is funded jointly by the regional community, the Victorian, Commonwealth and Local Governments. The SIR Catchment Strategy is an integrated program of works with funds sourced from a wide area.

Regional Community

The regional community has a major direct commitment to implementation of the SIR Catchment Strategy, both to capital projects and ongoing operation and maintenance. In 2001-2002, this was estimated at over $37 million.

Government Funding

Government funding is provided through annual integrated budgets for the SIR Catchment Strategy prepared on the basis of bids submitted by the SIR IC. The 2001-2002 State and Federal Government allocations for the SIR Catchment Strategy implementation totalled $14,754,000. This was made up of a State Government allocation of $8,567,000 through the State Consolidated Salinity Budget via Catchment Management and Sustainable Agriculture (CMSA) and Federal Government funding of $6,187,000 which was provided by the Natural Heritage Trust (NHT) mainly through the MD2001 Program.

Industry Funds

Private industry also plays a significant role in the program. Powercor Australia Ltd provide substantial support to the Sub-surface Drainage Program in the form of a rebate on the cost of a pole and substation. Shepparton Preserving Company (SPC) contributes significantly for the East Shepparton Salinity Project.

OUR PARTNERS

Goulburn-Murray Water

Goulburn-Murray Water (G-MW) manages water storages and the supply and drainage channel infrastructure in the SIR. G-MW is the major partner in the delivery of the SIR Catchment Strategy through the Sub-surface Drainage and Community Surface Drainage Programs.

Department of Natural Resources and Environment

The Department of Natural Resources and Environment (DNRE) is responsible for driving the key objectives of the SIR Catchment Strategy in natural resource management. The

DNRE implements the Farm and Environment Programs and, in conjunction with G-MW, the Community Surface and Sub-surface Drainage Programs. The Agriculture Victoria Division of DNRE also carries out vital Research and Development programs providing scientific advice and direction.

Local Government

Local Government is a key partner, providing Statutory and Strategic Planning, participating in cost-sharing for the SIR Catchment Strategy and providing a link with the broader community. Local Government jointly with the GB CMA funds a coordinator to ensure that the partnership operates effectively. This involves the Municipalities of the Greater Shepparton City Council, the Moira Shire Council and the Campaspe Shire Council.

Goulburn Valley Water

Goulburn Valley Water (GVW) provides urban water supply and wastewater services in the SIR. GVW, in conjunction with the GB CMA, works to minimise phosphorous (to <1mg/L) exports from wastewater treatment plants to our river systems, improved water quality and for full reclaimed water re-use to land. They develop waste management plans in line with Government requirements and implement these plans to meet State Environment Protection Policies (Waters of Victoria) and the SIR Catchment Strategy. GVW also house the Catchment Stormwater Officer who works in conjunction with GB CMA and all local councils throughout the SIR and catchment to improve stormwater through a range of structural and non-structural measures.

Goulburn Murray Landcare Network

The Goulburn Murray Landcare Network (GMLN) is a voluntary community-run forum, networking 35 Landcare groups in the SIR. A sound relationship has been established between the GMLN and the SIR IC. A number of projects are undertaken by the GMLN in partnership with the GB CMA. The GMLN coordinates and funds regional projects such as community monitoring, the Weed Busters and Rabbit Busters program, "Impact Tours" and primary school education. These projects enhance the high level of community participation in catchment management promoted under the SIR Catchment Strategy.

Ethnic Council of Shepparton and District Inc

The Ethnic Council of Shepparton and District Inc (Ethnic Council) represents more than 26 culturally and linguistically diverse communities who live across the region. Formed in 1991, this strong relationship supports and services the needs of these communities in land management issues. The 60 member Ethnic Council is represented on committees and in policy development by specialist staff from within the Ethnic Council and Agencies.

Farm Forestry Program

The SIR Farm Forestry Network (SIRFFN) facilitates and coordinates development and management of Private Forestry and Eco Services in the SIR. The SIRFFN works with landholders to integrate private forestry into local farming systems and rural landscapes for improved investment, social and environmental outcomes. There is a representative from the SIR IC on this program and it is closely linked to environmental and farm tree projects.

Murray Dairy

Murray Dairy was established to lead the economic and social development of the dairy industry in northern Victoria and southern NSW. This is achieved by investing industry Research & Development funds in research programs and regional development activities that benefit all stakeholders of the dairy industry and the broader community. Murray Dairy with its partners, including the SIR IC, invest around $2 million annually on natural resource management Research & Development.

As part of the dairy industry's national natural resource management strategy "Dairying for Tomorrow – Sustaining Our Natural Resources", Murray Dairy has coordinated the development of a Regional Action Plan that focuses on:

- Building on existing industry partnerships with government and the community organisations, including SIR IC
- Coordinating extension initiatives connecting on-farm practices with natural resource management
- Investing in Research & Development to improve water use efficiency on dairy farms
- Enabling the industry to better report and demonstrate its environmental performance to the market and community
- Ensuring a strong and coordinated industry response to new and emerging issues

OUR ORGANISATION - COMMUNITY ENGAGEMENT

Members of the SIR IC are nominated for their specific skills and community networks. The SIR IC meets on a six-week cycle throughout the year and is made up of eight community representatives and representatives from partnership agencies ie. DNRE and G-MW.

Working Groups have also been established for the four action program areas overseen by the SIR IC:

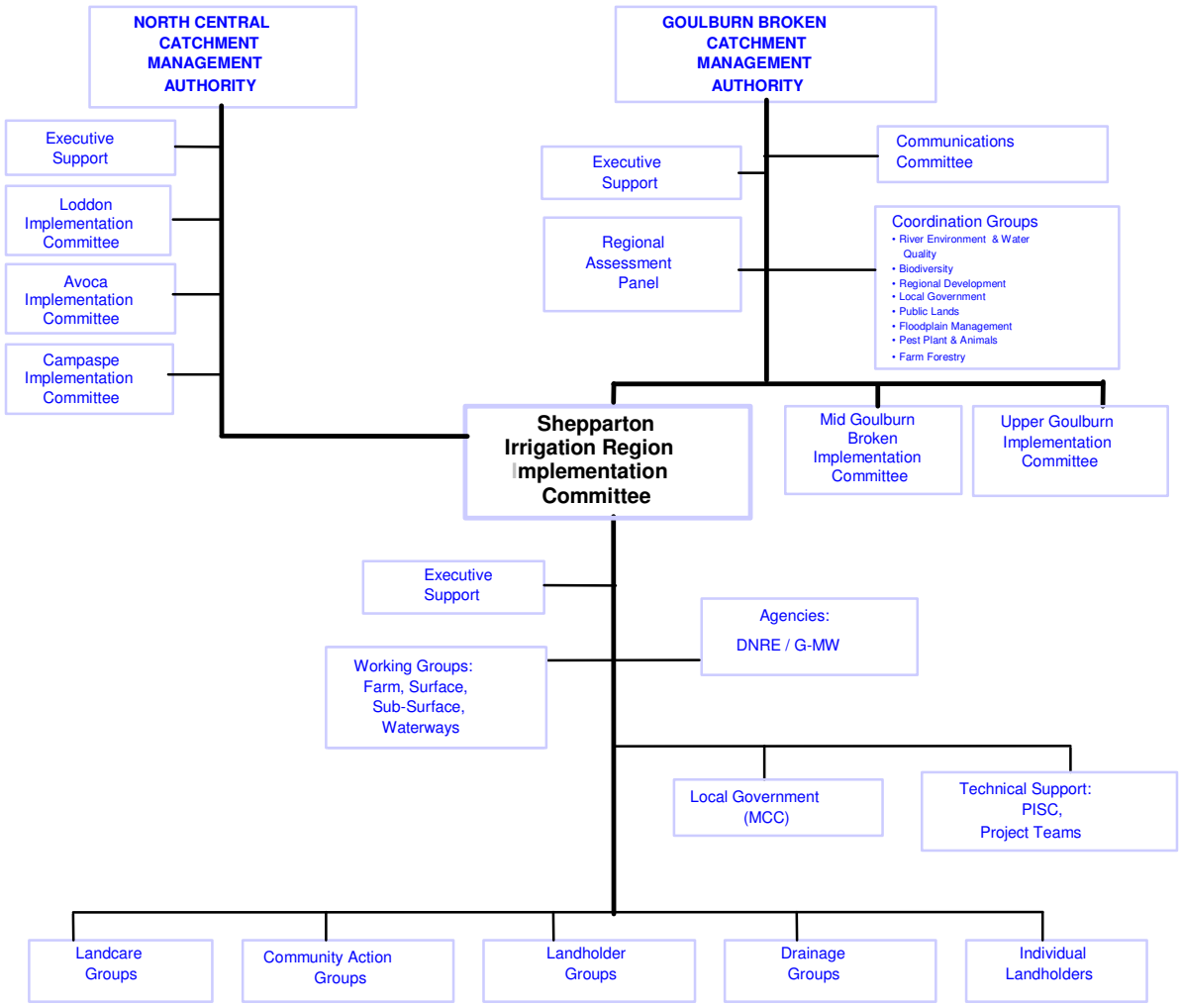
- Farm and Environment
- Surface Drainage
- Sub-surface Drainage
- Waterways

Each Working Group comprises community representatives (including representatives from each of the four G-MW Water Service Committees, Victorian Farmers Federation, Local Government and environmental groups and agency representatives. These groups manage all aspects of the particular program: budget allocation, works programs, monitoring, policy development and research. They address issues in detail so that the SIR IC can operate effectively and strategically, ensuring strong input from all stakeholders in the partnership.

The SIR IC is supported by an Executive Support Team, which provides executive and technical advice for the implementation of the Catchment Strategy. Agency staff also provide technical input through a Plan Implementation Support Committee (PISC), the working groups and specific project teams. This seemingly complex structure ensures community input and ownership of the Catchment Strategy as it continues to evolve during its implementation.

The SIR Catchment Strategy signifies a true partnership between the local community and all levels of government - state, federal and local. There has been a dedicated commitment to and ownership of the SIR Catchment Strategy from community members and agency staff because they all have a role in the evolution of it and a sense of responsibility for it.

Management Structure for the Implementation of the Shepparton Irrigation Region Catchment Strategy



CHAIR'S REPORT

The year 2001-2002 has been one of continued progress in the implementation of the Shepparton Irrigation Region (SIR) component of the Catchment Strategy. In my first year as Chair the members of the Shepparton Irrigation Region Implementation Committee (SIR IC) continued to effectively carry out their role.

The SIR IC has a number of working groups (farm, waterways, surface drainage and sub-surface drainage) which provide strategic advice on the implementation of specific programs. These groups have a wider community and agency representation. The community-based working groups continued to bring a broader perspective to our decisions. As well, a technical support group provides technical and managerial input into the program.

I would like to express thanks to all those community people and agency staff who continue to constructively develop and implement the Regional Catchment Strategy in the SIR.

FEATURES

Outcomes for the individual programs will be further detailed in other sections of the SIR IC Annual Report. I would like to mention a couple of key activities.

We have largely completed the major task of reviewing our strategy – our performance over the last five years and what we will be doing into the next five years and beyond. This was a major challenge for the year whilst continuing to maintain our implementation activities. The reviews of each of the individual programs – Farm, Environment, Surface Drainage, Sub-surface Drainage and Waterways are nearing completion. The documentation of the SIR Catchment Strategy is well under way, as is the integration into the Goulburn Broken Regional Catchment Strategy.

In particular the independent review of the Surface Drainage Program being conducted jointly by the Murray Darling Basin Commission (MDBC) and DNRE has led to some new thinking. However, this independent review of the surface drainage program found that:

> *'Overall, and in comparison to approaches being taken elsewhere, current Northern Victorian Surface Drainage Programs are providing significant environmental benefits. The Surface Drainage Programs are also performing at a high level, in regard to practices and approaches being taken to achieve beneficial environmental outcomes for the agricultural environment.*
>
> *The Surface Drainage Programs (ie. design, construction, and operation) are currently operating with a high level of environmental sensitivity. Drain design, construction and operational practices are considered to be 'best practice' compared to elsewhere in Australia and overseas. There is a high degree of innovation and continual improvement.'*

This reflects the strong contribution from agency staff and community members to integrated catchment management that has sound economic, social and environmental outcomes.

The further development of the 'cost-share matrix' for grants has enabled us to develop a process for cost-share which reflects both multiple benefits and the integration of activities conducted under the Regional Catchment Strategy.

The Broken Creek Catchment Project was a finalist in two sections of the 2002 Banksia Awards - The Bushland and Waterways section and the Prime Minister's Award for the Environmentalist of the Year.

CONCLUSION

It is essential that the SIR IC continues to attract substantial government funding in order to maintain landholder confidence in the program. Our ability to implement well planned, fully integrated, environmentally sensitive and cost effective works, ensuring the future of the SIR, is dependent on continued funding.

We participated in a 'one-bid' process for Natural Heritage Trust funding that significantly reduced the administrative requirements for community groups in our catchment. However, it led to a huge increase in the administrative burden on our staff and unfortunately will not be continued. The transaction cost of attracting funds continues to increase alarmingly.

This is my first report as Chair of the SIR IC and I would like to acknowledge the role of the support staff who were responsible for the implementation of work programs and meeting program budgets. A special thanks to our support team of Ken Sampson, Peter Howard and Pam Collins who make our jobs as IC members much more productive.

I would also like to recognise the role of the other SIR IC members. We have an extremely talented group of people who contribute a tremendous amount of time and effort to the health and future of the SIR. I would particularly like to acknowledge the role of our retiring members Stephen Mills who has moved on to Chair the GB CMA, and John Avard who is stepping 'back to the paddock' to be involved at the Local Area Plan level. Both have contributed generously of their time to catchment management in the SIR. John Avard has been involved for over 10 years through this committee and its predecessors. We wish them well in the future and know that they will still be contributing to the future of the SIR.

I would like to welcome Stephen Farrell, Ann Roberts, and Nick Roberts onto the SIR IC. I am sure that they will continue the high standard of community contribution.

Allen Canobie has completed a two-year term as SIR IC Chair from 1998-2000. I am pleased that he will continue his commitment and involvement as a SIR IC member. On behalf of the Committee I would like to thank Allen for his valuable contribution and dedication to the SIR IC.

I am certain that one of the great strengths of the SIR IC program will be the continuing strong and healthy partnerships that have been established between the Community, Agency and Government.

Russell Pell
Chairman

Shepparton Irrigation Region
Implementation Committee

IMPLEMENTATION REPORT

EXECUTIVE OFFICER'S REPORT

Overview

The year 2001-2002 has been one of achievement and progress in the implementation of the Shepparton Irrigation Region component of the Goulburn Broken Regional Catchment Regional Strategy. The partnership program with the Catchment and Water Group of DNRE is delivered with our regional partners in G-MW and the Catchment and Agricultural Services business of DNRE. The progress towards our targets for onground works continues to be impressive.

The support given by agency staff and the regional communities has been tremendous.

Outcomes for the individual programs are summarised below and are further detailed in the individual project reports.

The significant undertaking of reviewing the Catchment Strategy for the SIR is well under way with final reports expected to be produced early in 2003. This review will determine the program direction for the next five years.

Implementation

Environmental Program

The Environmental Program is an integral part of all the SIR Catchment Strategy programs with program activities predominantly reflecting native biodiversity protection and enhancement and including both issue development and delivery of onground works. During the past twelve months, program achievements and direction have been reviewed as part of the five year review of the Shepparton Irrigation Region Land and Water Salinity Management Plan (SIRLWSMP) and the subsequent development of the Regional Catchment Strategy.

The Goulburn Broken Draft Native Vegetation Management Strategy goals and native bio-diversity targets have become part of the SIR Catchment Strategy. As a consequence native biodiversity protection and enhancement works are more focused and where possible are being directed towards high priority action zones, significant and particular Ecological Vegetation Class remnants and habitat localities. The Grey Crowned Babbler project in the Murray Valley area is an example of habitat protection and restoration works.

A strengthening of partnerships with other SIR IC programs, the catchment community and other regional and state natural resource managers has brought about some very positive results highlighted in the annual target achievements. The program has also developed strong productive relationships with Trust for Nature and Greening Australia resulting in several conservation covenants being negotiated with private landholders.

Through the development of adaptive management plans for significant wetland sites on private land and terrestrial sites on both public and private land improved native biodiversity management practices are being implemented. The management plan development process has assisted the development of strong links with both community and agency bodies. Their development has also assisted funding applications, environmental water allocations and implementing native biodiversity monitoring regimes.

Again this year the program was successful in transferring some environmental water to Reedy Swamp, one of the important Goulburn River wetlands. In May, 112ML was transferred into Reedy Swamp to augment earlier drainage flows which had been controlled using structures installed for the purpose. The results appear promising and we are assessing them now.

Small isolated public land sites including road reserves supporting significant native bio-diversity continue to be protected and enhanced through the implementation of a comprehensive SIR Public Land Works program. One of the most significant achievements in this program has been the success of the Peppercorn Removal Project.

During the last year significant industry sponsorship was achieved. Kraft Pty Ltd, Strathmerton sponsored the further development of a regional Seed Bank operation and have provided for the purchase of a native seed harvester. Direct seeding activity is now being incorporated into public and private land works. A direct seed machine has been purchased for use in the SIR.

Tree Growing and Environmental Grant Incentive Schemes continue to be refined through the more recent development of cost-share matrix systems that reward landholders for seeking multiple benefits and greater native biodiversity outcomes.

The program continues to consider and respond to Statutory Planning Referrals. With the introduction of the Statutory Planning Case Management System the process has been simplified and case information is now available on line. Statutory Planning Referrals and the associated negotiations have provided a continual source of protection and enhancement opportunities generally resulting in a net gain outcome and sometimes significant remnant protection works.

As a result of a range of extension activities agency and industry bodies appear to be more aware of native biodiversity and environmental best management practices. A very noticeable and positive change in landholder attitude towards the retention of native vegetation and works associated with protection and enhancement is evident with landholders now protecting larger areas of remnant vegetation and are showing a greater awareness of environmental protection legislation and enforcement procedures.

This year's works program has led to the protection of 174ha of wetland and remnant vegetation.

Farm Program

A particular highlight in the works program was the completion of a further 189 Whole Farm Plans grants. These related to 189 properties and covered 16,675ha, resulting in 54.1% of the irrigated part of the region now being covered by Whole Farm Plans. This project continues to exceed targets. As well, the Whole Farm Planning process continues to evolve and improve to satisfy changing environmental requirements.

Over 75.5ha of native vegetation was planted on properties in the SIR as a result of the program. Another 109ha of remnant vegetation on private land were fenced for protection.

Landholders in the region have continued to implement salinity mitigation works, encouraged by the public expenditure in infrastructure such as surface drains and public groundwater pumps. Initial estimates indicate that landholders have expended over $35 million on their properties. Works such as farm re-use and improved irrigation layout contribute significantly to the improvement in water use efficiency. These have both environmental and economic benefits. Each year in the SIR, a further 6% of properties are installing drainage re-use systems and 3% of the irrigation area is lasergraded.

The SIR IC has introduced two new incentives for next year to further encourage improved irrigation management. The incentives are for construction of re-use systems and installation of automatic irrigation. These two incentives created a large amount of interest with 343 applications for the re-use incentive and 203 for the automatic incentive. Seventy-two (72) re-use incentives have been paid for systems that drain 6,078ha and twenty-seven (27) automatic irrigation systems have been installed under the scheme. These automatic irrigation systems service 1,373ha. It is interesting that 27 channel outlets have also been automated under the scheme.

A matrix determines the rates for both incentives. The matrix assesses the existing commitment of each landholder to implementing all aspects of the Regional Catchment Strategy.

The main aim of the Pest Plant and Animal program in the SIR during 2001-2002 was to maintain a more co-ordinated approach to pest management in the community. Through the efforts of the Goulburn Murray Landcare Network (GMLN) facilitators, SIR Landcare Groups and DNRE staff, significant progress has been made towards this objective.

