

Creating a resilient  
Shepparton Irrigation Region  
**1990 to 2020**

**30 years done!**

# Reference details

**Updated 19 October 2021**

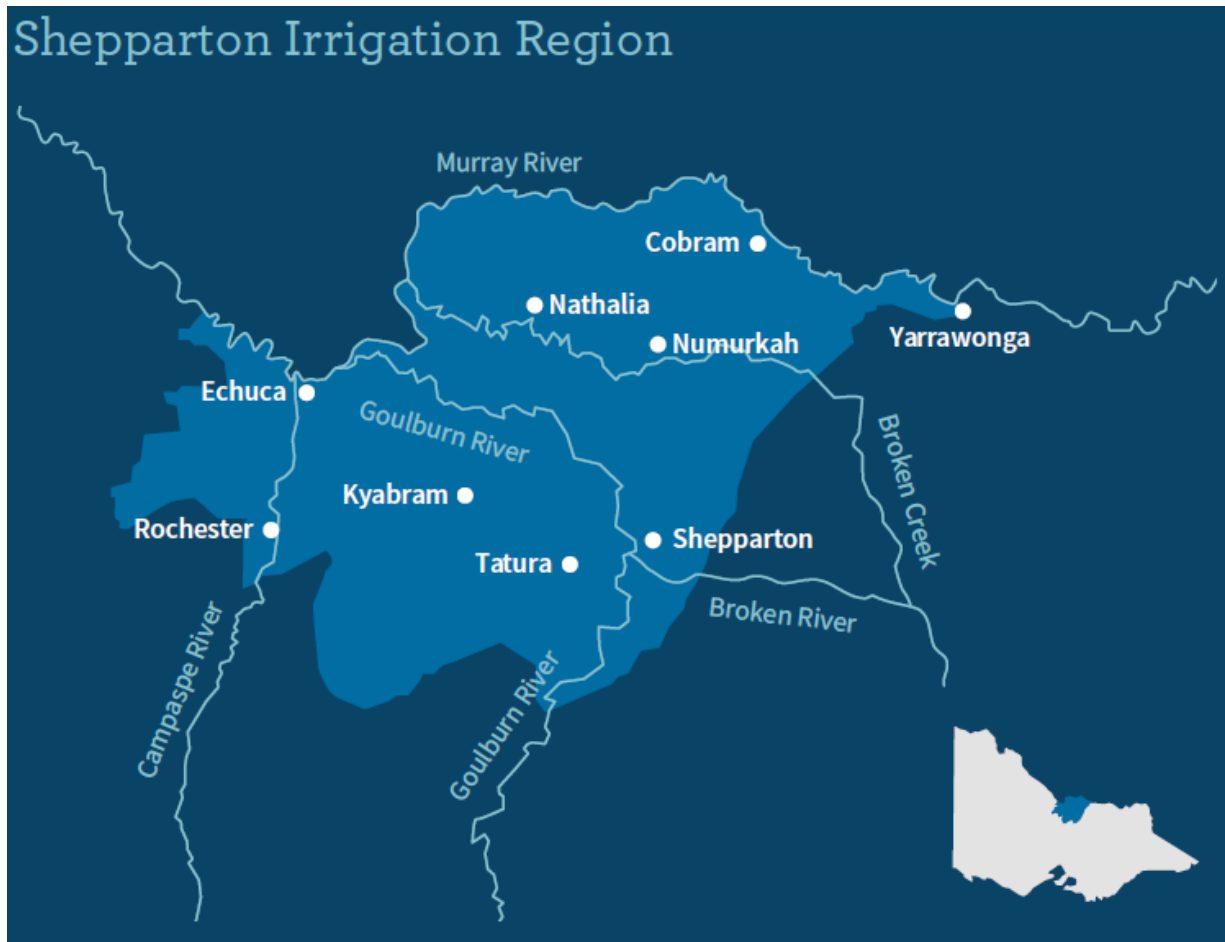
This document supports continuous improvement by providing links to regional and other knowledge. It helps to transfer knowledge between current and future custodians of the SIR, which will help ensure lessons are not lost as strategic directions are updated.

It has full references to key information within 30 years done!  
It also signposts other information in 30 years done! so that detailed references can be readily found if needed.

Further fuller referencing will be included opportunistically to support an update of the Shepparton Irrigation Region Land and Water Management Plan: check via [www.gbcma.vic.gov.au](http://www.gbcma.vic.gov.au) for updates to the referencing in this document.

For ease of navigation, this document's content includes the same words that are in 30 years done!