Waterways Program

The GB CMA within the SIR completed an impressive array of works related to waterway management. The Waterways Program in the SIR has focused on targeting specific reaches of the rivers and streams to achieve multiple benefits in stream health, water quality and biodiversity. The primary targets this year were the Seven, Castle & Pranjip Creeks, the western part of the catchment incorporating the Cornella and Yallagallorah system along the Goulburn River and Broken Creek. Community support for the works program as a result of the Local Area Planning process has continued to be a highlight.

Major projects included the development of the River Murray Action Plan with the Murray-Darling Basin Commission and NSW Department of Land and Water Conservation for the River Murray between Yarrawonga and Echuca and the bank stabilisation works on the Goulburn River at Mooroopna involving over 10,000 tonne of rock. Last year, the works program resulted in over 13 work sites being completed including rock beaching and grade control structures. Two fishways and two fish ladders were also built.

Implementation of the Waterway Fencing Incentive Guidelines resulted in over 34kms of frontage fenced and protected from stock and 1,000 plants established to revegetate some of these areas. These were mainly under-storey species but included some trees, grasses and wetland species. This was well down this year due to the dry conditions.

The success of the river health program is monitored and evaluated using the statewide index of stream condition. This index reflects the various aspects of river health (water quality, in-stream habitat, river hydrology, riparian condition and river form).

A wide range of research evaluation and demonstration projects continued to be supported within the catchment with a range of partners.

Surface Water Management Program

The Surface Water Management Program continues to progress well with 12.2km of Primary Drains constructed, 5.3km of existing Primary Drains remodelled, and 30km designed, along with another two weirs replaced on the Broken Creek. As well 12.4km of Community Drains were constructed this year. In addition 49.4km were surveyed and designed. This provided a regional drainage service to another 2,460ha, protecting this area from waterlogging and rising watertables.

Progress occurred in a number of developments, including drain monitoring, nutrient stripping and drain management, to keep the SIR at the leading edge of best practice. All of these developments are aimed at improving downstream water quality.

Drainage resource assessments have been completed for 19 of the 20 existing main drain catchments in the SIR. Drain Diversion Plans have been completed for all but four of these catchments, allowing allocation of additional drainage diversion licences to proceed.

A template developed for Drain Management Plans has been trialed on the new Muckatah and Campaspe 3A drains, as well as the existing Murray Valley Drain 13. Metering of drain diversions continued, however some types of indirect flow meters installed several years ago have failed prematurely. Two Water Services Committee Areas remain to be completed.

The program continued a joint research project together with G-MW and Land & Water Rural Research & Development Corporation (LWRRDC) looking at ways of reducing the nutrient and sediment loads in surface drains.

The continued deliberations of the Farm Dams Review and its potential implications interrupted the demand for the Nutrient Removal Incentive Scheme. This Incentive Scheme is aimed at building large farm storages (greater than 50ML) to capture high flow diversions from our major drains and it results in significantly reduced nutrient outfalls from the region.

Two new systems were completed this year with capacities of 200 and 150ML. There have been fifteen systems constructed with assistance from this project with a total capacity of 2,665ML. A survey undertaken over 2001-2002 indicated that these storages were able to prevent 2.5 tonne of phosphorus from reaching the rivers of the region. This was much lower than last year because of the drier season.

Sub-surface Drainage Program

Implementation of the SIR Groundwater Management Plan continued with flow meters being fitted to 39 private groundwater pumps, bringing the total number of meters fitted under the three-year program to 355. The metering program is now effectively complete with 725 private groundwater pumps now metered. Routine groundwater monitoring, flow meter reading and groundwater sample collection and analysis were completed. Monitoring, analysis and reporting for the August 2001 watertable study were completed.

Members of the SIR IC have also been involved in the development of management plans for the Katunga and Campaspe Deep Leads. These have been through the public consultation stage.

As well as the work on the Groundwater Management Plan, the Sub-surface Drainage Program continued to progress. This year, a further five group groundwater investigations were undertaken in co-operation with the Goulburn Murray Landcare Network (GMLN). These have proven to be more efficient than investigations on individual farms. Exploratory drilling investigations were completed on 61 properties, identifying 11 sites suitable for private groundwater pumps and 17 sites with potential to be developed for public pumping sites. Twenty-nine investigations are still currently in progress and there are 112 farmers on the waiting list.

Promotion of the Private Groundwater Pump Installation Program included production of Farm Exploratory Drilling Service information and a promotion video. A field day was held to launch the 200th new pump installed. A further five private groundwater pumps were installed and six existing pumps upgraded. This brings the total number of new pumps to 220, with 70

upgraded, protecting over 30,580ha. A further 21 systems are in the process of being completed. A further six public pumps were completed bringing the total of 32 protecting over 4,600ha.

Presentations were made to Moira Shire on the Local Government contribution to ongoing costs of SIR Catchment Strategy implementation.

The Sub-surface Drainage Program completed a review of the second 5 years of Sub-surface Drainage Program implementation. This included a significant input into developing a Future Directions Strategy.

A great deal of time has been put into refining the Salt Disposal Guidelines for the program. No winter-spring salt disposal under the Murray Darling Basin Salinity & Drainage Strategy was available from groundwater pumps last year, due to the low flows in the River Murray. The SIR is presently debited with 2.52EC of its allocation of 4.9EC.

During the year a project looking at "Effective Implementation of Best Management Practices in the Shepparton Irrigation Region" was conducted. The main aims of the project are to identify barriers to change in groundwater management and map various chemical parameters of groundwater bores across the SIR.

To determine barriers in effecting change in management of groundwater by pumpers, a phone survey of 115 groundwater users in the Kyabram-Tongala district was undertaken. Preliminary findings indicate that the knowledge base of groundwater users (in regard to best management of their groundwater) is quite varied. Further, the survey results demonstrate that "knowledge does not influence behaviour". This means if the Sub-surface Drainage Program requires change in management of groundwater then other methods of generating change will be needed – providing extension leaflets only goes part of the way.

Mapping the chemistry of groundwater across the region has shown there are some hazards with groundwater when used for irrigation purposes. Sampling of groundwater this year proved to be the most successful with more than 500 groundwater users participating in the annual G-MW sample mail out.

Funding

The implementation of the SIR Catchment Strategy is funded jointly by the regional community and the Victorian and Commonwealth Governments. The program has continued to attract significant Federal funding – a reflection of our ability to implement well-planned, environmentally sensitive and cost effective works. However Federal allocations are declining.

In 2001-2002, the total SIR IC budget was over $18 million. This was composed of 46% State funds, mainly from the salinity and river health programs, 31% of Federal Natural Heritage Trust funds, mainly from the MD2001 and 3% from the National Action Plan programs. The majority of funds (75%) were directed to works. Other components include research and investigation, extension, monitoring, planning and co-ordination.

General

The SIR IC has continued to work closely with local Landcare Groups and networks to ensure their input into and support of the SIR Catchment Strategy. The SIR IC has continued with the Community Salinity Grants program. Last year the grant allocation was increased and 30 groups in the SIR received a share of $30,000 for a range of projects.

Local Area Planning (LAP), as a means of delivering strategic planning aligned to the Goulburn Broken Catchment Strategy at a sub-catchment (Landcare Group) scale continues to gain momentum. This project is a joint activity between the GMLN, DNRE and the GB CMA with eight LAP groups progressed through 2001-2002. The first LAP groups to be launched, the Cornella LAP and the Wyuna LAP, are now well into implementation of the plans. The Invergordon LAP and the Nanneella LAP were successfully launched in 2001-02, and four other groups have all made progress in developing LAPs for their areas.

LandLearn

LandLearn has continued to work in partnership with GB CMA to deliver activities and curriculum resources to environment education programs in schools across the catchment. For example LandLearn staff provided advice and resources for the Mid Goulburn Education Kit for schools. The GB CMA was represented at "Careers Day Out 2002" held at Dookie College in May 2002 when 2400 students, teachers and parents explored career and course options in workshops and exhibits.

Over 600 students from within the Goulburn Broken catchment and beyond have used elements of the Agriculture and Land Management Fieldwork Kit 2001 to explore agriculture and natural resource management in the lower Goulburn Broken catchment. The fieldwork featured in workshops for 92 teachers and trainee teachers at four different forums. The recent LandLearn newsletter, (delivered to every school in Victoria plus 200 supporting education and industry organisations), featured the Goulburn Broken catchment.

Policy and Planning

The SIR IC and its working groups have had a major input into review of the SIR Catchment Strategy to align with a number of State activities and the National Action Plan (NAP). This includes reviews of Surface Drainage, Farm, Environment, Waterway and Sub-surface Drainage programs. These activities have provided the opportunity to reflect on our progress in implementing the SIR Catchment Strategy and develop programs to take these activities into the future.

The SIR IC and its working groups had significant input into the review of the broader GB CMA Regional Catchment Strategy (RCS). This has been a major commitment by members of the SIR IC and working groups, by agency staff and by members of the catchment community. Particular input was received from the LAP groups and the Dairy Industry Action Plan in addition to the specific reviews of each of the programs.

A large input has also been committed to the new NAP processes. Unfortunately this has been unrewarding as yet and the introduction of the NAP has significantly slowed the implementation of SIR Catchment Strategy. The SIR IC prepared its Business Plan as a component of the GB CMA Regional Management Plan. Individual communication strategies are being developed for each new or amended policy issue as they are endorsed.

Future Directions

Major new challenges including the increasing competition for water, structural change and "Greenhouse", will continue to require new thinking to keep our catchment at the forefront.

The SIR Catchment Strategy will continue to evolve as new challenges arise.

PROGRAM REPORTS

INTRODUCTION

The year 2001-2002 has been one of achievement and progress in the implementation of the SIR component of the Goulburn Broken Regional Catchment Regional Strategy.

The partnership program with the Catchment and Water group of the Department of Natural Resources and Environment (DNRE) is delivered with our regional partners in Goulburn-Murray Water (G-MW) and DNRE. The progress towards our targets for onground works continues to be impressive. The support given by agency staff and the regional communities has been enthusiastic and dedicated towards achieving positive results.

Program Reports are represented under the headings of each of the programs and their sub-programs, as detailed below.

Program	Sub-Program
Environmental Protection	• Environmental Works on Public Lands • Environmental Works on Private Lands • Wetlands Grants (Bushcare) • Wetland Ecology Planner
Farm	• Irrigation Management – WFP Grants • Irrigation Management – Automatic Irrigation • Tree Growing – Environmental Works • Water Quality • G-MW Extension – Farm Management Services • Agronomic Research and Investigation
Surface Drainage	• Environmental Assessments • Community Surface Drains • Drain Management • Nutrient Removal Incentives
Sub-surface Drainage	• Public Groundwater Pumps • Private Groundwater Pumps • Capital Grants for Salinity Control Works
Waterways	• Waterways • Sewerage Treatment Plants • Urban Stormwater • Floodplain
Monitoring	• Environmental Research & Investigation • Shepparton Drain Nutrients • Mandatory Environmental Monitoring • G-MW Monitoring
Program Support	• DNRE Program Management • Community Support • Municipal Coordination • Community Education • Planning
Research – Water for Growth Projects	• Policy Mechanisms to Drive Improved WUE • Bayesian Networks for Water Resource Decisions • Increased WUE through Improved Irrigation Systems

ENVIRONMENTAL PROTECTION PROGRAM

Goal: To prevent and, where possible rehabilitate the natural environment of the Region from loss or serious damage from high watertables and salinity.

Environmental Works on Public Lands

Works were performed on 17 Public Land projects with 187.5ha of plains grassy woodland fenced and 7ha revegetated. The amount of area revegetated was lower than previous years due to a change in focus from traditional seedling planting to direct seeding.

After successful direct seeding trials in the Nathalia district in August 2001, the SIR IC purchased a Burford Direct Seeder. Over 73ha of public land was prepared for seeding in August 2002. Revegetating such a large area would be difficult with seedlings however it is anticipated that the area can be direct seeded within two weeks given favourable conditions.

Because of the large area to be direct seeded, seed collection was a priority for this year. Working closely with the Goulburn Broken Indigenous Seedbank, 110kg of native seed was collected within the SIR. The Public Land Works Program also contributed $15,000 for the establishment of the Seedbank, which will prove to be a significant investment for future revegetation projects in the SIR.

Once again we have had excellent community support with 16 community groups involved in the program. They include Koyuga Landcare Group, The Yalca South and Narioka Recreation Reserves Committees of Management, Superb Parrot Project, Broken Creek Improvement Group, Nathalia Tree Group, Numurkah Golf Club, Cussen Park Committee of Management, Broken Creek Field Naturalists, Fig Tree Community Gardens, Rumbalara, Picola CFA, Nathalia Rotary Club, Undera Landcare Group, Nathalia and District Development Corporation and the Yorta Yorta Nation.

A number of agencies were also involved and of assistance including Moira Shire, City of Greater Shepparton, Campaspe Shire, Parks Victoria, Goulburn Broken Indigenous Seedbank, Greening Australia, the Regional Environmental Employment Program, Conservation Volunteers Australia, California Corps, and G-MW.

Environmental Works on Private Lands – Grants (C304/F221)

The number of landholders interested in undertaking environmental works remains high. The number of landowners that had environmental grants was 30 more than the annual target. These extra 30 grants can be mainly attributed to targeted Grey Crowned Babbler extension work and also to the increased level of funding being offered through the Environmental Grants Matrix.

The number of hectares of remnant vegetation protected was more than double the annual target with 112ha. This was assisted by three large remnant blocks being protected, 44ha (Stevensons, Wunghnu), 25ha (Browells, Torrumbarry) and 11ha (Costellos, Murchison). All three of these sites have agreed to put Trust for Nature Conservation Covenants on their properties to ensure protection of these sites in perpetuity.

Approximately 40ha of wildlife corridors were established this financial year. Many of these provide important linkages for fauna species such as the Superb Parrot and the Grey Crowned Babbler. The revegetation figure for the number of plants put in the ground was double the amount of last year with 42,314. These plants were used to enhance 21.12ha of remnant vegetation and create 38.48ha of wildlife corridors.

This year there was protection of an exceptional amount of threatened flora (80.5ha) and fauna (59.16ha). The Grey Crowned Babbler Project assisted in the protection and creation of habitat of this Victorian Rare or Threatened (VROT) bird species.

Many threatened plant habitats were protected this year including some notable species such as Northern Sandalwood (Santalum lanceolatum), Kamarooka Mallee (Eucalyptus froggatti), Broom Bitter Pea (Daviesia genistifolia), Pepper Grass (Panicum laevinode), Hooked Needlewood (Hakea tephrosperma), Waterbush (myoporum montanum) and Cane Spear Grass (Austrostipa breviglumis). A range of regionally significant tree, shrub and grassland species were also protected from inappropriate grazing with fencing.

There was again strong links with Trust for Nature, Land for Wildlife and Greening Australia which has led to landholder interest in grants as well as adding to the ecological knowledge within our group.

Extension Officers working for the Environmental Grants – Private Land Project have been successful in generating interest in long term protection of high quality sites (Trust for Nature Covenants). Four potential covenant sites have been recognised, with the owners expressing interest in Conservation Covenants. These have ranged from Northern Plains Grassland, Yellow Box Woodland and Grey Box Woodland area with Hooked Needlewood.

The community interest in the weekly Bush and Land newspaper articles continued, with most articles generating numerous phone calls to authors.

Wetlands Grant (Bushcare)

Bushcare is a regional approach to integrated wetland management. This is part of the amalgamated Natural Heritage Trust (NHT) project entitled "Protecting and enhancing depleted vegetation types in the Goulburn Broken Catchment". This report only covers the SIR component of this project.

Target: To protect 25ha of wetlands on private land

Progress: Protected 54ha of wetlands on private land and 2.2km of fencing erected

Wetland Ecology Planner

This financial year has seen the consolidation of the Wetland Ecology Planner role and the process under which to develop Wetland Environmental Management Plans with completion of the 'Guidelines for the Development of Environmental Management Plans for Wetland and Terrestrial Sites'. This has involved co-ordinating both the wetland and terrestrial management plan processes to ensure a uniform approach to development, consultation, presentation and promotion of management plan processes. Two management plans have been edited to meet new format requirements. The Reedy Swamp Environmental Management Plan is nearly ready to be released for final review to sign off. The Mansfield Swamp Environmental Management Plan is near completion for stakeholder release.

A key outcome of the Mansfield Swamp Environmental Management Plan process has been the upgrade of regulating structures within the wetland reserve and on the Timmering Surface Water Management Scheme to ensure delivery of water to the wetland from the Woolwash and Timmering catchments.

A key outcome of the Reedy Swamp Environmental Management Plan process was the co-ordinated (Parks Victoria, G-MW, DNRE and Field & Game Australia) operation of drainage infrastructure (Drain No.3) to allow for necessary drying of the wetland. This infrastructure was also used to deliver catchment flows to the wetland followed by an Environmental Water Allocation which was then further complimented with diversion of unused channel outfall.

Conservation Volunteers Works Program Report (Public/Private Lands)

Conservation Volunteer crews once again worked in the SIR this year for a total period of five weeks. The volunteers performed site maintenance on past public land planting sites; erected 3.6kms of fencing as well as planting over 24,000 seedlings. Of those seedlings, 20,000 were planted in a three week period in Autumn 2002. This was the largest revegetation effort undertaken by the Volunteers in the SIR. The crews worked on six neighbouring properties in the Strathmerton district as part of the Grey Crowned Babbler project which aims to create habitat and corridors for this endangered woodland bird and other species.

The crews came from a variety of countries including Japan, America, Canada, Korea, Ireland, Sweden, England as well as local volunteers. They particularly enjoyed working in the Strathmerton district where they regularly saw koalas and kangaroos. The landowners involved also enjoyed both the assistance and cross-cultural interaction with the volunteers. Long time farmer in the district, Eddy Bourchier, remarked that the project was "the biggest thing to happen in the area since settlement".

FARM PROGRAM

Goal: To reduce groundwater accessions, soil salinisation and water logging on farms.

Irrigation Management

Whole Farm Plan – Grants/Extension Staff (F099A)

A total of 189 Whole Farm Plans were completed covering an area of 16,675ha during 2001-2002. This exceeded the target number of plans to be completed (140) and resulted in the largest area Whole Farm Planned in a year since the start of the Whole Farm Plan Incentive Scheme. This outstrips the previous record of 13,244ha set in 2000-2001. Part of this increase can be attributed to the introduction of new incentives for Automatic Irrigation and Drainage Re-use systems. Both of these incentives require a Whole Farm Plan as part of their eligibility criteria.

Whole Farm Plans were prepared for four horticultural properties covering 299ha and 186 broadacre properties over 16,376ha. Over 54% of the irrigated area of the SIR has now been "Whole Farm Planned".

A total of nine "Introduction to Horticultural Whole Farm Planning" workshops were held in the SIR, with 72 people attending these. As a result of these workshops six new applications were received for Horticulture Whole Farm Plans, whilst work was undertaken with a further 20 applicants who had previously applied. Following a request another workshop is proposed for September 2002 specifically aimed at citrus growers in the Cobram area.

A total number of 280 Whole Farm Plans commenced in 2001-2002. This was the highest number of plans to commence since the start of the Whole Farm Plan Incentive Scheme beating the previous record of 226 set in 1992-1993. Whole Farm Plans undertaken in Local Area Plan areas were recorded for the first time in 2001-2002. A total of 56 plans were completed in areas covered by a Local Area Plan, covering 6,506ha.

Grants totalling $502,667 (excluding GST) were paid to landowners for preparing their Whole Farm Plans, well above the initial target of $350,000 and slightly above the modified target of $499,940. Landowners paid $1,037,854 (excluding GST), for the preparation of these plans. A total of 70 grants were paid to landowners for having their plans certified by Local Government, more than doubling the number of plans certified in 2000-2001 (30).

Automatic Irrigation – (14,397)

Long term objectives (after 3 years) of the project

- The promotion, adoption and uptake of automatic control of flood irrigation.
- Improved water use efficiency, leading to reduction of watertables, reducing areas affected by salinity and lower nutrient loads to the rivers.

Short term objectives (to be achieved in 3 years or less)

- Increase area of automated flood irrigation in the SIR by 500ha for each year of project.
- Demonstrations of benefits of automated irrigation systems particularly those that directly impact on irrigators including: reduced irrigation labour requirement, improved lifestyle, greater flexibility to commence and cease irrigation and reduce wastage of water.

Project Planning, Review and Evaluation

The team consisting of two project officers together with their supervisor and other Water Use Efficiency staff went through the process of identifying activities and outcomes for the Water Use Efficiency projects as a whole. The process helped determine priorities and directions of Water Use Efficiency projects. The work program for the Water Use Efficiency (automation) project was regularly reviewed to assess priorities and improve activities. An Evaluation Plan was also developed to assess the outcomes of the project. A Communication Strategy was also developed to secure the support and commitment of those people and stakeholders who have an interest in the project.

Implementation Activities

- Introduction of New Automatic Irrigation Incentive.
- The Automatic Irrigation Incentive launch on 31st January by Russell Pell of the SIR IC.
- Presentations given regarding the new incentives for automation to all the Water Services Committees (WSCs) in the SIR (Rochester-Campaspe, Central Goulburn, Shepparton and Murray Valley).
- Individual briefings to manufacturers of automatic equipment about the new incentives.
- Presentations to Target 10 Officers, Salinity Extension Officers and Water Use Efficiency Officers (Research).
- Involvement in 28 Whole Farm Plans to discuss automatic irrigation options.
- Four automatic irrigation farm walks were conducted during November 2001 and March 2002 demonstrating the advantages and disadvantages of automation (Wunghnu, Tongala, Nanneella and Katunga). Three of the properties had installed a SCADA (Supervisory Control and Data Acquisition) based automation system. One property had a pneumatic system. Altogether there were more than 150 landowners who participated in these farm walks.
- An Automatic Irrigation Trailer with different types of automation was used to demonstrate the automation equipment available. This equipment was regularly updated with detailed consultation with manufacturers. The trailer is very popular as it shows how some of the equipment works.
- An Automatic Irrigation display at the Stanhope Field Days on 10th and 11th April jointly with G-MW, showed the types of automation currently available. Several follow-up visits resulted from the display.
- 197 applications have been made for the Automatic Irrigation Incentives. Among these, the total number of automatic irrigation systems completed with assistance from the incentive scheme is 27, automating 1,373ha. The majority of landowners who have

applied were considering the installation of some form of automation on their respective properties in the near future.

- A series of newspaper articles were produced on the basis of interviews with four landowners who had installed automatic irrigation systems on their properties.
- Two radio interviews and several media releases were published in several local papers about the Automatic Irrigation Incentive.
- Survey levels of farm channels were undertaken on two properties where the landowners were having problems with irrigation and wanted to install the right structures for a fast irrigation with minimal head loss.

Co-ordination with other Project Teams

- Two additional farm walks were held at Nanneella and Kyabram in conjunction with Target 10 discussion groups to provide information about the advantages and disadvantages of automation.
- Automatic irrigation equipment was displayed at a "Light Soils" Field Day in Campaspe West in November 2001.
- An Automatic Irrigation presentation was given to Dairy Apprentices from Echuca TAFE in September 2001.
- An Automation Farm Walk was run on a Strathmerton property in conjunction with a Tatura Milk suppliers discussion group on the 28th February.
- Visited DNRE Maffra to share program and incentive ideas.
- Undertook Saltwatch activities with Katunga and Katunga South Primary Schools.
- Water for Growth Initiative Evaluation Strategy (with Rendell McGuckian consultant).
- Helped draft Evaluation Plan for Local Area Plans (LAPs).

Tree Growing

Environmental Works – Private Land – Extension (F221/C304)

The Tree Growing Guidelines for the Shepparton Irrigation region state:

"Tree Growing in the Shepparton Irrigation Region is an integral part of all four components of the Shepparton Irrigation Region Land and Water Management Plan (SIRLWMP)".

"The Farm Program can utilise trees to reduce accessions to the watertable and/or actually take up groundwater from the watertable thereby reducing sub-surface drainage and salt disposal needs. In addition, within the Surface Drainage Program, tree plantations can be utilised to recycle nutrients and dispose of water both on farm and at key locations along the drainage system. Within the Sub-surface Drainage Program, tree plantations can provide a productive means of utilising saline groundwater, particularly where salinities exceed 5,000EC. The Environment Program established a key role for trees in revegetation of degraded environments and wetlands".

Outputs

The Tree Growing Program has again exceeded the majority of targets in 2001-2002. The total area revegetated was 19.20ha (48%) above the yearly target. The total number of grants processed was significantly higher than the yearly target, and the total number of grants payed was slightly higher than the yearly target.

The number of grants payed during this financial year was identical to the 2000-2001 financial year (46), although 41 less grants were approved this year (107 grants approved in 2000-2001 compared to 66 in 2001-2002). This suggests a trend towards a higher

completion rate for approved grants. The introduction of the Cost-Share Matrix for Tree Growing Grants in the SIR should also increase the completion rate of approved grants.

The amount of fencing along corridors, 21.58kms compared to the yearly target of 5kms, suggests a trend towards wider plantations, as fencing incentives are only provided for plantations 10 metres wide or greater. Since September 2001 the actual expenditure remained higher than the estimated expenditure, a first for the Tree Growing Program.

Highlights

The Cost-Share Matrix for Tree Growing Grants in the SIR rewards landholders that:

- plant wider corridors and clumps
- revegetate a larger percentage of their property
- link plantations and corridors with neighbouring plantations or remnant vegetation
- carry out the work within 12 months of grant approval

Fencing and Revegetation incentive rates are now in line with the Environmental Grant rates. Landholders are provided with a percentage of $5.00 per metre for standard fencing and $2.50 per tree, depending on the score produced by the Cost-Share Matrix.

The minimum width for a tree growing plantation also increased from 1 row (3 metres wide) to 3 rows (ten metres wide). These changes should ensure larger projects are undertaken by landholders on properties in the SIR.

Water Quality

Improving and sustaining Water Quality in the Goulburn Broken including Nutrient Best Management Practices (BMP) and Dairy Shed Effluent (99120F CAS).

The project was developed with the aim of helping local farmers and the wider community build valuable businesses whilst looking after the quality of regional streams and waterways.

Objectives

- Work with the community of North Murchison/Toolamba to develop a change program for water quality management.
- Minimise nutrients from irrigated and dryland farms to improve the conditions of the local waterways and catchments.
- Assist farmers to confidently design and manage dairy effluent to ensure all effluent remain on the property and is managed to prevent pollution of both surface and groundwaters.
- Increase (promote and encourage) the uptake of dairy effluent best management practices in the Goulburn Broken Catchment to ensure effluent is returned to pastures in a sustainable and productive manner.

Implementation

The change program for water quality management was implemented by demonstrating Best Management Practice for nutrient application on two sub catchment case study farms in the North Murchison/Toolamba catchment. The selection criteria for both case study farms was that the farms should be representative of commercial dairy farms in the catchment, one being average nutrient input and the other being a low nutrient input farm. The volume of water leaving the farms was measured using a v-notch weir. Gamet water samplers collected water samples as run-off occurred. The water samples were then analysed to

determine their nutrient concentration. This was done to demonstrate the benefits of using the nutrient management Best Management Practices. The project also monitored nutrients entering both properties to enable a nutrient budget to be conducted, which was necessary to clarify results.

Community involvement was a key strategy with several meetings and focus groups to discuss the benefits and challenges of using the nutrient management Best Management Practice on farms. Two field days were run for the wider farming community, including service providers, to demonstrate the Best Management Practice for nutrient application on one of the case study farms.

A further achievement of the project was the development of nutrient maps for the case study farms which were used as part of the Target 10 Soils and Fertiliser Program that was delivered to farmers in the Goulburn Broken Catchment. The project also attracted significant media coverage, which has encouraged farmers in other areas of the Goulburn Broken Catchment to seek further information regarding both fertiliser management and dairy effluent management.

In an effort to increase the uptake of Best Management Practice for dairy effluent in the Goulburn Broken Catchment, the project staff conducted 91 farm visits to provide advice on the siting, sizing and management of dairy effluent systems in this reporting period. In addition, there were numerous presentations and workshops conducted with community groups. They are as follows:

- Five presentations were conducted for farmer groups on the subject of dairy effluent management and the infrastructure required.
- Two presentations were conducted for service providers:
    - One of the presentations was targeting Whole Farm Planners where the relationship between farmers having correctly sited and sized effluent ponds and being able to manage dairy effluent effectively, was discussed.
    - The other targeted earth-moving contractors who currently build or plan to build effluent ponds and highlighted the importance of correct sizing and siting.
- Two presentations on the topic of dairy effluent were conducted for school groups.
- Two farm tours were conducted with staff from the Environmental Protection Agency (EPA) to highlight the difficulties of measuring and monitoring irrigation tail water and show the benefits of nutrient management Best Management Practice implementation.
- One farm tour was conducted for the Dairy Research and Development Corporation (DRDC) which was a scoping study completed for future projects.

The Future

The effectiveness of nutrient management Best Management Practice implementation will be analysed whilst gathering information on the barriers and drivers for adoption of the nutrient management Best Management Practice.

Goulburn-Murray Water Extension

Farm Management Services – SIR (F814)

Progress

- Provided advice and information as required to service landholder enquiries. Attended Farm Program Working Group meetings, provided input and discussion papers as required.

- Prepared article on Farm Exploratory Drilling Service (FEDS) near Lockington for the Lockington Community Bulletin. Provided other FEDS promotion activities, including newspaper articles, radio interviews, television advertisements and Landcare group presentations. An information and promotion video on the FEDS program was produced.
- Organised field day for the launch of the 200th new pump installed with SIR Catchment Strategy assistance. Prepared and staffed display at Elmore Field Days. Gave talk on sub-surface drainage in East Shepparton to a meeting of the East Shepparton Landcare Group.
- Provided DNRE a summary of groundwater conditions and salinity risk to land near Waranga Basin that has potential to come under DNRE management.
- Assessed groundwater pumps that appear not to be used to determine reason for no pumping, need for advice, and potential for assistance.
- Assessed 212 Whole Farm Plans referred by Local Government.

Agronomic Research and Investigation

Farm Salinity Management (D115/R147/12180)

Project Objectives: To investigate and field-test a range of management systems for saline drainage effluent in irrigation areas with shallow watertables.

The pumping of saline groundwater is one of the cornerstones of the SIR Catchment Strategy. Where groundwater salinities are low, conjunctive use of groundwater and channel irrigation supplies is recommended. At higher salinities only a portion of the pumped groundwater could be utilised for conjunctive use as full utilisation would result in excessive irrigation salinities and subsequent production losses. Some of the groundwater would have to be used on salt tolerant crops or trees and/or disposed of into evaporation basins. Long-term monitoring programs are essential to investigate processes impacting on the performance of these management systems.

This project currently investigates three management scenarios:

- Full conjunctive use (Tongala project);
- Partial conjunctive use (Mt. Scobie);
- Serial Biological Concentration (SBC) – a pilot salinity management system at Undera where saline groundwater is used on salt tolerant trees/pastures underlain by tile drains, with disposal of a relatively small volume of highly saline tile drain effluent to a small on-farm evaporation basin.

Progress

- Monthly monitoring of wells and groundwater pumps completed at Tongala and Mt.Scobie. Regular data acquisition has been completed to agreed schedule. The Tongala project has now collected over 20 years of groundwater re-use information and has built an invaluable database for understanding the processes associated with conjunctive ground/channel irrigation water. The project has shown that under farm conditions soil salinities can be controlled by full conjunctive use at low groundwater salinities. There is however a rising trend in the water salinity extracted by some pumps, which are approaching levels where full conjunctive options, such as the partial conjunctive use approach being trialed at Mt.Scobie, will need to be considered in the future at Tongala sites.
- “Tongala Groundwater News” newsletter distributed. Distribution of the 2002 “Tongala Groundwater News” newsletter has been delayed pending publication of “Tongala

Groundwater Pumping and Re-use Project 20 Year Review 1980-2000", which has now occurred. The newsletter will be distributed in August 2002.

- Groundwater pumping to evaporation basins and redgum blocks only (EC and quantity).
- Measurement (EC and depth) of wells around groundwater pump, across redgum blocks and around evaporation basins.
- Soil sampling of redgum blocks only.
- Measurement of drainage EC and volume from individual redgum blocks.
- Measurement of drainage and EC from all blocks into evaporation basin.
- Bird surveys.
- Redgum timber volume measurements.
- Soil sampling of redgum blocks only.
- All data acquisition has been completed to the agreed schedule. After five years of application of 9 dS/m groundwater to the tile drained tree and saltbush blocks, no net increase in soil salinity to a depth of 1.5m was found. This indicates that the tile drainage is achieving sufficient leaching and that the productivity of the drained blocks is potentially sustainable. Eucalyptus occidentalis has grown particularly well under these conditions. The fish trials identified a number of species suitable for commercial production under the site conditions. Bird counts at the project site (which was virtually barren before project establishment) have identified over 50 bird species, indicating the biodiversity potential of relatively small re-vegetation pockets in irrigation areas.

Links to On-farm Activity

All project site components have direct links to on-farm activities. The sites cover a logical sequence in saline groundwater management scenarios. Trends found in the Tongala data were identified at the 20 Year Review Workshop as important for future policy development for on-farm drainage water use. A closer integration of the data collected at the three sites will form the basis of the development of a systematic approach to drainage water management, covering a wide range of salinities.

Future Directions

Additional resourcing provided by the GB CMA in 2000-2001 was used to review the Tongala conjunctive use monitoring project and to develop an improved and integrated farm groundwater monitoring and investigation program with regional stakeholders. A review report has been completed. New directions for aspects of the project will be negotiated with regional stakeholders during 2002-2003.

Technical Support for Local Area Plans (R146A/12117)

Local Area Plans (LAPs) are now being developed to accelerate the implementation of the SIR Cacthment Strategy; within a community developed, integrated local framework. The LAPs will be the major vehicle for implementation of the SIR Catchment Strategy and the community groups developing the LAPs require technical and organisational support in the development of their plans.

The project provides technical and organisational support for community groups undertaking LAP development in the SIR. The project also provides technical support for the community-based Watertable Watch monitoring program.

The project ensures that:

- The LAPs are based on good science and align with the SIR Catchment Strategy, while at the same time achieving community ownership of the LAPs; and

- The Watertable Watch monitoring program yields data that is both reliable and useful to the effective implementation of the SIR Catchment Strategy.

Milestones and progress

1. Launch of Wyuna Local Area Plan (LAP)
   Launched in July 2001, and is now in implementation phase.
2. Agency endorsement of Nanneella LAP
   Agency endorsement days were held on 28th June 2001 and 17th July 2001. A community endorsement day was held on 30 August 2001.
3. Nathalia and District LAP initiated
   Group has met on fifteen occasions since their public meeting in April 2001. The plan is progressing well and they are readying for the first stages of endorsement.
4. Bunbartha/Kaarimba/Zeerust LAP initiated
   Community Planning Group formed; has met nine times and is progressing well.
5. Dhurringile LAP initiated
   Dhurringile and District Community Planning Group held a public meeting in February 2002 and formed a steering committee, which met in April to establish a Community Planning Group. The Community Planning Group has met on three occasions and will continue with the planning process, meeting once a month.
6. Invergordon LAP launched
   Invergordon LAP launched in January 2002 and now in implementation phase.
7. Nanneella LAP launched
8. Naaring/Muckatah LAP initiated
   Muckatah Katamatite Naringaningalook held their public meeting at the end of March 2002 and have held four Community Planning Group meetings. The group has also held a bus trip to familiarise themselves with the issues of the Local Area Plan area.

Outputs

- Wyuna Local Area Plan, July 2001, produced (provided with six monthly report January 2002).
- Comments from agency and community endorsement days incorporated into Nanneella Draft Plan
- The Nathalia and District Community Planning Group has set priorities for all of the issues and is currently working on the community/agency share arrangements and making further changes to their draft plan before sending it out to all of the relevant agencies for comment before the endorsement. The Nathalia and District Community Planning Group support the planning and works being done by the Community Capacity Building Initiative Program.
- The Bunbartha Kaarimba Zeerust Community Planning Group has identified aims and actions for the five key areas and are collecting information for the introductory section of their Local Area Plan.
- Dhurringile and District Steering Committee met in April to gain community representation to proceed. The Community Planning Group was set up and seven key areas identified. Currently identifying aims and actions for the seven key areas.
- Invergordon Local Area Plan, November 2001, produced. (Provided with six-monthly report January 2002).
- Nanneella and District Local Area Plan, January 2002. (Provided with six-monthly report January 2002).

- The Muckatah Katamatite Naringaningalook Community Planning Group is set up and has identified eight key areas. Currently working through identifying aims and actions for the eight key areas.

Links to On-Farm Activity

The development of the Local Area Plans will accelerate the implementation of the Shepparton Irrigation Region Land and Water Management Plan (SIRLWMP) through carrying out onground works under programs such as the Farm Program and Surface Drainage Program.

As a part of the Local Area Plan process, Community Planning Groups are informed of the works that have been already carried out, alignment of their identified issues with the strategies and priorities of natural resource management agencies, the incentives that are available and who they need to contact for further information.

Local Area Planning promotes Best Management Practices and the actions that need to be carried out by landholders and agencies to achieve the acceleration of onground works and overcome local issues. The Local Area Plan process supports existing works and encourages communities to work on tackling some of the actions as a part of the Planning process.

SURFACE DRAINAGE PROGRAM

Goal: To provide by the year 2020 a surface drainage system to the 267,990ha of the Shepparton Irrigation Region that is currently undrained. Currently 183,100ha is served which is 35% of the area.

Environmental Assessments

Environmental Works – Drainage (C144)

Following on from a successful year in 2000-2001, the 2001-2002 financial year has again been very successful with the majority of the Project Targets having been met and three exceeded. The success achieved this year is again of particular significance when you take into account the prolonged dry conditions that have prevailed in our catchment which has resulted in the continued reluctance by the catchment community to undertake Surface Water Management and Environmental works. Staff departures and secondments have compromised our ability to service all the requirements of C144 stakeholders. Project activities will be prioritised according to demand and resource availability.

Community Surface Water Management Program

A detailed Environmental Assessment of the Shepparton 26P catchment at Kaarimba was recommenced during the year with that scheme finally moving to detailed design. Field assessment and alignment negotiation for that scheme has been completed and the draft detailed Environmental Assessment is now in production.

The reviewing of Environmental Assessments and proposed environmental works for existing community catchments has continued along with the development of the process for including proposed works on Works Specification Plans and improvements for getting more onground environmental works. These have been developed for all DNRE staff involved in the Community Surface Water Management Program.

Primary Surface Water Management Program

A detailed Environmental Assessment revision for the Shepparton 2/11 Primary Scheme (Guilfus – Congupna Catchment) was commenced towards the end of the year as part of the revised works program to meet the requirements of the expected changes to the Statutory Planning process.

Progress was maintained in the Weirs Program with Balls Weir and the Melville Street Weir at Numurkah having been constructed and the Station Street Weir at Numurkah having progressed through the Planning and Design Stage.

Sub-surface Water Management Program

Environmental Assessments for the Public Salinity Control Program has not been as active this year with the number of initial pump assessments requested down from the expected eight to four and the detailed/feasibility assessments having been reduced from the programmed seven to five. Of particular note in this year's program has been the extension of environmental protection activities in the Public Salinity Control Program catchments and the cross program linkages which have been forged with Sustainable Irrigated Agriculture and Land Management Program staff of DNRE through an introduction and orientation to groundwater management activities in the SIR, presented at a seminar and catchment tour. Installation of Public Pumps saw a further 9.5ha of remnant vegetation and 1.5ha of wetland protected from high watertables as assessed.

Presentations and Publications

A considerable effort was put in to promoting the Environmental Objectives of the Sub-surface Drainage Program through the presentation of environmental management issues with over eleven presentations and tours having been conducted, thirteen newspaper articles, two feature articles written and two radio interviews conducted. Twenty extension publications were also produced or updated.