**Abbreviations**

The Plan	SIRLWMP (see below)
CMA	Catchment Management Authority
GB CMA	Goulburn Broken Catchment Management Authority
SIR	Shepparton Irrigation Region
SIRLWMP	Shepparton Irrigation Region Land and Water (Salinity) Management Plan ('salinity' included until 1996)
SIRPPIC	Shepparton Irrigation Region People and Planning Integration Committee
SPAC	Salinity Program Advisory Council
SPPAC	Salinity Pilot Program Advisory Council

*This is a reference document that supports 30 years done! Creating a Resilient Shepparton Irrigation Region 1990 to 2020, an achievements report* guided by the Shepparton Irrigation Region People and Planning Integration Committee and prepared by Rod McLennan and staff of the Goulburn Broken Catchment Management Authority, Goulburn-Murray Water, and the Department of Jobs, Precincts and Regions.

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**The Goulburn Broken CMA acknowledges the Traditional Owners of land in the Goulburn Broken Catchment and strongly respects the rich culture and intrinsic connection Traditional Owners have to the land.**

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Scan for more information or  
[click here](#)



**Video clips and other information**

- online video clips, including Plan personalities
- Plan participant lists, including community members and agency staff
- media releases
- previous reviews
- detailed achievements and references
- photos and memorabilia.

# The 30-year Plan story



**Kelvin Bruce**

Chair  
Shepparton Irrigation Region  
People and Planning Integration  
Committee

We are in the rare position of being able to reflect on implementing a 30-year plan.

I feel privileged to have played a small part of the incredible journey. I am amazed at the difference that can be made when there is goodwill between hundreds of community and agency people and a shared vision.

The Victorian Government's 1988 salinity strategy set the foundation for community-led joint action with government.

This has enabled us to navigate great changes and formally adapt the Shepparton Irrigation Region Land and Water Management Plan (the Plan) five times since 1990.

While meeting broader needs, government investment in action has been made locally relevant. We have done this by connecting scientists, farmers, bureaucrats, indigenous groups, politicians, and other land managers at all scales.

## Adapting to changes

Our biggest achievement has been community involvement in the Plan. Community members and government agency partnerships have been built on trust and an understanding of how to be good partners, often forged in trying circumstances.

Partners have together withstood many unprecedented changes and events over the 30 years:

- competition for our Catchment's water
- droughts and dry sequences
- information technology changes that revolutionised communication, irrigation water delivery and agriculture
- globalised markets for agricultural produce
- floods and fires
- a global pandemic.

Over the years the focus has broadened from salinity to include water quality, biodiversity, waterway management, environmental water, water availability, climate change, and community resilience. Our latest update of the Plan in 2016 aims to "support and grow the natural base that is vital for agriculture, biodiversity and people to jointly flourish".

## Partners stay the course

We are proud that our farmers, communities and agencies have worked closely for so long to make large-scale and sensible onground actions and changes happen.

Our partnerships have been stabilised by the continuity of many government agency staff despite frequent major departmental restructures. This reminds us that the most crucial ingredient for successful partnerships is the involvement of good people, who keep participating while they have the power to influence the Plan's destiny.

This has led to people's efforts being integrated at all levels, from strategy development to whole farm planning and onground works.

Climate change and other large challenges still face our farming and environmental systems. The Plan has been underpinned by great science and we must keep challenging our methods based on the best current information.

## Onground action and benefits

More than 330,000 hectares of onground actions have been implemented through 7057 incentives over the 30 years, including installation of irrigation drains, water reuse systems and native vegetation works.

This helped protect our natural resource base while generating significant benefits, with government investment of \$650 million. Farmers and the community have also contributed \$2 billion.

## Local focus and broader influence

We are proud our partnership efforts to tackle local problems have often influenced government policies beyond the Shepparton Irrigation Region. Our region is known internationally for its leadership in natural resource management.

Key partnerships became easier to nurture when thirteen municipalities were amalgamated to become three in 1994, and when the Lower Goulburn Waterway Management Authority became part of the Goulburn Broken Catchment Management Authority on its 1997 inception.

Legislation that created Victoria's catchment management authorities in 1997 built on many Goulburn Broken Catchment and Shepparton Irrigation Region experiences. Our present

Shepparton Irrigation Region People and Planning Integration Committee reports to the Board of the Goulburn Broken Catchment Management Authority.

## Ready for more changes

The greatest benefit of ongoing partnerships has been the ability to jointly reflect and adapt to changing circumstances. We have not wasted the lessons from many crises and mistakes we made. And while 30 years of Plan implementation has been done, our job is far from complete.

This reflection helps celebrate and explain the achievements of thousands of individuals and hundreds of groups over 30 years. But more importantly, it helps us pause to reinforce our partnership approach so that we are ready to create and capture opportunities, and for the formidable challenges ahead.

Although the long-term trend away from small family farms continues, farmers retain major responsibilities for the region's environment. The rapid rate of change in scale and operation of farm enterprises is accelerating. This is forcing us to keep adapting both what we do and how we engage others in the Plan.