General

- The transfer and delivery of Environmental Water Allocations (EWA), for the Goulburn Broken Catchment with environmental water transferred from within the Goulburn Broken Catchment for a delivery to Reedy Swamp in Autumn 2002 when the approved EWAs from the DNRE Murray River Bulk Entitlement could not be transferred.
- The update and presentation of the wetlands component of the EMP Environmental Training program and the development and presentation of other Environmental extension activities.
- The processing of tree growing/revegetation grants for over 23,210 native trees and shrubs in Surface Drainage and Sub-surface Water Management catchments across the SIR many of which have been or are currently being planted.
- The processing of environmental grants to protect 26.5ha of remnant vegetation and the enhancement of environmental protection sites with the additional planting of 10,400 trees/shrubs.
- The treatment of nutrients utilising wetland technologies with continued input into the D-118 Project at Kinnairds Swamp and at the other trial sites as well as input into proposed urban stormwater and other treatment wetland developments.

The Project Team also had significant input into other aspects of the Environmental Program including the Private and Public Land works programs, Waterways Program and Environmental Monitoring and channel remodelling assessment. Project team input into private and public wetland planning and management and wetland protection activities and Whole Farm Planning has continued to increase this year. The dry season has had other

consequences as well with significant periods of staff time again being required for Fire Management activities on public land.

Program Support

Significant input has been provided throughout this financial year to the Goulburn Broken Regional Catchment Strategy. Reviews (Environment Program, Farm Program and Surface and Sub-surface Water Management Programs) with ongoing input into the outcomes of the Government response to the Nolan Statewide review which focused on the environmental aspects of Victoria's Drainage Program. Another critical issue which has required significant input of project time has been the management of the implications of the new Commonwealth Environmental Biodiversity Conservation Act (EPBC Act 1999). This has been progressed via templating the process which was used to assess the Murray Valley 11 Primary Project and is now being applied to other primary and community projects as they move through the planning process.

The Environmental Assessment Project Team has continued its commitment to program related forums having serviced 45 throughout the year ensuring that the environmental features of the region's catchments are protected and where possible enhanced.

The annual achievements for the project have been reported against the project targets for 2001-2002 in the final report "Project C144, Environmental Works – Surface and Sub-surface Water Management Final Report Summary 2001-2002".

Project targets

- Assess the potential environmental impacts of construction of all proposed Community and Primary Surface Water Management Schemes.
- Assess the potential environmental impacts of all proposed Public Salinity Control Pumps.
- Provide technical input to the catchment community and departments.
- Provide extension of environmental objectives of the Goulburn Broken Catchment Management Strategy to the community and other agencies (complements Projects C137 Private Land Works and Project C105 Public Land Works).
- Ensure that environmental features in Surface and Sub-surface Water Management Catchments are protected and enhanced.

Other significant achievements

- Negotiated and secured a cross catchment transfer of a DNRE held water right in the Goulburn catchment for an Environmental Water Allocation to top up Reedy Swamp in Autumn 2002 as part of the implementation of the Wetland Management Plan. The 112ML for the flooding was secured and delivered to the public wetland along with negotiated channel shutdown flows totalling approximately 220ML. The transfer was negotiated when the approved Environmental Water Allocations from the DNRE River Murray Bulk Entitlement could not be transferred.
- Tree growing/revegetation grants were processed for 17,890 native trees and shrubs in Surface Water Management Scheme Catchments across the SIR.
- Environmental grants processed in Surface Water Management Scheme catchments for the protection of 26.5ha of remnant vegetation with an additional 10,400 native trees/shrubs to be planted.
- Provided input to the independent review of Environmental Aspects of Victoria's Surface Drainage Program including the High Level Operating Agreement (HLOA) process.

- Provided significant input into the SIR Environment Program, Surface Water Management and Sub-surface Water Management Program Five Year Reviews – including the workshops to establish program priorities and targets for the next 5 years.
- Produced and implemented a template process for assessing the impacts of the newly enacted Commonwealth Environmental Protection and Biodiversity Conservation Act (1999) as tested with the Murray Valley Drain 11 primary project and now applied to both Primary and Community Surface Water Management Schemes.
- Developed and trialed new project reporting processes and updated Catchment Environment Officer and reporting roles and responsibility flow charts/templates.
- Provided the Environmental input into, and assisted in further developing the Project D118 "Nutrient Removal from Drains using Wetland Technologies" at Kinnairds Swamp and the other trial sites.
- Project staff assisted in seed collection activities and the planting of over 2000 native trees and shrubs as part of the Conservation Volunteers Australia Program.
- Project staff assisted in the implementation of the Mooroopna Sandhills Project.
- Project staff assisted in the implementation of the Mandatory Monitoring Program (ie site assessments and data collection throughout the four seasonal collection periods).
- Project staff assisted with the implementation of the Salt Watch Program – 2002.
- Project staff assisted at the DNRE stand at the Royal Melbourne Show – October 2001.
- Environmental assessment and negotiations for the protection of environmental features of 5 channel remodelling proposals.
- Project staff assisted with fire management on public land in the Shepparton fire management district in 2001-2002 with a record number of fires (81) requiring turn out.

Co-ordination and Support for Community Drains (D806)

- Ongoing support as required
- Process for transferring existing community surface drains to G-MW management is being developed

Drain Management

MD2001 Irrigation Drains Program (DV705/99120F)

The Irrigation Drain Program (IDP) is a component of the water quality strategies of northern Victoria that aims to reduce the adverse impacts of irrigation drainage on receiving waters. The program has been jointly funded by G-MW, and the Commonwealth Government and Victorian Governments since 1997. The activities undertaken over the 2001-2002 financial year under the major components of the IDP are detailed below.

Drainage resource assessments have been completed for 19 of the 20 existing main drain catchments. Drain Diversion Plans have been completed for all but four of these catchments, allowing allocation of additional drainage diversion licences to proceed.

A template developed for Drain Management Plans has been trialed on the new Muckatah and Campaspe 3A drains, as well as the existing Murray Valley Drain 13. Metering of drain diversions continued, however some types of indirect flow meters installed several years ago have failed prematurely.

Drainage Diversion

Drainage Diversion has been identified as one means of reducing irrigation drain outfall. In October 2000 the Drainage Diversion Strategy was completed following several rounds of consultation with key stakeholders. The purpose of this strategy is to set framework to manage drainage diversion, and it includes guidelines for assessing drainage diversion applications in gauged and ungauged catchments. Implementation of the Drain Diversion Strategy will be via Drain Management Plans. Drain Diversion Plans will form a significant component of Drain Management Plans.

Drain Management Plans

Drain Management Plans (DMPs) are intended to be a single reference point for all issues relating to the management of a drainage system. As well as containing Drain Diversion Plans, DMPs will include sections on catchment characteristics, drain design principles, operation and maintenance aspects, emergency response measures, management arrangements, and monitoring and reporting programs.

Drain Diversion Plans

Drain Diversion Plans will provide drain managers with a tool for assessing applications for drain diversion permits and determining progress against diversion targets. Drain Diversion Plans are being formulated following priorities based on known water quality impacts on waterways and resource management considerations. Drain Diversion Plans are based on resource assessments that have been undertaken based on a standard (benchmark) period of years.

Resource assessments have been completed for all 20 existing main drain catchments except Mosquito Depression. Those completed cover Murray Valley Drains 3, 5, 6, 13, 18, 19 and 20, Shepparton Drains 2 to 16, Deakin, Warrigal Creek (Wyuna, Coram, Tongala), Rodney-Ardmona and Lockington-Bamawm. Drain Diversion Plans have been completed for all but four of these catchments (Mosquito, MV Drains 13 and 18, and Warrigal Creek).

Muckatah Drain

The drainage resource assessments have identified over the entire Shepparton Irrigation Region a further 41GL is available for allocation under drainage diversion agreements. This would bring the total volume allocated to drainage diversion to 124GL, although this includes an existing 25GL over allocated on some drains. This 124GL is marginally less than the target identified in the Goulburn Broken Catchment Water Quality Strategy of 132GL necessary for diversion to reduce nutrient loads by 50%. The nutrient reduction target therefore may not be met through drainage diversion alone, but it should go very close. The Water Quality Strategy recognised that on-farm activities such as installation of re-use systems and implementation of best practices would also lead to reduced drain flows and nutrient export.

Of the further 41GL identified as available for diversion, 16GL is available under low flow agreements and 25GL under high flow. Several drain catchments have been identified as being over-committed to low flow diversion allocations including Deakin, Bamawm, Lockington, and Shepparton Drain 11.

During the 2001-2002 year the total volume measured as diverted was 66GL, and it was estimated that a further 11GL was diverted through unmetered drainage diversion installations. High flow diversions accounted for less than 1GL of the total diverted, due to the low rainfall and subsequent lack of high flow events.

Total drain flows for 2001-2002 are not yet available, but in 2000-2001 the estimated 64GL diverted from monitored drains compares to 117GL outfalled, ie. 35% of the potential drain

outfall was diverted compared with the Water Quality Strategy target of 50%. Deakin, Warrigal Creek and Bamawm drains had the highest proportions of flow diverted. Drain flows in 2001-2002 were considerably lower than 2000-2001, while volumes diverted were very similar, therefore we expect to be closer to the target.

Metering of Diversion Pumps

The installation of drainage diversion meters is an integral part of the implementation of Drain Management Plans. In the 2001-2002 financial year this program contributed to the purchase of six flow meters for Central Goulburn and 11 flow meters for Murray Valley. Some types of indirect flow meters in both these areas have failed during the year, which has set back the metering program. The metering status therefore remains 80% complete in Central Goulburn, 90% in Murray Valley, 100% in Rochester and 100% in Shepparton. Management of drainage diversion also includes calibration of indirect meters, reading meters and liaison with diverters.

Drainage Officers in each of the Irrigation Areas conduct regular field inspections and monitoring of drainage systems and diversion pump installations.

High Flow Diversion to Storage

The Drainage Nutrient Removal Incentive Scheme is a component of the program that encourages construction of off-stream storages for diversion of high drain flows. Since its introduction in 1998, fifteen storages with a total capacity of 2,485ML have been constructed in catchments in the SIR with assistance from the scheme. Two grant payments were made in 2001-2002 for storages totalling 350ML.

Biocides and Metals

Sediments in drains have the potential to act as both a sink and source of contaminants in drainage water. Analysis of sediments can indicate the potential for re-suspension of contaminants in the water and therefore the potential for these contaminants to affect irrigated crops and pastures. Sediment analysis has been undertaken on three previous occasions, in 1998, 1999, and 2001, that found very little evidence of biocides and metals.

Follow-up investigation and sampling was recommended for three locations following the 2001 study. Moderate levels of some metals were detected at most sites, while DDT breakdown products were again detected in Shepparton Drain 2. The contamination appears to be confined to the drain, as no biocides were detected at a downstream location. Further investigation is under way to attempt to establish the source and threat posed by contaminants.

Pathogens

Analysis of water from 18 locations on drains across the SIR was undertaken between January and April 2002 to assess pathogen levels. Twelve sites were initially monitored over four weeks, then four of these were selected for further sampling together with six additional sites. The results displayed faecal coliform and E.coli levels ranging from 100 to 60,000 organisms/100mL. Median faecal coliform levels above 1000 orgs/100mL are considered higher risk and warrant a management response such as further investigation. High levels were found at 6 of the initial 12 sites and at most of the additional sites. Follow-up work is scheduled for 2002-2003.

Low Level Rock Weirs

Low level rock weirs are arrangements of rocks across the drain profile that enhance opportunities for drainage diversion and improve sediment trapping to improve the water quality of receiving waterways. In 2002 a weir was constructed at the end of Coomboona Drain 3P. A weir has also been designed for Shepparton Drain 4.

Potential Drain Nutrient Discharges

Detailed field inspections were completed in the four irrigation areas in the SIR to identify, map and compile an inventory of discharges into drains and waterways under G-MW's jurisdiction. Database entry is 90% complete. The data has allowed G-MW to identify the issues of greatest concern, target priority areas and direct resources to minimise adverse impacts.

Isolated breaches of G-MW Environmental Guidelines have been followed up with the discharger, with intervention from third parties (eg EPA) when required.

Development of by-laws commenced during the year with the aim of providing better control of the quality and quantity of discharges to drains. Legal opinion had previously concluded that water authorities had little legal control over discharges to drains once a property was charged a drainage rate. The by-laws will give dischargers the option of complying with best management practice for their enterprise or meeting stringent water quality levels.

Drain Monitoring

Monitoring of drain flows and water quality parameters at 14 sites continued with funding from the SIR Catchment Strategy and G-MW. Analysis of the 2000-2001 data showed that:

- Deakin Drain discharged the largest load of Total Phosphorous, Total Nitrogen and suspended sediment
- Murray Valley Drain 6 continues to have the highest nutrient generation rate (kg/ha/yr)
- Rodney, Shepparton Drain 12 and the Bamawm drain also have high generation rates
- Overall, nutrient export loads have increased since 1999-2000

Trend analysis indicates that Total Nitrogen and Total Phosphorous concentrations are generally increasing and flows are predominantly decreasing, with the result that loads are decreasing in all drains except Murray Valley Drain 6. Irrigation deliveries were found to have a significant effect on flow and/or nutrient load at a few sites.

In conjunction with Waterwatch, a monitoring program was implemented on Murray Valley Drains 6 and 13 in an attempt to identify 'hotspots' (consistently high nutrient concentrations). Phosphorus, turbidity, salinity and flow were measured at 11 locations on a fortnightly basis. Results so far have revealed significant variation between sites and sampling dates. Investigation of these areas shall continue in 2002-2003, with links to farm extension programs and Local Area Plans developed.

Three new drain flow monitoring installations were completed and a fourth is in the process of being constructed. These provide real-time access to flow data, which will improve day-to-day management of diverters and increase our knowledge of water availability, patterns, trends, etc.

Investigate In-drain Nutrient Sources

Funds and time are being contributed towards the Ecological Risk Assessment project (ERA) for the Goulburn Broken catchment. Phase 1 identified a number of ecological risks associated with irrigation development, including increased occurrence of blue-green algae, reduced native fish abundance and diversity, and spread of aquatic pest plants and animals. Phase 2 seeks to quantify relationships between risk factors and risks, address knowledge gaps and assist in developing a generic framework to apply the approach more broadly.

Farm Program

Related activities, largely undertaken by DNRE staff, include investigation and promotion of Best Management Practice in dairy shed effluent, fertiliser application, water use efficiency and Whole Farm Planning.

In July 2001 incentives were introduced to encourage adoption of re-use systems and automatic irrigation. These complement existing incentive schemes for preparation of Whole Farm Plans and construction of storages for diversion of drainage water.

Activity Summary

- 189 Whole Farm Plans were prepared, covering an area of 16,675ha. Whole Farm Plans completed with the assistance of the incentive scheme now cover 54% of the irrigated area in the Goulburn Broken catchment, up 5% in the past year.
- 72 re-use systems servicing 6,078ha (1.9% of irrigated area) were installed.
- 27 automatic irrigation systems servicing 1,373ha were completed.
- 2 high flow drain diversion storages were completed.

Broken Creek Weir replacement

Eight weirs in the Broken Creek have been replaced since the start of the program in 1996. Reconstruction of the final weir, Balls, was completed in April 2002. The Surface Water Management Program has contributed a total of $204,000 towards the total estimated Broken Creek project cost of over $3.3 million.

Other activities

- MDBC Dairy Environment Stewardship Working Group member
- MDBC Watermark project “Managing Water Quality in Irrigation Drains”
- Potential for use of Polyacrylamide in drains – steering committee member
- Input to Goulburn Broken Catchment Water Quality Strategy update
- Farm Dams (irrigation) review – comment and advice
- North Central CMA Tailwater Strategy – review and comment

Reporting

Regular progress reports (6-weekly) are circulated amongst SIR IC, Surface Drainage Working Group, other forums and relevant staff across G-MW. Annual reports are circulated amongst the same for inclusion in relevant annual reports for GB CMA.

Nutrient Removal Incentives (14998)

The Drainage Nutrient Removal Incentive Scheme was introduced in April 1998 to encourage landowners to construct strategically located storages (drainage nutrient removal systems) to collect and use regional drainage water. The water and nutrients collected can be used productively, and are not lost to areas of the catchment where they can cause problems such as blue-green algae blooms. These storages can increase the volume of water available for irrigation, reducing the amount of nutrient rich water entering catchments.

Project Targets

The Regional Catchment Strategy aims for irrigation drainage nutrient outputs to be reduced by 50% by 2016. The Drainage Nutrient Removal Incentive Scheme is a key component in achieving this target and aims to have at least four high flow storages constructed each year.

Progress

In April 2000, the Minister for Environment, The Hon. Sherryl Garbutt released a discussion paper, Sustainable Water Resources Management and Farm Dams. As a result, the Victorian Farm Dams (Irrigation) Review committee was established and produced a draft report in February 2001.

This review raised several licensing issues which could affect the storages being constructed with assistance from this incentive scheme. The implications for the storages being planned were not clear until May 2001. Once the implications were made clear, the SIR IC lifted the moratorium on storages and informed the landowners (who had applied for the incentive) of the review and the findings. Newspaper articles were placed in the local papers in September 2001 and February 2002, publicising the scheme.

The majority of landowners that applied for the grant decided to wait until the findings were released before they began construction. One landowner decided to begin construction in May 2001 despite the uncertain outcome of the Review, aiming to be completed by August 2002. Two storages were constructed this year. A 150ML storage was constructed in Wunghnu, and a 200ML storage was constructed in Bearii. Both received a grant in April.

There was one new application this year for a 400ML storage at Bearii whilst another seven landowners that have applied for the incentive and had their applications approved are still interested in constructing. Two landowners are keen to begin construction in August 2002 and January 2003.

Since the scheme commenced, 2,618ML of storage capacity has been constructed. During July 2002 all landholders with systems constructed were contacted to determine the volumes of water collected and used for irrigation. Samples of the water were taken and tested for salinity and phosphorous levels.

Due to a dry year and low water availability, the volume diverted was quite low compared to last year's figures with only eight of the 15 storages storing water in the last week of July. Therefore phosphorous and saltloads saved are less than previous totals, as those storages without water in them were not counted. It is thought that these figures are artificially low because of this.

Geographic Information Systems (GIS) was again used to map constructed and planned storages. All Local Area Plan (LAP) boundaries were added to the map this year to indicate any storages which fall into these areas. At present only three previously constructed storages fall into a LAP boundary (Wyuna, and Nathalia and District) and there are currently five planned storages which fall into a LAP boundary (Nathalia and District, Muckatah/Naring and Bunbartha/Kaarimba/Zeerust).

Conclusion

Now that the final Farm Dam Report has been released, with no apparent negative effects on the construction of the storages, all landowners intending to construct have been contacted and all have expressed interest in constructing in the near future.

Despite the release of the Farm Dam Report, construction of storages in 2001-2002 was hindered. However two storages were constructed and grants paid, whilst two more storages made progress towards completion.

SUB-SURFACE DRAINAGE PROGRAM

Goal: To, where possible and justified, protect and reclaim the Shepparton Irrigation Region's land and water resources from salinisation through management of the Region's groundwater.

Public Groundwater Pumps

Implementation of Sub-surface Drainage – Recurrent (D484A)

- Feasibililty investigations in progress – Hunter, Weardon, Collie, Gagliardi, Borgert, Miller and Makin
- Feasibility investigations completed – Forryan, Wyatt, Hamono, Newham and Rathbone
- Final rating in progress – Ro108 and CG12
- Final rating completed – CG9, CG8, CG10 and CG11
- Research & Development Projects – assessment of new gas extraction technology, revision of the Public Pump Design Manual and development of electronic pump control systems
- Strategic Planning – development and implementation of Key Performance Indicators for the Public Pump Program, reviewed planning required for public pumps, assessment of public pump disposal options. Assessed policy on disposal of groundwater to drains, and held discussion with Central Goulburn Water Services Committee. Prepared a publicity pamphlet on groundwater disposal to drains. Assessed options for enhanced groundwater re-use from public pumps and developed procedures for evaluating and selecting discharge points for public pumps.