Against a backdrop of a changing climate, we face ongoing challenges to save species by protecting and creating habitat at larger scales. We also need to ensure all consumptive and environmental users receive a fair share of our precious water, both within and downstream of the Shepparton Irrigation Region.

Thank you to the thousands of past and present agency staff, community members and landholders who have fought for the future of the SIR's agriculture, community and environment.

We look forward to the next 30 years of working together to make the most of our natural advantages and help the region thrive in the face of change.

*It (the Plan) also successfully brought the community together. I believe the community has been the big winner out of this. There was great trust. The agencies grew to trust the community leaders and we in turn put our trust in them. Without trust we would have achieved very little.*

**John Pettigrew**, retired orchardist and former SPAC and SIR Implementation Committee member

# 30 years of joint action: the numbers<sup>1</sup>

Achievements by farmers, community groups and government agencies working together to implement the Plan from 1990 to 2020.

Estimated community investment in farm works	\$2 billion
Estimated government investment in the Plan	\$640 million
Farmer and community group incentives funded	7,057
Number of whole farm plans	4,456
Area of whole farm plans	326,092 ha
Length of drains built	737 km
Area of farm and environment protected from high watertables	73,611 ha
Area laser levelled	330,801 ha
Number of groundwater pumps installed	356
Area protected by groundwater pumps	52,847 ha
Reduced annual salt loads into Murray River	6,500+ tonnes
Irrigation reuse systems installed	3,567
High flow diversion storages built	34
Native vegetation fenced on private land	1,822 ha
Native vegetation planted or direct seeded on private land	2,078 ha
Environmental water provided to SIR wetlands, rivers and streams	6,619 gegalitres
People employed in drought, flood, fruit industry and environment employment programs	2010
Community and agency partnership expectations met or exceeded	91%
Water saved for agriculture and the environment through farm efficiencies	81 gegalitres
Reduced phosphorus loads from drains into rivers and streams annually	60+ tonnes

<sup>1</sup> Many sources of these numbers are being compiled in [internal GBCMA Excel workbook](#). [One key source](#) is (GBCMA, 2005)

# Long-term impacts of the Plan: Summary 1990 to 2020\*

Critical attribute	Contribution to SIR system		Long-term risk of tipping		Details Page
	1990	2020	With current support	With no support	
Water availability for the environment	POOR	OK	MEDIUM	HIGH	16
Water availability for agriculture	EXCELLENT	POOR	VERY HIGH	VERY HIGH	16
Water quality	VERY POOR	OK	MEDIUM	HIGH	18
Watertables	POOR	OK	MEDIUM	HIGH	20
Native vegetation extent	VERY POOR	VERY POOR	VERY HIGH	VERY HIGH	22
Farm and regional viability	GOOD	POOR	HIGH	VERY HIGH	24

The Plan has focused partners on managing the SIR’s abundant natural resources for the long-term wellbeing of the region’s environment and people.

Enduring partnerships have uniquely equipped the region to adaptively manage these natural resources to address rapid technological, social, economic and environmental changes.

Amid the unprecedented volatility of the past 30 years, the Plan also consistently focused partners on action where it was most needed to set the region up for the future. This involved identifying six connected critical attributes of the SIR’s natural resource system. These attributes are critical to the functioning and therefore resilience of the system, and in the long term are at risk of being in an undesirable state.

Progress in managing critical attribute risks is summarised ~~below~~ <sup>above</sup><sup>2</sup> and described in detail on pages 20 to 28. (Scan the QR code inside the front cover or click here for further background on [critical attributes](#) and [resilience](#).)

Plan implementation has helped significantly with improvements in the critical attributes water quality, watertables, and water availability for the environment. However, it has proven very difficult to provide water availability for agriculture, native vegetation extent, and farm and regional viability (including communities) with levels of support needed for them to be in a desirable state.

The SIR community has depended on highly productive, efficient and sustainable irrigated agriculture. The millennium drought triggered the ongoing regional challenge of adapting to a future with less water. Water availability for agriculture has reduced to levels beyond a tipping point, which is forcing farmers, the community and agency partners to adapt and transform agricultural systems,

including delivery and use of water. This is creating new opportunities while also causing significant uncertainty and stress.

Although water availability for the environment is improving, high unseasonal flows to meet downstream water demands are impacting significantly on the banks of the Goulburn River and the Murray River’s Barmah Choke. Native vegetation on private land covers less than 3 per cent of its pre-European extent, with many pockets improved through intervention since 1990. Most threatened ecosystems and several dependent species remain at high risk of irreversible decline. Intervention and many dry years have improved waterway nutrient levels and salinity levels. Works and long-term dry conditions have stabilised watertables for now. The risk is directly related to rainfall on an irrigated landscape.