Implementation of Sub-surface Drainage – Capital (D484B)

- Sites completed and handed over – CG4, CG9, MV1, CG8, CG10 and CG11
- Commissioning in progress – CG12 and Ro108
- Construction in progress – CG13, CG14 and CG15
- Design completed – CG16
- Design in progress – CG17 and RO107

Private Groundwater Pumps

Farm Exploratory Drilling Service (G800)

Pasture property investigations:

- Individual:
  - 48 completed
  - 10 successful
  - 13 unsuccessful but identified 0 potential public pumping sites
  - 13 unsuccessful with limited or no pumping potential
  - 2 unsuccessful due to low yield
  - 9 unsuccessful due to low watertable levels
  - 1 withdrawn by landholder
  - 26 in progress

- Groups:
  - 13 completed
  - 1 successful
  - 4 unsuccessful but identified 0 potential public pumping site

- 6 unsuccessful with limited or no pumping potential
- 0 unsuccessful due to low yield
- 2 unsuccessful due to low watertable levels
- 31 in progress

- Horticultural property investigations:
  - 1 completed
  - 0 successful
  - 1 unsuccessful
  - 0 in progress

Overall 15 completed in Local Area Plan areas
Continuation of promotional program for FEDS

Capital Grants for Salinity Control Works

Administration of Capital Grants and Incentives for Sub-surface Drainage Works (F818)

- Pasture property grants:
  - 5 new systems complete
  - 9 new systems in progress
  - 6 upgrades complete
  - 5 upgrades in progress
  - 7 grant assessment pump tests completed

- Private exploratory drilling
- 0 completed
- 0 unsuccessful
- 2 in progress
- Completed 0 design pump tests.

Total grant payments made by GB CMA $120,839.16

Horticultural property grants – no grant payments made, one new system in progress

Implementation of Groundwater Management Plan (G700)

- Routine watertable monitoring and groundwater database input continued. Additional monitoring was completed for the August 2001 watertable study. Completed analysis and mapping for the watertable study.
- Provided support for the Groundwater Management Plan Working Group. Developed discussion papers on Groundwater Management Plan implementation issues, and discussed these at a Working Group meeting. Reviewed management requirements for the SIR Groundwater Management Plan.
- Where flow meter monitoring after 2000-2001 season indicated zero or very low pumping, these landholders were surveyed to determine the reason for the low pumping. Where flow meters were not recording they were repaired. Where systems were inoperable due to faults in wellpoints or header lines, grants officers followed up to offer advice and assistance to upgrade the systems.
- Metering program: - assessed requirements at 11 sites, installed 39 flow meters. The current phase of the metering program has been completed with the fitting of meters to all operational bores except a few “difficult” sites. There are approximately 100 non-

operational bores that may require metering once they become operational. During the three year metering program a total of 355 flow meters have been fitted.

- Updated co-ordinates of pump sites on sub-regional plans.
- Prepared and distributed to groundwater pumpers a pamphlet to generate further awareness of salt loads being applied through irrigation with groundwater. Commenced trial of EC meter use by landholders to assess benefits to on-farm management of groundwater.

Groundwater Pumping Extension (F121 including 11580)

Farm Exploratory Drilling Service Promotion

The promotion of the groundwater program was increased to attract new interest in the Farm Exploratory Drilling Scheme (FEDS). Renewed effort was made to increase the size of the waiting list from about 10 to more than 100. This has put the private groundwater program in a good position for the next few years.

Public Groundwater Pump Program

During the last year, the processes used for assessing the impacts of Public Pumps were reviewed and improved to assist in identifying impacts of groundwater disposal on irrigated areas and remnant vegetation. There were several new Public Pump Schemes investigated requiring follow-up by Extension Officers in Koyuga, Tongala, Cooma and Stanhope areas.

Groundwater Best Management Practice Project

Funding from the Natural Heritage Trust was received for a 10 month project looking at "Effective Implementation of Best Management Practices in the Shepparton Irrigation Region". The main aims of the project are to identify barriers to change in groundwater management and map various chemical parameters of groundwater bores across the Shepparton Irrigation Region.

To determine barriers in effecting change in management of groundwater by pumpers, a phone survey of 115 groundwater users in the Kyabram-Tongala district was undertaken. Preliminary findings indicate that the knowledge base of groundwater users (in regards to best management of their groundwater) is quite varied.

Mapping the chemistry of groundwater across the region has shown there are some hazards with groundwater when used for irrigation purposes. The infiltration hazard of groundwater (a combination of the sodicity of groundwater and the salinity) was mapped for the 2000-2001 irrigation season.

The biggest challenges facing the groundwater extension program are:

- promoting groundwater pumping to make it attractive to potential new customers; and
- evaluating impacts of extension services in private and public groundwater programs.

WATERWAYS PROGRAM

Goal: Protection and enhancement of the environmental, economic, recreational and aesthetic values of the rivers and waterways (stream health). Protection of public and private assets from stream related impacts.

Waterways

- Rehabilitating the Broken Boosey and Nine Mile Creeks (V8051)
- Implementation of the Lower Goulburn Integrated River Health (V8052)

Funding for the implementation of waterway health programs is provided by local (in-kind), State and Federal Sources.

SIR Implementation Committee Income 2001-2002	
State	$1,241,000
NHT	$777,050
National Action Plan	$ -
Total	**$2,018,050**

The following key projects are undertaken within the SIR. These projects are located within priority management zones.

Acceleration of the Lower Goulburn Integrated River Health Works Program

Investigations into nutrient pollution in the Murray-Darling Basin have identified the Goulburn Broken Catchment as contributing, from diffuse and point sources, nutrients which can affect the quality of water both within and external to the catchment. The nutrient sources contribute to the development of algal blooms (including blue-green algae blooms). Previous successful projects, funded through State and Federal sources, have made significant contributions to improving the health of waterways.

However it is considered essential that we accelerate work towards improving water quality and stream health. The implementation of continued integrated waterway management programs for the Lower Goulburn River and its tributaries the Broken Boosey Nine Mile system, the Seven, Castle, Pranjip Creeks, the Lake Cooper and Corop Lakes catchment. These projects have reduced sediment loads, improved water quality, restored riparian vegetation, enhanced biodiversity within the riverine environment and protected and restored instream ecological values (hence improvement in water quality and stream health).

Regional Environment & Employment Program

The Regional Environment & Employment Program (REEP) is a unique partnership between the SIR IC, DNRE, G-MW, Goulburn Murray Landcare Network, and philanthropic trusts, the community and private employers. It will build on a pilot project (GVEEP) in 1998-1999, as a step to making it self-funding in future with boosted local contributions. It has completed a range of onground works within the GB CMA Regional Catchment Strategy, especially the river health program.

Accelerating nutrient management within the Mid and Lower Goulburn Broken Catchment

The primary focus was to reduce nutrients and sediments entering our streams, through in-stream and near-stream erosion control, fencing and revegetation.

Kinnairds Wetland Recreation Masterplan and Numurkah to Kinnairds Recreation Plan

The aim was to develop a landscape plan for Numurkah which links the existing parks and gardens with the environmental features along the Broken Creek. In conjunction with the Shire of Moira and other relevant stakeholders, recreation plans are being developed for the Kinnairds Wetland and the Broken Creek and surrounds in the vicinity of Numurkah. Final designs have been completed for the Kinnairds Wetland Masterplan with implementation of some works underway.

Fish Migration Broken Creek

The aim is to enhance native fish populations through the removal of barriers to fish movement. Fishway projects completed during the 2001-2002 year within the Goulburn Broken Catchment included Balls Weir downstream of Nathalia, and Melville Street fishway

in Numurkah. The Lower Broken Creek Fish Ladders are being funded through a range of initiatives including the Nutrient Management Initiative, Natural Heritage Trust, State Waterways Program and the Surface Water Management Program. These projects were constructed using the resources and expertise of G-MW. An investigation of the effectiveness of the Broken Creek fish ladders has shown an equalisation of numbers of native fish both upstream and downstream of the fish ladders. This is in contrast to the situation before the fish ladders were constructed where fish numbers were high at the base of the barriers downstream and lower immediately upstream.

One more fish ladder remains to be installed at Station Street in Numurkah. This will see over 400km of stream opened up for fish passage.

River Murray Yarrawonga to Echuca Action Plan

In February 2002, The GB CMA, NSW Department of Land and Water Conservation (DLWC) and the Murray Darling Basin Commission (MDBC) engaged consultants Earth Tech, to develop a Waterway Action Plan for the River Murray between Yarrawonga and Echuca. Earth Tech used a team of specialists and input from a steering group to assist with the work.

The intent of the planning study is to develop and document a suite of management programs that are designed to:

- Sustain continuing and demonstrable improvements in river condition into the future, while recognising economic and water use imperatives
- Stimulate an increasingly holistic approach to managing this section of river, while also recognising its place in the broader Murray Basin ecosystem and economy
- Generate an increasing level of interest, acceptance and commitment from stakeholders and the wider community

Sewerage Treatment Plants

Goulburn Valley Water, the urban water authority for much of the SIR, continued major capital works investing almost $21 million on 95 projects. The scope of work ranged from augmentation of water mains to enable increasing demands to be met, to completion of sewering of small towns, to new and augmented reclaimed water re-use projects. The extensive capital works program will continue for a least the next three years.

Shepparton Wastewater Management Facility High Rate Anaerobic Lagoon

Following the success of Goulburn Valley Water's high rate Anaerobic Lagoon installations at Tatura and Mooroopna, a 200ML lagoon is to be constructed at the Shepparton site. At an estimated project total of $16.4 million, this is the largest project ever undertaken by Goulburn Valley Water. It includes a new lagoon with 5ha polypropylene cover, gas collection and flaring equipment, lagoon aeration and interconnecting pipeline modifications.

The works will reduce odorous emissions from the plant by capturing the gas produced by the process and safely flaring it. The project is of great benefit to Shepparton, as it will allow the large wastewater discharge from local industry to be processed at the plant in an economic and environmentally sustainable manner. The Commonwealth Government and local industry have provided financial support for the project. Project design is complete and the works will be delivered using innovative contract arrangements. The works are to commence in November 2002 and are programmed for completion in December 2003.

Shepparton Wastewater Management Facility Tertiary Plant

A $3.8 million state-of-the-art tertiary treatment plant has been constructed to remove phosphorous and algae from lagoon effluent prior to discharge to the Goulburn River in winter. The plant is a first for Australia and highlights Goulburn Valley Water's commitment

to address environmental concerns through innovative solutions. The project completion is expected in late 2002.

Urban Stormwater

Stormwater – Lake Cooper (991399)

The project is to design and construct stormwater wetlands around Rushworth area and Lake Cooper in order to provide filtration of stormwater entering the Lakes.

Design and lagoon construction works at Colbinabbin and Lake Cooper were mostly complete in August 2001. The remaining works include the establishment of aquatic plants and has been put on hold until the Rushworth reticulated sewage system is complete. This is likely to be finished within the next 12 months or so, therefore planting of aquatic plants will be held back until Spring 2003 as this is optimum time for planting.

Floodplain

Lower Goulburn and Deep Creek Floodplain

A floodplain is generally the low-lying land bordering a waterway over which water tends to flow during floods. The width of floodplains in the Goulburn and Broken River Basins varies from a few metres for a small creek to about 15km for the lower reaches of the Goulburn River. The Broken and the Goulburn Rivers have breakaway flow paths that carry floodwaters a considerable distance away from the main stream.

For the purpose of floodplain management, a floodplain is considered to be all land liable to flooding, whether adjacent to a stream lake and whether flooded due to rainfall. As a natural phenomenon, flooding will continue periodically as it has in the past. Key tools such as flood warning, emergency response planning and careful land use planning are encouraged across the Goulburn Broken Catchment to minimise the impacts of flooding.

Objectives

Floodplain management involves setting down guidelines for use and development of floodplains to assist in the protection of life, property and community infrastructure from flood hazard by applying sound planning principles, undertaking investigations and preparing flood management plans. The objectives of floodplain management are to carry out activities to address the existing, future and residual flooding problem.

Priority activities

- Provision of accurate and timely floodplain management advice under the Planning and Environment Act, 1987 and the Water Act 1989
- Finalise the Regional Floodplain Management Strategy for the Goulburn Broken Catchment
- Resolution of the Lower Goulburn River flooding issue
- Continue maintenance programs for the River Murray and Goulburn River levees
- Survey 750 determined flood levels from the 1993 Peak Flood Levels for the Broken River, Broken and Boosey Creek Systems
- Assist in implementation of floodplain management works for Numurkah
- Assist in the preparation of Floodplain Management Plans for Shepparton-Mooroopna, Tatura and Nathalia
- Finalise Flood Action Plans for the Goulburn Broken Catchment

Funding

Funding has been received for the Merrigum and Dicks Levee to Koonoomoo flood studies.

Floodplain Manager

Guy Tierney is the Floodplain Manager for the GB CMA and manages floodplain management activities across the Goulburn, Broken and part of the River Murray basins.

Statutory Planning Referrals

The GB CMA is responsible for statutory floodplain management advice under Section 55 of the Planning & Environment Act 1987. Under the Water Act 1989, the GB CMA provides advice to the public when requested. The GB CMA is frequently approached for advice from the community, consultants and developers before formal applications are made to municipalities.

About 700 referrals including requests for advice were processed this financial year within the SIR. Referrals included the assessment of subdivisions, Whole Farm Plans, dwellings, extensions and general flood information.

The GB CMA helped prepare statutory amendments in the planning schemes of all councils within its area. The City of Greater Shepparton has adopted these and the Shire of Campaspe has formally displayed these changes through a three-year review of its planning scheme.

Regional Floodplain Management Strategy

The Regional Floodplain Management Strategy is finished and will form the basis of how the GB CMA carries out its floodplain management activities over the next five to ten years. The strategy was developed by the Floodplain Management Co-ordination Committee with representatives from municipalities, DNRE, G-MW, Department of Infrastructure and the SIR IC.

The strategy will deal with eleven programs:

- Asset (levee) management
- Flood monitoring action
- Local flood studies and floodplain management plans
- Information systems (GIS and data base development)
- Statutory land use planning
- Best practice development and training
- Best practice principles for sound floodplain management decision making
- Resources - responsibilities, priorities and cost sharing
- Performance monitoring
- Control of works and activities on floodplains
- Emergency response planning

Lower Goulburn Deep Creek Floodplain

In March 1999, the GB CMA unanimously resolved to adopt the Lower Goulburn Floodplain Rehabilitation Scheme as the preferred option for future management of the Lower Goulburn and its floodplain. This resolution followed a number of studies carried out by Sinclair Knight Merz, SMEC Victoria and Price Waterhouse Coopers. The Business and Implementation Plan has been completed and has received State Government support.

The consulting firm, Sinclair Knight Merz, has been commissioned to undertake a detailed design which will enable accurate determination of the area.

Fencing and Revegetation

Inspections of completed works: Total Projects – 28

Activity	Number of sites	Output	Allocated resources
Fencing	24	Length (m) 33,914	*Grant $107,779.62
Revegetation	1	Plants: 1,000	
Off-stream Watering	11	Dams: 9	*Grant $ 16,780.80
Troughs	11		

* Grant amounts are as calculated from data within the tables.
N.B. Actual amounts may have varied at time of payment

Grants offered during 2001-2002 but not completed

Activity	Estimated Activity Target	Allocated resources
Fencing	Length (m) 23,961	$82,413.66
Off stream watering dams	9	
Off stream watering Troughs	20	$23,286.85
Individual Property outfalls	6	$ 6,447.50
Total		$112,148.01

Note: The figures in this report include all work on all grants where an offer has been made, but the grant is not completed (or postponed nor cancelled). This report does not take into account any work that may be partially completed (ie the full grant is included for partially completed work).

MONITORING PROGRAM

Goal: To review the efficiency of outcomes achieved by implementing the plan, provide data for prioritising and targeting works and from regular plan review, identify the impact of salinity and nutrient pollution where no plan activity has been undertaken.

Shepparton Drain Nutrients – Mandatory (C806A)

Progress

- Continued routine monitoring and additional monitoring at Kanyapella and Campaspe River sites.
- "Chlorophyll a" monitoring continued at Deakin Drain and MV Drain 6 sites.
- Continued assessment of "Sonde" continuous water quality monitoring equipment at Goulburn River Shepparton and MV Drain 6 sites. Report commenced.
- Annual report on data, nutrient loads completed.
- Report reviewing nutrient trends completed.
- Report reviewing timing of discharges of nutrient loads completed to draft stage.

Mandatory Environmental Water Quality Monitoring (T072)

The Environmental Water Quality Monitoring Program is part of the Victorian Statewide Salinity Monitoring Strategy. As part of this program seven sites are monitored throughout the SIR. The sites are:

Wetland Sites		Remnant Vegetation Sites	
Kinnairds Swamp –	near Numurkah	Muckatah –	near Numurkah
Reedy Swamp –	near Shepparton	Mosquito –	near Tatura
Gaynors Swamp –	near Corop	Minchins –	near Merrigum
		Timmering –	near Echuca

Water quality is monitored at the wetland sites on a three monthly basis. Photos are taken at all seven sites on a three monthly basis and groundwater bores are measured on a three monthly basis. Vegetation surveys and water macro-invertebrate sampling is undertaken annually.

Goulburn-Murray Water Monitoring

Shepparton Drain Monitoring (D841)

Progress

- Routine monitoring and database input continued.
- Continued input to a review of D841 monitoring and analysis.
- Draft report prepared and assessed. Comments provided for changes and additional requirements. Changes were made to report, and additional analyses completed. A second draft of the report was completed and circulated for comment.

Effectiveness of Groundwater Pumping – Shepparton Region (R499)

Progress

- Routine bore monitoring, maintenance and groundwater database input continued.
- Renewed contract for monitoring of Barmah Forest bores.
- Continued preparation and negotiations for the trial installation of a sub-surface drainage system using deep trenches stabilised during construction by biopolymer “muds”. The trial was eventually abandoned due to cost-sharing and risk-sharing sharing issues.
- Routine (biannual) sampling and detailed analysis of groundwater from a selection of public groundwater pumps continued.
- Completed a review of information on groundwater flow systems in the SIR. Commenced assessment of groundwater threats and control options near sites of high environmental importance. These assessments are to be incorporated into site management plans being developed by DNRE.

PROGRAM SUPPORT

Goal: To provide the framework to manage and co-ordinate the Shepparton Irrigation Region Land and Water Management Plan.

Department of Natural Resources and Environment Program Management

Salinity Program Management – SIRLWMP (F098)

Leadership management of staff and implementation of projects at all levels during 2001-2002 continued to ensure effective delivery of the DNRE responsibilities under implementation of the Plan. A continuous improvement approach is taken with management of projects and programs using the Australian Business Excellence Framework.

Valuable input was provided to community and agency working groups and committees. These include technical support for the SIR IC, Water Service Committees, PISC and the Sub-surface Drainage, Surface Drainage and Farm Program Working Groups.

Local staff play a pivotal role in the implementation of the DNRE Cultural Diversity Strategy. Much of this strategy was based upon learnings generated within the SIR by staff working with local multicultural communities. A range of learning opportunities and workshops have been provided to assist staff improve our service of the most culturally diverse rural region of Australia, the SIR. An excellent working relationship exists between DNRE and the Ethnic Council of Shepparton and District.

Many staff have undertaken cross-cultural training to improve understanding of local indigenous communities. An indigenous facilitator has been appointed within the DNRE Northern Irrigation Region.

Leadership was also provided statewide in the DNRE Sustainable Agriculture and Land Management Key Project, with this region providing useful processes and knowledge to other regions.

Extension staff used a variety of methods to communicate the activities and successes of the Plan, including one-on-one discussions, group discussions, workshops, conferences, hosting of tour groups, seminars, press releases, posters and brochures, and visits to and from schools and special interest groups.

A series of extension improvement forums were convened for regional extension staff to improve linkages by increasing communication and understanding between programs and agencies. This has grown across the Northern Irrigation Region and elsewhere in the State.

The DNRE Statutory Planning responsibilities have again consumed a disproportionate amount of the project team resources due to dealing with increased numbers of land development and native vegetation clearance issues, resulting in a restructure of existing resources. On average, 15 Statutory Planning applications were processed each month in addition to investigations relating to illegal clearing and channel remodelling.

The past 12 months have also seen strengthening links to research and development staff within the Agriculture Victoria section of DNRE. The success story was the continuation of a large integrated project with both research and extension components focused on Water Use Efficiency under the Water for Growth Initiative.

Community Support

Co-ordination of the SIRCS (F146)

To maximise the value from the public funds allocated to the SIR Catchment Strategy, the Executive Office provides a high level of technical advice and administrative support across all levels. The Executive Office also provides advice and support to the SIR IC to ensure successful progress of the SIR Catchment Strategy.

The Catchment Strategy attracted an integrated budget of close to $19 million in 2001-2002. Funding was co-ordinated across 50 projects and three agencies. The success of the program requires strong liaison and co-operation between agency staff to ensure works are completed on time and within budget allocations.

The Plan Implementation Support Committee (PISC) continues to provide support with the evaluation of program and individual project proposals. PISC membership consists of a

number of key agency staff and community representatives. This process allows issues to be extensively discussed and analysed before presentation to the SIR IC for endorsement.

A wide cross section of community participation is vital to the operation of community and technical working groups. These working groups focus on the Farm, Waterways, Surface Drainage and Sub-surface Drainage programs and continue to monitor progress of current activities and provide input into emerging issues.

The Policy Document of the SIR IC (released 1999) continues to be revised and updated to reflect new policy adoption and amendments to existing policies.

The communication strategy for the SIR Catchment Strategy and its individual programs continue to be revised and updated to ensure all stakeholders are kept informed of all new and arising issues. As part of the communication process, a number of documents outlining the activities and achievements of the SIR IC were released during the year providing a simple outcome-orientated process with elements of evaluation and monitoring. The activities and achievements of the SIR Catchment Strategy were also highlighted in a number of tours organised throughout the year.

Local Area Plan Progress

Cornella

The Cornella LAP group has successfully developed a video of the plan and has spent over $300,000 on works along one of the tributaries to the Cornella Creek. The group won the Victorian Landcare Award in the White Pages Catchment Award Category.

Nanneella

The first action the Nanneella LAP group undertook was to re-introduce the Nanneella Newsletter which is distributed to all landowners in the Local Area Plan area and discusses local specific issues within the area.

Invergordon

The group is in the process of marketing the plan to the wider community and involving other groups to begin working on the actions in the Local Area Plan. The community is currently organising a silage wrap and waste management field day.

Wyuna

The Wyuna Catchment Group has applied for funding to begin a project on revegetation in the catchment. The project is aimed at private land and looking at linking corridors and enhancing and protecting existing vegetation.

The Lockington Landcare group held its Annual General Meeting in October. This meeting discussed Local Area Plans in the Rochester Irrigation Area west of Campaspe River as the group had previously inquired about developing a Local Area Plan for their area.

A presentation on the implementation of the Wyuna Local Area Plan was shown at the DNRE Salinity Extension Officer's January meeting as part of the "15 minutes of fame".

The Wyuna Catchment Group presented the Wyuna Local Area Plan to the Kyabram Rotary Club in February and spoke about their progress and ideas for the future, also how Rotary can be involved.

General

As part of the March Dairy Training Day (Target 10), the training component was a workshop on what Local Area Plans are. The workshop was aimed at increasing awareness of Local Area Planning within the Target 10 team and how Target 10 can become involved. The catchment management incentives available in the SIR were also discussed.

In March two sessions were held at the Lancaster Primary School regarding the Wyuna Local Area Plan and Saltwatch. This was part of marketing the Wyuna plan and involving the school with implementing the Local Area Plan.

The committee members from the Wyuna catchment group presented their progress and future projects as part of the Wyuna Local Area Plan to the March SIR IC meeting. The Nanneella Local Area Plan committee presented their progress to the May SIR IC meeting and discussed issues the group is facing with implementation.

At the April PISC meeting the SIR IC Business Planning cycle that included Local Area Planning was presented and discussed.

Municipal Co-ordination

This year has seen significant progress made by Local Government in the area of urban stormwater. The Shires of Moira and Campaspe have completed Urban Stormwater Management Plans and the City of Greater Shepparton is well on the way. All three municipalities have been very successful in attracting funds from the Victorian Stormwater Action Program for implementation and are committing significant funds themselves.

Community Education

The community education component of the Program Support project in the SIR has a number of roles:

- Facilitating decision-making between community groups and government agencies
- Establishing and maintaining an efficient and systematic process for meeting the needs of client groups through providing access to information and technical support
- Promoting community education activities to increase the number of community groups participating in DNRE programs thus enhancing understanding of natural resource management issues. For example in 2001-2002, 37 schools participated in Saltwatch activities, involving 1400 students and 60 staff and landholders
- Providing Community Salinity Grants to community groups to undertake local activities that promote awareness of appropriate salinity management strategies

Planning

Continuing Development of the Shepparton Salinity Management Plan (S802)

Committee and Working Group

- Provided support to SIR IC, PISC, Surface Drainage and Sub-surface Drainage Working Groups.
- Prepared annual reports and progress reports. Input to budget development. Prepared discussion papers and policy amendments.

- Organised field tour for SSDRWG, cancelled due to rain, was reorganised, but eventually postponed.
- Helped prepare and deliver presentations to Moira Shire on Local Government contribution to ongoing costs of SIR Catchment Strategy implementation.
- Prepared and sent accounts for Local Government contribution.

Salt Disposal

- Prepared background paper on SIR salt disposal. Met with Murray Darling Basin Commission staff who are revising their River Murray flow and salt transport model, discussed SIR monitoring.

Five Year Review

- Continued input into the Five Year Review of the Surface Drainage Program and the review of "Environmental Impacts of Irrigation in Northern Victoria". Steering Committee meetings held, and review documentation being progressed.
- Completed input into the Five Year Review of the Sub-surface Drainage Program.
- Obtained comments and direction from the steering committee and project team.
- Held a workshop to obtain further comment and direction for the review. Updated review report to incorporate outcomes of workshop. Obtained SIR IC and G-MW Board endorsement of the review. Arranged printing of report.

Sub-surface Drainage Program Work Plan Development

- Continued input to the development of a work plan for Sub-surface Drainage Program implementation.
- Interviewed 19 people to obtain a list of important issues and requirements for the Sub-surface Drainage Program. Those interviewed included landholder representatives on SIR IC and working groups, agency and consultant representatives involved in the program.
- A meeting of the project reference group is being planned to obtain a ranking of priorities.

Audit EC Impacts

- Continued audit of EC impacts of SIR Catchment Strategy implementation. Planning a meeting of the project steering group.

Development of Sub-Regional Management Plans – Shepparton (S815)

- Commenced updating information on the SIR sub-regional plans of Sub-surface Drainage Program implementation. Continued input with DNRE Institute of Sustainable Irrigated Agriculture Geographic Information Systems (GIS) Group to assess requirements to convert the sub-regional plans to GIS and to provide additional enhancements. Continued development of plans of the Wyuna area displaying hydro-geological information and sub-surface drainage information. This mapping is being developed to assist program planning at a sub-regional scale.
- Commenced project to assess salt load entering the Goulburn River between Goulburn Weir and Murchison, and to assess options to reduce groundwater inflows. Collected available data; carried out a survey along the river to identify zones with greatest groundwater and salt inflows.
- Met with Trust for Nature representative to discuss options to manage groundwater risks to Naring Grassland Reserve.
- Nutrient stripping study: site monitoring and analysis continued; reports completed.

- Completed a review of currently available geophysics technique that may improve sub-surface drainage investigations.

Shepparton Geographical Information Systems Support (S820/12068)

The Shepparton Geographical Information Systems (GIS) project aims to establish and maintain information systems that support the implementation, monitoring and review of the SIR Catchment Strategy. Project S820 provides a range of tools and information products that are being extensively utilised in the implementation of onground works by the SIR Catchment Strategy officers and in the ongoing management of the SIR Catchment Strategy.

Objectives

- Improved information management, leading to better land and water management policy decisions, more effective targeting of effort and expenditure, and improved effectiveness monitoring.
- Provision of a strategic suite of data sets, information management tools and expertise applied to the range of land and water management programs including farm, sub-surface drainage, surface drainage, environmental and education.
- Strong links with the Regional Data Net and Local Area Plan (LAP) projects.

Achievements and Outputs

1. Support to SIR Catchment Strategy programs, ad hoc map and information requests, database administration
    - Support provided to 16 SIR Catchment Strategy program staff utilising ArcView GIS as part of their activities including mapping of on-ground Environmental and Farm Program works, production of aerial photo based property maps for landholder consultation and map production for reporting.
    - Responding to over 90 map and information requests by SIR Catchment Strategy program staff including map products and target setting information for the four implemented LAPs, property, irrigation and catchment maps for the Toolamba drainage sub-catchment and a range of maps for the SIR Catchment Strategy executive.
    - Mapping support and analysis for Shepparton 26P Drain Environmental Assessment
    - Mapping support and analysis for wetland projects in the SIR
    - 90 map products for SIRLWMP programs including LAPs
    - GIS database assembled for the Shepparton 26P Drain Environmental Assessment.

2. User training (course preparation and conduct)
    - User training carried out in August for 16 SIR Catchment Strategy staff. Training included both a one-day beginner course introducing participants to the basics of using ArcView GIS for their SIR Catchment Strategy activities and an advanced course for current users to ensure they are making the most of the GIS tools provided.
    - Training notes for Basic and Advanced GIS prepared
    - 16 Staff trained in ArcView GIS.

3. Database management
    - Collation and upgrade of regional data sets including Whole Farm Plan Incentives, environmental grants, Community Surface Drains, irrigation infrastructure and aerial photography.

- Enhanced GIS database of environmental grants merging data sets from three systems (Gaites, NITS and CAMS).
- GIS database of Farm Program activities including Whole Farm Plans, Drain Diversion Schemes and New Irrigation Incentives (automatic irrigation and re-use).

4. Support of the New Irrigation Incentives and Drain Diversion Schemes data capture.
   - Established a data capture process for use by Farm Program officers based in Echuca, building on the existing Whole Farm Plan data capture program.

RESEARCH – WATER FOR GROWTH PROJECTS

Policy Mechanisms to Drive Improvements in Water Use Efficiency

Issue Studied and Service Provided

Market research into the on-farm and off-farm drivers for adoption of irrigation practices in the dairy industry indicated that there are no strong drivers in place that lead solely and directly to industry wide improvements in water use efficiency on farm. Despite the industry's major improvements in water use efficiency and substantial investment by Natural Resource Managers, pressure for a greater rate of change in improvements on-farm is compounding. This project considers the introduction of additional policy mechanisms (eg. market mechanisms) as an option to increase the rate of change in water use efficiency on-farm.

The project is investigating:

- The appropriateness of additional policy mechanisms (particularly market mechanisms) to increase the rate of improvements in water use efficiency on dairy farms in the SIR.
- With key stakeholders, the appropriateness of introducing new mechanisms; their feasibility, impact, if they are required, and possible implementation pathways (institutional framework).

Objectives

- To increase the rate of improvement in on-farm water use efficiency in the dairy industry in the SIR.
- To identify and document a range of market mechanisms that could be implemented (using case studies where possible) to illustrate their intended and potential consequences.
- To recommend market mechanisms appropriate for the improvement of water use efficiency in the dairy industry in the SIR.
- To develop implementation strategies for the recommended market mechanisms.
- To support implementation of a market mechanism in partnership with the GB CMA; Murray Dairy; DNRE and private industry that will result in water use efficiency improvements.

Achievements

Milestone	Achievement and Output	Due Date	Finish Date
1. Report on potential market mechanisms	Completed and submitted to Catchment and Water and circulated to GB CMA Farm Working Group	30 November 2001	May 2002
2. Report of recommended market mechanisms for the dairy industry	The report has been deferred to enable joint input from key stakeholders to ensure the development of mechanisms capable of delivering complementary industry, community and catchment outcomes	30 June 2002	

Outputs Produced

Milestone	Output description
1	'Market mechanisms to drive water use efficiency in the dairy industry' Milestone Report. 'Maintaining a successful dairy industry in northern Victoria with better water use efficiency' Paper presented to the 2001 ANCID Conference. 'Market Mechanisms – good for NRM policy?' Discussion paper (Provided with six monthly report January 2002)
2	Documents contributing to milestone 2 'Study of Stakeholder Outlook on Water Use Efficiency – interim report May 2002' draft to be circulated to key stakeholders. This report is a qualitative analysis of the issues surrounding water use efficiency improvements from key stakeholder perspectives which is fundamental to developing appropriate policy mechanisms (policy cycle milestone 1). The report outlines stakeholder group current priorities and implementation of improved water use efficiency, pressures for improvements and their implications, current mechanisms, farmer response to mechanisms, and difficulties in achieving improvements on-farm. This report provides a foundation for assessing the appropriateness of additional mechanisms to achieve water use efficiency improvements in the context of the regional factors.

Key Findings

The scoping phase of the study has developed an approach to assess methodologies for mechanism analysis, and engaging stakeholders to determine their priorities for water use efficiency improvements on dairy farms. Prior to developing additional mechanisms, a policy cycle approach has been used to determine the important factors of success in achieving improvements in water use efficiency on farm. Several important factors outlined in the scoping phase of the project are:

- The definition of water use efficiency at the farm level varies across stakeholders. The purpose and definition of water use efficiency varies as it is used to meet different policy objectives across stakeholder groups. Definition also differs on scale (catchment to farm) and complexity (factors determining definition). Hence it is difficult to achieve a shared definition of water use efficiency. This lack of consensus could be a barrier to improvements in water use efficiency.
- Problems with actual measurement of water use efficiency due to the complex nature of 'cause and effect' (impacts of water for irrigation) makes it difficult to clarify farmer contribution to meeting broader Natural Resource Management policy objectives.
- Improvement in water use on-farm (through improved water use efficiency) is not a new solution to achieving policy objectives. There are already a range of mechanisms in

place. What has altered is the urgency to make these improvements, and the nature of the required improvements. Current mechanisms include a large proportion of voluntary and mixed mechanisms (incentives) and some regulatory mechanisms (guidelines).

- As water use efficiency is a solution to achieve broader policy objectives and outcomes, it needs to be considered in the context of other solutions to improve water use on-farm. Also there are many factors that contribute to sustainable use of water resources, of which improved farm water use is only one. The extent to which improvements in water use on-farm can contribute to policy objectives needs to be considered in the context of other solutions. Other contributing factors need to be addressed (infrastructure etc).
- There are many pressures that are driving farmers to improve their water use on-farm. Many can be grouped under broader "environmental pressures" such as environmental flows, salinity and land management, Snowy River requirements and End of Valley Targets. It is perceived by some that these pressures may result in restricting farmer access to irrigation water.
- Farmers are experiencing many pressures on their businesses and the industry has rationalised greatly in the past. In an effort to remain competitive, farmers are pressured to intensify and expand their operations, which may actually conflict with pressures for sustainable improvements. There are many complex factors at the farm level that can make achieving the required water use improvements very difficult for some farmers.
- Future mechanisms need to allow for the on-farm complexities. Current mechanisms may be blunt in that they are not accounting for the complex factors that impact on an individuals' improvements and there may be cases where current mechanisms are discouraging desired changes. To design better mechanisms to achieve desired onground changes, requires investigation of the impact of mechanisms at both the farm and regional levels before designing an efficient and equitable bundle of mechanisms.

These key factors investigated in the scoping phase will provide the basis for determining the appropriateness of additional mechanisms.

Links to On-Farm Activity

The project links to on-farm activity through the influence that market-based policy instruments have on decisions about farm management affecting investment in sustainable systems and adoption of best management practices.

Budget

Year	**Allocation $**	**Actual Expenditure $**
2001-2002	153,995	154,086

Proposed Variation to Existing Milestones

Milestone 2 'Report of recommended market mechanisms for the dairy industry' was not completed in June 2002. Milestone 1 indicated there are additional components required prior to implementation of policy mechanisms. In particular:

- The priorities and outcome objectives of improving water use efficiency on-farm amongst stakeholders; scoping the current appropriateness of mechanisms and the institutional framework in which mechanisms are implemented.
- Outline the current mechanisms designed to achieve water use efficiency improvements to provide a basis for assessing the need to modify existing mechanisms and provide additional mechanisms.

- Develop mechanism scenarios (based on regional information) and identify the impact of mechanisms on dairy farmers and dairying regions to assess their capacity to respond (unintended consequences).

The project focus is to gather the relevant data as described to ensure possible mechanisms are not open to risk of failure. Additionally, stakeholder analysis suggests there is not one key group in a position to develop a market mechanism. Currently the project can build awareness amongst the range of stakeholders of the appropriate components required to make informed decisions. If the research suggests a market mechanism is appropriate stakeholders will be in a better position to jointly develop and implement a mutually beneficial market mechanism. Consequently milestones will be altered to account for additional information to be collected and analysed.

Proposed Milestones

- *December 2002 – Report of appropriateness of additional mechanisms to achieve Water Use Efficiency – important factors.*
- *June 2003 –Report on results of trialing mechanisms to increase Water Use Efficiency – appropriate options (potentially)*

Future Directions

The qualitative study 'Stakeholder Outlook' provides an indication for developing the appropriate direction for the project. Two key research components will be pursued over the project life. They are:

1. Appropriate mechanisms for the regional context (regional priorities, institutional frameworks, and identified difficulties of achieving desired levels of change in water use efficiency on-farm).
2. Most appropriate mechanisms to increase improvements in water use efficiency on-farm (hypothetical mechanisms for water use efficiency improvements – discussion paper, case study mechanisms, mechanism scenarios trialed with farmers).

This approach will provide tangible information to stakeholders to enable them to make informed decisions for mechanisms aimed at achieving water use efficiency improvements.

Bayesian Networks for Water Resources Management Decision Analyses

Issue Studied and Service Provided

Land and water management strategies are developed for complex systems with multiple management objectives. Therefore, a systematic framework is necessary to support and integrate decision-making processes to achieve desirable outcomes. The framework needs to allow easy capture of knowledge, consider the dynamics of whole systems, facilitate risk and uncertainty assessment, and enable participation of important stakeholders. This project is investigating the potential of Bayesian Networks to provide a decision-making framework that includes multiple objective assessment, treatment of risks, and stakeholder participation.

Project Objectives

- Assess the potential of using Bayesian Networks for decision analyses of integrated water resources and catchment management.
- Provide a framework to develop an holistic understanding of the complex water resources and catchment management systems and their dynamics, capture current scientific and experiential knowledge, facilitate assessment of risks and uncertainties, and allow evaluation of multiple outcomes in decision-making processes.

- Develop a basis for sound water resources and catchment management investment and policies development, and for identifying critical information gaps.

Achievements

Milestone	**Outputs & Achievement Criteria**	**Due Date**
1. Project Steering Committee Established	Steering Committee Meets Achievements: • Project concepts presented to the Plan Implementation Support Committee (PISC) of SIR IC. • Project has been incorporated under the auspices of Improved Irrigation Practices Projects Group Steering Committee following recommendation from PISC. • Project Steering Committee met August 2001 and February 2002. • Report to SIR IC Farm Program Working Group quarterly.	31 December 2001
2. Completion of Bayesian Network investigating on-farm decision making	Report on key strategies and knowledge gaps in irrigation management on dairy farms Achievements: • Constructed an example Bayesian Network examining farmer decisions regarding irrigation systems selection. • Presented paper entitled "Bayesian Networks for decision analyses – An application to irrigation system selection" to the Irrigation 2002 Conference in Sydney. • Compiled literature of Bayesian Networks. Commenced reviewing collected literature documenting: - what Bayesian Networks are; - how they have been implemented; and, - usefulness of outcomes of the analysis to end users. - implications for the development of a Bayesian Network for land and water management planning.	30 June 2002
3. Compilation and review background documentation to the SIRLWMP	Review of key processes underlying Shepparton Irrigation Region Land and Water Management Plan (SIRLWMP) Achievements: • Commenced compilation of background documentation with several original documents sourced and available. • Established database of background documentation. • Interviews with experts in the SIRLWMP have been conducted to identify knowledge not documented in the literature and the location of regional data sets. • Compiled list of assumptions made in the SIRLWMP. • Documenting chronology of SIRLWMP evolution, identifying changes in land and water management policies, priorities and technologies. • Developed conceptual framework for the Bayesian Network representation of the SIRLWMP, considering four different scales of understanding. Primary processes and management activities considered to occur by the plan, at each scale, have been identified. • Conceptual representations of the water movement within two of the scales within the overall framework have been developed.	30 June 2002

Outputs Produced

Milestone	Output title/descriptor
2	Conference paper entitled "Bayesian Networks for decision analyses – An application to irrigation system selection".

Links to On-Farm Activity

This project addresses policy level issues rather than farm activities.

Budget

2001-2002	Allocation $	Actual Expenditure $
15050 (CW307)	142,901.00	116,915.88
15051 (CW107)	56,637.00	56,984.31
TOTAL	199,538.00	173,900.19

Proposed Variation to Existing Milestones

Variations detailed in January 2002 six-monthly report. Milestones for 2002-2003 will vary according to shift in project focus. Two deliverables, "Regional water use efficiency decision analyses" and "Local Area Planning decision analyses", will be replaced by "Development of a system model for SIRLWMP". Manager Sustainable Irrigation & Development has agreed to milestone changes. Due date 30 June 2003.

Future Directions

Future Directions detailed in January 2002 six-monthly report. Following a recommendation by PISC, the focus of the project has been revised from the original project plan. Initially the project was to focus on farm-scale water management decisions, gradually increasing the scale to eventually develop an approach to catchment-scale decision analysis. The revised focus is the analysis of catchment-scale decisions from the start of the project. Project milestones have been revised to accommodate the change in project focus. Some farm-scale work will be completed to gain experience using the Bayesian Network methodology.

Increasing Water Use Efficiency through Improved Irrigation Systems

Issue Studied and Service Provided

Border-check irrigation systems are currently being designed according to "rules of thumb" and experiential knowledge, with little reference to the hydrological processes involved. Many tools have been developed which can assist in assessing the hydrological performance of irrigation systems, however there has been relatively low adoption by irrigation designers due to the complexity of the tools and lack of input data, particularly with respect to soil hydraulic properties. The Analytical Irrigation Model (AIM) was developed specifically for soils within the Shepparton Irrigation Region and is simpler than most of the other models. This project is investigating the place for such a tool in the irrigation design process and making an initial step toward compiling the required input data.

Project Objectives

- Identify the needs of irrigation designers for tools to assist the improvement of border-check flood irrigation system performance;
- Assess potential of and develop appropriate interface to best performing design tool;

- Examine the impact on the performance of the design tool, and hence design reliability, of the uncertainty of input parameters (particularly soil properties); and
- Develop and implement the adoption pathway for the design tool engaging Whole Farm Planners, irrigation designers and extension officers.

Milestones

Milestone	Outputs & Achievement	Due Date
1. Formation of Project Reference Group	Reference Group Meeting Achievements: ▪ Incorporated project under the auspices of the Improved Irrigation Practices Projects Group Steering Committee. Steering Committee met August 2001 and February 2002 ▪ Report quarterly to SIR IC Farm Program Working Group.	31 December 2001
2. Completion of Market Research	Report on the needs of irrigation designers for tools to evaluate the performance of irrigation system design Achievements: ▪ Completed report outlining attitudes of Irrigation Designers and Extension Staff to water related issues, the adoption of technology, the access to technical information and resources and awareness of irrigation design tools and relationships with DNRE. ▪ Presentation to Irrigation Surveyors and Designers Group. (January 2002)	30 June 2002
3. Completion of review of design practices guidelines and available tools.	Review of existing design practices and guidelines and available tools complete Achievements: ▪ Collected existing flood irrigation design tools and guidelines and compared according to their user-friendliness and robustness. ▪ Draft report of available irrigation design tools and concepts underlying these tools is currently under review. ▪ Performed numerical experiments examining usefulness of the design tool output, comparing performance and underlying assumptions.	30 June 2002

Outputs

Milestone	Output title/descriptor
2	Report entitled “A Market Research Assessment of the Whole Farm Planning Process.” (Provided with six-monthly report January 2002)
3	Draft Review Border-check Irrigation Models.

Links to On-Farm Activity

This project links with Irrigation Surveyors and Designers and Irrigation Extension staff who subsequently are involved with farm activities. A number of the Irrigation Surveyors and Designers have used AIM in design decisions both in northern Victoria and South Australia. Additional links have been made with farmer education programs in northern Victoria, where AIM has been used to demonstrate the processes occurring during an irrigation event.

Budget

2001-2002	Allocation $	Actual Expenditure $
15050 (CAW307)	98,504.00	97,790.92

APPENDICES

PHYSICAL PERFORMANCE INDICATORS FOR YEAR ENDED 30 JUNE 2002

Program Activity Description	Note	2001-2002		Cumulative	Targets	Cumulative Target
		Target	Actual	Total to Date	2002-2003	2020
WHOLE FARM PLANS						
Broadacre						
Number		140	186	2,291	140	5,000
Area (ha)		10,000	16,376	165,792	10,000	350,000
Horticulture						
Number	1	20	4	154	20	250
Area (ha)		350	299	5,588	350	25,000
LANDFORMING/ LASERGRADING (HA)	2	10,000	11,700	149,174	10,000	106,000
GROUNDWATER PUMPS						
Private pumps installed - broadacre						
Number: new		12	5	201	12	365
upgrade		4	6	69	4	95
Agreed Volume (ML/yr)	3	1,790	757	25,476	1,790	51,500
Area protected (ha)	4	1,790	757	25,476	1,790	51,500
Private pumping - broadacre						
Agreed Volume (ML/yr)	5		20,390			
Volume pumped (ML) – 2001-2	6		27,700			
Salt disposed (tonnes)	7		0			
Meters installed			39	725		
Private - horticulture						
Number: New		2	0	19	2	40
Upgrade		2	0	1	2	10
Area protected (ha)	8	50	0	770	50	1,000
Tile drainage (ha)		15	0	15.9	15	300
Public						
Number	9	4	6	32	4	425
Volume pumped (ML/yr)	10	400	522	2849	400	40,000
Area protected (ha)	11	800	1485	3505	800	85,000
SURFACE DRAINAGE						
Arterial						
Length designed (km)		35	30	321.5	35	644
Constructed: New (km)	12	14	12.2	146.3	14	362
Remodelled (km)		14	5.3	47.6	14	282
Community						
Length designed (km)		100	49.4	1,145.8	100	2,102
Constructed (km)		65	12.4	398	65	2,102
Area drained (ha)			2,460	52,617		

Program Activity Description	Note	2001-2002		Cumulative	Targets	Cumulative Target
		Target	Actual	Total to Date	2002-2003	2020
IRRIGATION RE-USE SYSTEMS						
Number		70	96	2,706	70	2,788
NATIVE VEGETATION ESTABLISHMENT						
Trees Planted		550,000	220,000	3,429,000	550,000	9,800,000
Area planted (ha)	13	780	314	4,900	780	14,000
TREE PLANTING ON PRIVATE LAND						
Tree Growing Incentives (ha)		60	75	320	60	
WATER QUALITY						
Nutrient Removal Schemes:						
Number			2	15		
ML Storage			350	2,665		

Notes:

(1) Does not include 25 horticultural whole farm plans prepared by landholders with technical assistance from agency staff.

(2) Includes regrading works. This needs to be taken into account when considering cumulative total. Estimated from the 1996-1997 census.

(3) Average annual volume to be pumped in accordance with the capital grant agreement.

(4) Assumed that 1 ML/yr pumped and re-used regularly and within Plan guidelines provides salinity control for 1 ha.

(5) Estimate of minimum required pumping volume for registered salinity plan bores.

(6) Estimated volume factored from measured volume of salinity plan bores.

(7) Salt load pumped under Salt Disposal Allocation contract, 2001 winter disposal period (no disposal available).

(8) Assumed that small horticultural pumps operate on average for 100 days per year and that 1.0 ML/yr pumped provides salinity control and reasonable watertable control for 1 ha.

(9) Pumps with final rating completed. The 1999-2000 targets are interim values (less than original Plan targets) that have been adopted pending resolution of disposal issues. The future targets are the original Plan targets, and include targets for pumps disposing to evaporation basins.

(10) Assuming 120 days per year of operation.

(11) Area of private land rated as receiving salinity control. The target values are based on the assumption that the average gross area served by public pumps is 200 ha per site.

(12) The Cumulative Total has not increased by the length of drain completed, as the previous Cumulative Total was incorrect due to the use of “equivalent lengths” of drains in previous reporting. Drains are now only considered complete when handed over to G-MW.

(13) Based on a planting rate of 700 trees per hectare.

FINANCIAL STATEMENT 2001-2002

Project Number	Agency	Project Title	State Funds	Federal Funds	2001-2 Budget	2001-2 Expended
			$'000s	$'000s	$'000s	$'000s
ENVIRONMENTAL PROTECTION						
C105	DNRE CAS	Environmental Protection Works - Public Land	155		155	157
F221/C304	CMA	Environmental Works - Private Land - Grants	20	192	320	319
FARM						
F099A	DNRE CAS/CMA	Whole Farm Plans	299	487	907	867
12216	DNRE CAS	Automatic Irrigation		144	301	298
11581	DNRE CAS	Re-use		287	537	571
F221/C304	DNRE CAS	Environmental Works - Private Land - Extension	83	40	162	130
991201F	DNRE CAS	Improving & Sustaining Water Quality in the Goulburn Broken Catchment	40	140	252	210
	#	Nutrient Best Management Practices				
	#	Dairy Shed Effluent				
F814	G-MW	Farm Management Services - Shepparton Irrigation Region	14	52	130	140
D115	DNRE AV	Piloting a Farm Scale Serial Biological Concentration Project	150		150	155
SURFACE DRAINAGE						
S702/C104	DNRE CAS	MCC/AAV	20	20	40	40
C144	DNRE CAS	Environmental Works - Drainage	176	80	272	248
D800	G-MW	Shepparton Region Surface Drainage	1,926	1,669	4,149	4,643
F099B	DNRE CAS	Community Surface Drainage - Extension Staff	449	200	653	736
F099B	CMA	Community Surface Drainage - Grants	133	200	300	395
D806	G-MW	Co-ordination and Support for Community Drains	135	135	270	303
DV705	G-MW	MD2001 Irrigation Drains Program	180		456	336
14998	DNRE CAS/CMA	WUE Strategic Water Management - SIR		91	215	98
SUB-SURFACE DRAINAGE						
D484A	G-MW	Implementation of Sub-surface Drainage (Recurrent)	251	330	700	715
D484B	G-MW	Implementation of Sub-surface Drainage (Capital)	422	260	700	688
G800	G-MW	Farm Exploratory Drilling Service	371	434	956	968
F818	G-MW	Admin of Capital Grants & Incentives - Sub-surface Drainage	91	91	190	190
G123	CMA	Capital Grants for Salinity Control Works - Grants	70		270	121
G700	G-MW	Implementation of Groundwater Management Plan		178	580	567
F121	DNRE CAS	Groundwater Pumping - Extension	31	35	101	64

Project Number	Agency	Project Title	State Funds	Federal Funds	2001-2 Budget	2001-2 Expended
			$'000s	$'000s	$'000s	$'000s
11580	DNRE CAS	Groundwater BMP's		58	58	29
WATERWAYS						
V8051	CMA	Rehabilitating the Broken Boosey & Nine Mile Creeks	345	100	479	655
V8052	CMA	Implementation of Lower Goulburn Integrated River Health	180	127	645	655
Cooper	CMA	Lake Cooper/Corop Lakes	90		105	123
Strath-bogie	CMA	Strathbogie Plains Goulburn River Project	146		418	280
991201F	CMA	Improving & Sustaining Water Quality in the Goulburn Broken Catchment	15	45	163	133
991399	G-MW	Stormwater - Lake Cooper			35	24
	G-MW	Broken Creek Weirs Nutrient Management Program			69	69
Deep Creek	CMA	Deep Creek Sanctuary			888	247
Flood-plain	CMA	Floodplain/Levees	117		137	94
Water-ways	CMA	Other projects	302	80	327	240
MONITORING						
C806A	G-MW	Shepparton Drain Nutrients - Mandatory	51	54	106	131
T072	DNRE CAS	Mandatory Environmental Monitoring	24		24	24
D841	G-MW	Shepparton Drain Salt Monitoring	71	71	270	277
R146A	DNRE AV	Technical Support for Local Area Plans	79		79	81
R499	G-MW	Effectiveness of Groundwater Pumping - Shepparton Region	56	60	105	111
PROGRAM SUPPORT						
F098	DNRE CAS	Salinity Program Management - SIRLWMP	258	50	315	331
F146	DNRE CAS/CMA	Implementing the SIRLWSMP Community Support	293	137	569	429
S702	CMA	Municipal Catchment Coordinator	40		79	78
E100	DNRE CAS/CMA	Community Education - SIRLWMP/Community Salinity Grants	61	35	99	98
S802	G-MW	Continuing Development of the Shepparton SMP	125	225	410	472
S815	G-MW	Development of Sub-Regional Management Plans - Shepparton	55	81	140	165
S820	DNRE AV	Information Products for Improved SMP Implementation	41		41	43
RESEARCH - WATER FOR GROWTH PROJECTS			**1,202**		**608**	**554**
TOTAL PROJECTS			**8,567**	**6,188**	**18,935**	**18,302**

COMMITTEES AND WORKING GROUP MEMBERS

Shepparton Irrigation Region Implementation Committee Members

Voting Members Community Representatives	Non-Voting Members Agency Representatives	Executive Support Agency Staff
Russell Pell - (Chair) Wyuna	Chris Norman - DNRE	Ken Sampson - DNRE
Peter Gibson (Deputy Chair) Nanneella	Pat Feehan – G-MW	Peter Howard - GB CMA
Allen Canobie - Numurkah		Pam Collins - DNRE
John Avard - Colbinabbin		Ross Plunkett - G-MW
Stephen Mills - Numurkah		Bruce Cumming - DNRE
Peter McCamish - Ardmona		Melva Ryan - DNRE
Athol McDonald - Girgarre		Geoff Lodge - DNRE
Ann Roberts - Shepparton		Andrea Smith - GB CMA

Attendance Record

Name	01-5	01-6	01-7	01-8	02-1	02-2	02-3	02-4
Athol McDonald	Yes	Yes	No	Yes	Yes	No	Yes	No
John Avard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Peter Gibson	No	Yes	No	Yes	Yes	No	Yes	Yes
Stephen Mills	Yes	No	Yes	Yes	Yes	No	Yes	No
Russell Pell	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Peter McCamish	Yes	Yes	Yes	No	No	No	Yes	Yes
Ann Roberts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Allen Canobie	Yes	Yes	Yes	Yes	Yes	No	Yes	No

Working Group Members

Group	Voting Member	Non-Voting Member
Program Implementation Support Committee – (PISC)	Allen Canobie - SIR IC Russell Pell - SIR IC Ken Sampson - DNRE Ross Plunkett - G-MW Peter Dickinson - G-MW Graeme Wilkinson - G-MW Chris Norman - DNRE Bruce Cumming - DNRE Melva Ryan - DNRE Geoff Lodge - DNRE David Lawler - DNRE Steve Lottkowitz - DNRE Justin Sheed - GB CMA Andrea Smith - MCC Alfred Heuperman - DNRE	Peter Howard - GB CMA Pam Collins - DNRE Corresponding Members: Graham Barrow - EPA Laurie Gleeson - GVW Peter Gray - NVFGA
Budget Sub-Committee	Allen Canobie	Ken Sampson - DNRE

	Noel Russell Stephen Mills Athol McDonald Ann Roberts Peter McCamish	Chris Norman - DNRE Peter Dickinson – G-MW Peter Howard - GB CMA Pam Collins - DNRE
Farm Working Group	John Cornish John Pettigrew Jim McKeown Ann Roberts Ian Klein Les Langley Ashley Walker Peter Gibson Rien Silverstein Roger Wrigley Bruce Cumming Alan Lavis Andrea Smith Noel Russell George Trew Vera Fleming	Ken Sampson - DNRE David Lawler - DNRE
Sub-surface Drainage Working Group	Kevin Chapman John Avard Les Langley Ian Whatley George Trew Bruce Cumming Peer McCamish Andrea Smith Peter Dickinson	Ken Sampson - DNRE Peter Dickinson - G-MW Peter Howard - GB CMA
Surface Drainage Working Group	Allen Canobie Geoff Witten Noel Russell Peter Gibson Morris Brown Hank Sanders Les Langley Alan Strang	Ken Sampson - DNRE Peter Howard - GB CMA
Waterways Working Group	Russell Pell Stephen Mills Geoff Cooper Arthur Frost Brian Greed Tom Heaney	Graeme Wilkinson - G-MW

COMMUNITY SALINITY GRANTS 2001-2002

Community Group Details	$ Funded
Benalla West Primary School	1215
Broadford Secondary College	610
Broken Riverine Plains	340
Broken Riverine Plains	3240
Bunbartha Kaarimba Landcare Group	500
Corop Community Action Group and Cornella LAP	5200
Dabyminga Landcare Group	540
Delatite Landcare Group	2040
Dhurringile and District Landcare Group	470
Fig Tree Community Garden	300
Goulburn Broken Waterwatch/Goulburn Valley Water	4000
Goulburn Murray Landcare Network	3500
Goulburn Murray Landcare Network	6558
Goulburn Murray Landcare Network	2000
Mansfield Primary School	1526
Mitchell Shire Council	500
Nagambie Landcare Group/Burnt Creek Landcare Group	595
Nanneella/Timmering Landcare Group Inc	1200
Naring Landcare Group	1530
St. Josephs School Numurkah	1460
St. Mary of the Angels College, Nathalia	108
South Yarrawonga Landcare Group	1000
South Yarrawonga Landcare Group	300
Sunday Creek/Dry Creek Landcare Group	658
Sunday Creek/Dry Creek Landcare Group	1500
Sunday Creek/Sugarloaf Sub-Catchments Inc	1690
Swanpool and District Land Protection Group	1600
Tallygaroopna Primary School	1300
Wanganui Park Secondary College	300
Wyuna Landcare Group Inc	220
Total Community Salinity Grants	46000
44 applications for funding received	99778
30 successfully funded	46000
Total Value of projects	**$229,448**

PUBLICATIONS and PRESENTATIONS

F099A

- Presentation at statewide Nutrient Management Workshop on concepts of Whole Farm Planning, Shepparton, 24 October 2001.
- Whole Farm Plan Incentive Scheme Guidelines for the Shepparton Irrigation Region Catchment Strategy, 1 March 2002.

12216

- Nicholson, C., 2001, Automatic Flood Irrigation Saves Time and Money, The Australian Dairyfarmer.
- Nicholson, C., 2001, Automation – Saving Labour, Country News, November 01.
- Nicholson, C., 2001, Automatic Irrigation Making Life Easier, Country News, March 02.
- Maskey, R., 2001, Save Your Time, Country News, November 2001.
- Maskey, R., 2001, Getting the Best Value from Irrigation, The Australian Dairyfarmer.
- Maskey, R., 2001, Automating Water, Country News, November 2001.
- Maskey, R. Roberts, G., Graetz, B., 2001, Farmers' Attitudes to the Benefits and Barriers of Adopting Automation for Surface Irrigation on Dairy Farms in Australia, Irrigation and Drainage Systems, Vol. 15:39-51.

D115

- Biodrainage – trees for watertable control? By Alfred Heuperman at the International Union of Soil Science commissioned conference "Sustainable Management of Irrigated Land for Salinity and Toxic Element Control" at Riverside, California in July 2001.
- Planning and implementing salinity control in northern Victoria, Australia by Alfred Heuperman at the International Union of Soil Science commissioned conference "Sustainable Management of Irrigated Land for Salinity and Toxic Element Control" at Riverside, California in July 2001.

C144 / F099B

- Project staff assisted with and conducted presentations at the Environment Program - Environmental Training day August 2001.
- Project staff assisted with and conducted presentations at the Biodiversity Day activities at Cussen Park Tatura for local schools - September 2001.
- Conducted presentations to school groups at Kinnairds Wetland as part of the 2001 World Wetlands Day activities and 2002 Salt Watch Program.
- Presentation at Kinnairds Wetland for the Goulburn Broken Nutrient Management Workshop - October 2001.
- Presentation on Goulburn Broken Fishways Program to Kyabram Angling Club - November 2001.
- Environmental Management presentation at Reedy Swamp Wetland to Notre Dame Secondary College staff and students - November 2001.
- Presentations on Environment Program - Environmental Weeds tour - February 2002.
- Presentations on Environmental Management for the GVREEP tours - February 2002.
- Presentations on Environmental Management for the SIR Surface Water Management Program - orientation tours for new Program staff - April 2002.
- Presentations on Environmental Management for the SIR Sub-surface Water Management Program orientation seminar and tour for new DNRE staff - April 2002.
- Environmental Assessment procedure presentation and Integrated Surface Water Management and Wetland Management tour for Field and Game Australia delegates - June 2002.

Media Presentation/articles

- Thirteen newspaper articles (Bush and Land Column) written and published.
- Two newspaper / journal feature articles published.
- Two radio interviews.

Publications & Brochures/Extension Material produced

- Goulburn Broken Catchment Fishways Program - Progress Update completed - Paul O'Connor August 2001.
- Goulburn Broken Catchment Fishways Program - Fishways Monitoring - powerpoint presentation - November 2001.
- Kinnairds Swamp Case Study - Tour Note produced - Paul O'Connor March 2002.
- Managing Wetlands in an Irrigated Catchment Kinnairds Swamp Case Study (Poster) – Paul O'Connor March 2002.
- Shepparton Community Surface Water Management Scheme 26/P Environmental Assessment - Extension Posters (six).
- Native Flora, Native Fauna - Bushland Birds, Grey Crowned Babbler, Environmental Features, and Catchment Overlay Maps - Daniel Hunter June 2002.
- Prepared tour notes for nine sites for GVREEP tours - Rebecca Heard February 2002.
- Environment Program - Environmental Training - Wetlands presentation update - Paul O'Connor August 2001.

DV705

- On-site presentation to Nutrient Management Workshop, Shepparton, October 2001; three presentations to Water Service Committees.
- Eight Drain Resource Assessments (Deakin, Rodney-Ardmona, Warrigal Creek, Lockington-Bamawm, Murray Valley Drains 3 & 5 and 19 & 20, Shepparton Drain 2; 5 to 10 and 13 to16); Biocide and Metal Levels in Drain Sediments (follow up to 2001 study).

14998

- Statewide Nutrient Management Workshop, Shepparton, 24 and 25 October. On 26th a tour of the surrounding area was organised, with Project Officer Kym Ockerby to visit a high flow storage in Wunghnu. This proved very successful with many questions resulting in industry people from other areas gaining increased knowledge of the scheme.

Publications

- With the release of the Farm Dam guidelines and the lift of the moratorium on storages a newspaper article was written and published in the Country News regarding the completion of a 150 ML storage in Wunghnu (Country News February 11th). The Numurkah Leader also published a similar article on February 27th.
- Ockerby, K., 2002, A Guaranteed Future, Country News, February 2002.
- Ockerby, K., 2002, Water, water everywhere, Numurkah Leader, February 2002.

991201F

- Five presentations conducted for farmer groups on the subject of dairy effluent management and the infrastructure required.
- Two presentations were conducted for service providers, one targeting Whole Farm Planners where the relationship between farmers having correctly sited and sized effluent ponds and being able to manage dairy effluent effectively, was discussed. The other targeted earth-moving contractors who currently build or plan to build effluent ponds and highlighted the importance of correct sizing and siting of effluent ponds.
- Two presentations on the topic of dairy effluent were conducted for school groups.

- Two farm tours were conducted with staff from the Environmental Protection Agency (EPA) to highlight the difficulties of measuring and monitoring irrigation tailwater and show the benefits of nutrient management Best Management Practices implementation.
- One farm tour was conducted for the Dairy Research and Development Corporation (DRDC) which was a scoping study completed for future projects.

C806A

- Managing Nutrients in Irrigation Drains - Are we making a difference - Will we be able to tell if we are making a difference? MC Peel, TA McMahon CEAH Sept 2001.
- C806 Nutrients in Drains - 2000/2001 Review Report, SKM Dec 2001.
- GAM Analysis of Trends in Nutrients in Drains in the SIR, SKM April 2002.
- Biomonitoring of the Impacts of Discharges from Irrigation Drains, WSL Consultants March 2002.

R499

- Kanyapella Basin Hydrogeological Assessment, SKM Feb 2002.

S702

- Murray Darling Basin Association Local Government Salinity Summit - “Local Government And Salinity, The Shepparton Irrigation Region Experience”.
- Victorian Catchment Management Forum - “Aligning Planning Activities With Catchment Management Authorities – Best Practice”.
- Department of Infrastructure Salinity Reference Committee.

S802

- Kanyapella Basin Hydrogeological Assessment, SKM Feb 2002.
- Subsurface Drainage Program Review 1999/2000, SKM Jan 2002.

S815

- Review of Geophysical Methods for Salinity and Groundwater Application in the SIR, URS Nov 2001.

S820

- "GIS and Natural Resource Management in the Goulburn Broken Catchment." Andrew McAllister & Renee McPhee - Presentation at NewTech Conference, Shepparton. July 2001.
- "GIS applications in Irrigation Water Management." Andrew McAllister & Hayley Rokahr - Technical Paper presented at the ESRI (Environmental Systems Research Institute) Australia User Conference, Darling Harbour, Sydney October 2001.

15050

Presentations

- Presentation of project concept to Water Specialists at DNRE Tatura and Kyabram – Brigette Keeble, October 2001.
- Presentation to GB CMA Farm Working Group of milestone 1 results – Brigette Keeble, November 2001.
- Presentation of results of milestone 1 to associates at the University of New England – Brigette Keeble November 2001.
- Presentation of project concept to DNRE Tatura – Brigette Keeble, December 2001.
- Presentation of project concept to DNRE Kyabram – Brigette Keeble, December 2001.
- Presentation of results of milestone 1 to project funders (Catchment and Water) – Fiona Johnson, Brigette Keeble December 2001.

- Presentation of milestone 1 results to DRDC, MDBC program managers and representatives – Brigette Keeble December 2001.
- Presentation to University of Melbourne specialists (practice change, landscape change) – Fiona Johnson February 2002.
- Presentation to Shepparton Irrigation Region Irrigation Committee on principles of improving Water Use Efficiency – Fiona Johnson May 2002.
- Presentation to DNRE Chief Scientists on principles of improving Water Use Efficiency – Fiona Johnson May 2002.
- Presentation and testing of interim report results with key individuals – Fiona Johnson, Brigette Keeble June 2002.
- Irrigation 2002 paper entitled "Bayesian Networks for decision analyses – An application to irrigation system selection".
- Workshop to progress high level operating agreement between EPA and other NRM agencies – Echuca June 2002.
- Irrigation Surveyors and Designers Group (February 2002).

Groups Hosted

- University of Melbourne specialists (practice change, landscape change) to develop affiliation and present project concept and Product Development team program concepts October 2001, February 2002, May 2002.
- Rod Smith - University of Southern Queensland (August,2001).
- Tarim Basin (China) Integrated Environmental Management Technical Study Tour (April, 2002).
- Shepparton Irrigation Region Implementation Committee (April 2002).
- David Mitchell and Nick Austin – NSW Water Use Efficiency Unit (January 2002).
- Helen Fairweather – NSW Ag Water Use Efficiency Unit (June 2002).
- MDBC Landscape and Industries Program (March 2002).

QUANTITATIVE DATA 2001-2002

Financial Performance Indicators for the Year Ended June 30, 2001

Unit Costs:	Note	$
O & M (including depreciation) per km of arterial Drain		$540
O & M (including depreciation) per km of community drain		
Unit cost per km of arterial drain	1	$165,000
Unit cost per km of community drain	2	$38,300
O & M per ML of groundwater pumped Public pumps including depreciation, excluding salt disposal	3	$56.86
Unit Cost per private groundwater pump	4	$73,850
Unit cost per public groundwater pump	5	$157,000

1. Based on actual costs of survey, design and construction since program began. 1999/2000 costs include G-MW oncosts.
2. Page 72-3 Project 3 of the SIR Surface Water Management review.
3. Based on regional average figures and includes all Operation & Maintenance, management, renewals and overhead costs. Higher average costs/ML during 1998-1999 due to low volume pumped as a result of the dry season (lower watertables, less requirement to pump) and no winter disposal for the salinity control pumps.
4. Non-horticultural pumps only. Total system cost, including supply of flow meter. Investigations cost calculated from total investigations cost (individual jobs are not costed separately) and assuming a success rate equal to the running five year average FEDS investigations success rate, being 27.6% to 1998-1999. This is lower than the 35% success rate used for previous estimates, but better represents actual performance. The higher actual cost for 1998-1999 is due to a small increase in site completion costs, and to a significant success rate.

5. Calculated on pumps where all costs were incurred during the period July 1, 1994 to June 30, 1999. The success rate for investigations started and completed within this period was 59%.
    - Average cost of successful sites only was $137,000.
    - These values do not include research and development, extension and program management costs.

Summary of Cost Share Details

Summary Statement of Cost Share

	Annual Expenditure 2000-2001 $	Accumulated Expenditure $
Government	18,302,000	158,406,400
Community	37,463,210	431,491,210
	55,765,210	**589,897,610**

Note: estimates for water quality and waterways included for the first time in the1999-2000 report.

Government Expenditure
Includes expenditure of funds from budget allocation, plus funds transferred into the SIR Catchment Strategy during the year. The total amount for the year was for works related to the SIR Catchment Strategy.

Government expenditure has been obtained from reports on each project, provided by relevant agency. Appropriate managers, subject to verification certified the expenditure reports as correct by audit.

Community Expenditure
Regional community and landholder expenditure was derived from a survey of farmers within the SIR, and from records of government administered assistance programs.

Accumulated Expenditure
Accumulated expenditure is expressed in 2000-2001 dollars. Previous expenditure was adjusted by applying the Victorian CPI increase of 2.9% in 2001-2002.

SALT DISPOSAL REPORT 2001-2002

DESCRIPTION	2001-2002 ACTUAL		REVISED PLAN TARGETS	
			2009-2010	YEAR 30 2020
Entitlements (SDEs) Allocated by Govt				
Reg arterial surface drain	0.350		1.000	1.500
Com surface drains	0.250		1.000	1.300
Public groundwater pumps	1.650		3.690	8.900
Private groundwater pumps	2.250		3.070	6.400
Horticultural Program	0.400		0.360	0.400
Total Entitlements	4.900		9.120	18.500
SDE COMMITTED				
Works prior to June 1991				
Lockington Surface Drains	0.010			
Rodney Surface Drains	0.043			
Tongala Surface Drains	0.002			
Community Surface Drains	0.008			

DESCRIPTION	2001-2002 ACTUAL		REVISED PLAN TARGETS	
			2009-2010	YEAR 30 2020
Horticultural Program	0.030			
Sub Total:	**0.093**			
Previous Plan Works				
G-MW Surface Drains				
Murray Valley IA	0.027			
Central Goulburn IA	0.250			
Rochester IA	0.009			
Community Surface Drains	0.081			
Public Groundwater Pumps				
Murray Valley IA	0.181			
Central Goulburn IA	0.705			
Rochester IA	0.056			
Horticultural Program	0.125			
Private Pump Winter SDA	1.010			
Sub Total:	**2.443**			
Total Pre – 2001-2002	**2.536**			
2001-2002 Works				
G-MW Surface Drains (1)				
Murray Valley IA (2)	0.000			
Central Goulburn IA	0.009			
Rochester IA	0.018			
Community Surface Drains	0.014			
Public Groundwater Pumps				
Murray Valley IA	0.044			
Central Goulburn IA	0.218			
Rochester IA	0.000			
Horticultural Program	0.000			
Private Pump Winter SDAs (3)	-0.320			
Sub Total:	**-0.017**			
TOTAL	**2.518**			
Total SDE Allocated		**4.900**	**9.120**	**18.500**
Balance		**2.382**		
Summary to Date		Revised Target 02/03		
G-MW Arterial Drains	0.367	0.410	1.000	1.500
Community Surface Drains	0.103	0.120	1.000	1.300
Public Groundwater Pumps	1.204	1.500	3.690	8.900
Private Pumps Winter SDA	0.689	1.000	3.070	6.400
Horticultural Program	0.155	0.180	0.360	0.400
TOTAL	**2.518**	**3.210**	**9.120**	**18.500**

Note 1: Surface drainage SDE's (Salt Disposal Entitlements) still being estimated on basis used in draft plan. These figures are higher than used in recent MDBC Economic Analysis.

Note 2: Assume no SDE required for the Murray Valley Brownings Road Diversion Drain as this drain intercepts flow from a mostly unirrigated catchment. This flow would have mostly reached the River Murray pre-Plan. This assumption requires further assessment, particularly now that the Dowdles Swamp scheme is completed.

Note 3: Decrease due to "tightening" of the definition of sites that have SDA (Salt Disposal Allocation) committed. Mostly consists of the sites that would be expected to dispose during winter/spring 2002 if conditions were suitable.

PARTNERSHIP AGENCY STAFF

PROJECT	EMPLOYEES			AGENCY
C105/C138 (14996)	K. Brunt	K. Dyson	M. O'Hare	DNRE (CAS)
C144 (14006)	P. O'Connor T. Cody	K. Preece D. Hunter	R. Heard	DNRE (CAS)
E100 (02002)	D. Biesher (Jan 02)	S. Longford (Jan 02)	M. Martin (Nov 01)	DNRE (CAS)
F098 (02000)	T. Cody K. Fuller (fin Dec 01)	R. Gardiner C. Carter	M. Ryan S. Gibbs	DNRE (CAS)
F099A (02144)	B. Cumming D. Lawler	L. Maclean A. Sislov	J. Read G. Roberts	DNRE (CAS)
F099B (02142)	G. Lodge J. Bourchier C. Haines (fin 01) G. Fraser	V. Froelich M. Paganini O. Hayden J. Ford J. Frost	K. Dougherty (fin April 02) P. McGowan (fin Nov 01)	DNRE (CAS)
F121 (02031)	T. Batey	M. Leth		DNRE (CAS)
F146 (02116)	K. Sampson	P. Collins		DNRE (CAS)
	P. Howard	J. Ward		GB CMA
C304/F221 (14369)	M. White	M. O'Hare		DNRE (CAS)
S702 (02202)	A. Smith			GB CMA
T072 (14056)	T. Cody			DNRE (CAS)
Native Vegetation Management (TreeVic) (12201)	J. Castles			DNRE (CAS)
(11152)Landcare/ LAP facilitation	H. Murdoch (fin Nov 01)	R. Spokes (Nov 01)		DNRE (CAS)
Strategic Water Management (14998)	K. Ockerby			DNRE (CAS)
WUE – Automatic Irrigation/ Water for Growth (14397/02216)	C. Nicholson R. Maskey	L. Reynolds	J. Pagon	DNRE (CAS)

Goulburn-Murray Water Salinity Staff

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PROJECT	EMPLOYEES			AGENCY
	I. O'Brien	C. Preddy	S. Church	
D800	C. Walters R. Plunkett J. Owen D. Eaton	C. Nigro S. Green F. Withers A. Natalizio	R. Keir T. Nihill E. Young	G-MW
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D841	P. Dickinson	P. Feehan		G-MW
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F818	J. Burkitt T. Hunter P. Dickinson	D. Skehan I. Oppy R. Modystack	M. Turpin S. Keir K. Hutchins	G-MW
G700	T. Hunter P. Feehan L. Peters	P. Dickinson S. Longley J. Burkitt	R. Modystack K. Hutchins	G-MW
G800	T. Hunter J. Burkitt P. Dickinson I. Oppy	D. Skehan S. Herath M. Turpin R. Modystack	S. Keir K. Hutchins M. Hutchins S. Longley	G-MW
R499	T. Hunter P. Dickinson L. Peters	J. Burkitt S. Herath	K. Hutchins P. Bodsworth	G-MW
S802	P. Feehan P. Dickinson T. Hunter L. Dempster J. Burkitt I. Oppy	S. Feiss S. Longley K. Hutchins M. Hutchins R. Plunkett	C. Walters P. Hoare S. Green J. Owen D. Eaton	G-MW
S815	P. Feehan T. Hunter P. Dickinson	G. Smith L. Peters S. Feiss	I. Oppy D. Eaton	G-MW

River Health & Water Quality Staff

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GLOSSARY

Term	Explanation	Term	Explanation
AAV	Aboriginal Affairs Victoria	MASNV	Municipalities Against Salinity in Northern Victoria
ANCID	Australian National Committee of Irrigation and Drainage	MCC	Municipal Catchment Coordinator
ATCV	Australian Trust for Conservation Volunteers	MD2001	Murray-Darling 2001 Program (NHT)
CAS	Catchment and Agriculture Services	MDBC	Murray-Darling Basin Commission
CaLP	Catchment and Land Protection	MDBSDS	Murray-Darling Basin Salinity and Drainage Strategy
CMA	Catchment Management Authority	MIL	Murray Irrigation Limited
CMSA	Catchment Management & Sustainable Agriculture	NATA	National Association of Testing Authorities
CRC	Cooperative Research Centre	NHT	Natural Heritage Trust
CSD	Community Surface Drainage	NLP	National Landcare Program
CSIRO	Commonwealth Scientific Industry Research Organisation	NOX	Oxidised Nitrogen
DDP	Drain Diversion Plan	NRMS	Natural Resource Management Strategy
DNRE	Department of Natural Resources and Environment	O&M	Operations and Maintenance
DRDC	Dairy Research and Development Corporation	PISC	Program Implementation Support Committee
EM	Electromagnetic	RCS	Regional Catchment Strategy
EPA	Environmental Protection Agency	REALM	Resource Allocation Model
FEDS	Farm Exploratory Drilling Scheme	RWC	Rural Water Corporation
FRP	Filterable Reactive Phosphorus	SBC	Serial Biological Concentration
GAM	Generalised Additive Model	SDA	Salt Disposal Allocation
GIS	Geographical Information System	SIR	Shepparton Irrigation Region
GMLN	Goulburn Murray Landcare Network	SIRLWMP	Shepparton Irrigation Region Land and Water Management Plan
GMP	Groundwater Management Plan	SIRLWSMP	Shepparton Irrigation Region Land and Water Salinity Management Plan
G-MW	Goulburn-Murray Water	SKM	Sinclair Knight Merz
GPIS	Groundwater Pumping Incentive Scheme	SPAC	Salinity Program Advisory Council
GSPA	Groundwater Supply Protection Area	SPC	Shepparton Preserving Company
GVEEP	Goulburn Valley Environment Employment Program	SPPAC	Salinity Pilot Program Advisory Council
IC	Implementation Committee	TKN	Total Kjeldahl Nitrogen
IIP	Improved Irrigation Practices	TP	Total Phosphorus
ISDG	Irrigation Surveyors and Designers Group	UDV	United Dairyfarmers of Victoria
LAP	Local Area Plans	VFF	Victorian Farmers Federation
LPIS	Land Protection Incentive Scheme	WFP	Whole Farm Plan
LWRRDC	Land and Water Rural Research and Development Corporation	WSC	Water Services Committee

ACKNOWLEDGMENTS

A number of people have assisted Ken Sampson in the preparation of the 2001-2002 Shepparton Irrigation Region Implementation Committee Annual Report. The efforts of these people and their staff have been greatly appreciated.

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