## Measuring long-term impacts of the Plan

Each Plan achievement (on the opposite page) contributes to management of one or more critical attribute risks. Measuring impact is not easy because the SIR’s system of people and nature is complex. People who have implemented the Plan over many years check that cause and effect models make sense. They also ensure shifts in community values are factored into the assessment. The scorecard of changes since 1990 (above) is the collective view of more than 20 long-term agency and community Plan members, supported by the best available data. Perceptions are especially important when understanding organisational and personal relationships. Ratings of condition factor in positive and negative contributions from interventions and nature.

*Attribution of differences to individual actions over a long time is difficult.*

**Barry Croke**, farmer, scientist and SIRPPIC member

\* See pages 11-12 and 19-28 for details.

<sup>2</sup> Error corrected in this reference document as shown.

# From salt action to integrated catchment management and resilience

Many fruit trees were lost in 1974 when there was a dramatic watertable rise. This underlined the need for drainage to prevent salinity and waterlogging. The Goulburn Irrigation Regional Drainage Action Committee was formed in line with a [‘whole of catchment’ community and agency model](#) advocated by Albury’s Ernest ‘Watershed’ Jackson (Northage, 2014, pp. 47-48).

The 1981 wet year created widespread awareness of salinity and it became a community issue. Girgarre farmer Henry Vegter had watertable problems and with the Department of Agriculture Victoria’s Ian Norman, found others had similar problems. [Solutions needed to involve everyone](#) (Northage, 2014, p. 47). Tongala farmer Jack Regan was also instrumental in forging [partnerships between farmers and agencies](#) (Northage, 2014, p. 84).

[The all-party Parliamentary Select Committee on Salinity set up in 1982 instigated a 1984 report welcomed by all political parties](#) (Northage, 2014, p. 46). The report identified fragmented agency responsibilities and lack of coordination as major constraints on salinity control and advocated more community involvement (Northage, 2014, p. 46). This led to the Salinity Pilot Program Advisory Council being set up in 1985, chaired by John Dainton (Northage, 2014) (see [page 34](#)).

The Murray-Darling Basin Commission succeeded the River Murray Commission in 1988, adding land and environmental matters to managing and distributing waters<sup>3</sup>.

By the early 1990s, the 1980s’ salinity focus had broadened to accommodate emerging issues like blue-green algae blooms. The theory of integrated catchment management was applied, capitalising on extensive and maturing partner networks and the community’s desire to see action<sup>4</sup> (Farmanco, Hydrotechnology & Northage and Associates, 1995).

Many approaches were piloted through the SIRLWMP, including management of nutrients and salt entering waterways, coordination of new drainage systems across multiple properties, and

integration of biodiversity into irrigation delivery and drainage.

Indigenous heritage features have been integrated into drain designs and whole farm plans since the early 1990s<sup>5</sup>. Clear directions on the features’ needs ensure impacts are avoided and opportunities for enhancement are identified. Regional partners’ waterway management efforts became better integrated when the Goulburn Broken Catchment Management Authority began in 1997, including adoption of the former Lower Goulburn Waterways Management Authority duties and flood protection responsibilities<sup>6</sup>. This helped strengthen the regional approach on crises that soon followed related to unprecedented drought and increasing consumptive demand for water within and downstream of the region. Other challenges included increasing requirements to provide water for the environment, and other water regulation changes (MDBA, n.d.).

Community and partner networks developed through the Plan have resulted in lasting partner relationships at all scales, translating into better integration, more holistic outcomes and greater efficiency (see the case study on [page 29](#)).

The Plan’s partners have always focused on the most important issues for long-term environmental and community wellbeing. During the early 2000s, partners began describing these issues in terms of tipping points for resilience of the SIR’s complex system of people and nature (GBCMA, 2020a, pp. 137-8). While many challenges have not changed since 1990, others have evolved or emerged.

Through the Shepparton Irrigation Region People and Planning Integration Committee, Plan partners now annually review Plan progress<sup>7</sup> to check long-term direction and identify projects that should persist, adapt or transform (scan the QR code inside the front cover or [click here](#) to see Goulburn Broken CMA fact sheet on resilience (GBCMA, n.d.). Decisions are grounded in the reality of long-term unavoidable forces, such as climate change, the information

<sup>3</sup> Reference to be confirmed. (Rod McLennan September 2021)

<sup>4</sup> Several conference and workshop papers in the early 1990s will be in GB CMA and partners’ files regarding principles, processes and examples of integrated catchment management. Farmanco et al reference needs confirming via GB CMA offices when COVID-19 restrictions allow. (Rod McLennan September 2021)

<sup>5</sup> References to including middens, scar trees etc will be within individual drain designs and whole farm plans held on file. 1990s (and later) guidelines will describe the inclusion, and annual

reports will refer to examples of inclusion. (Rod McLennan September 2021)

<sup>6</sup> Several conference papers again will be in GB CMA and partners’ files. Catchment and Land Protection Act 1994 is a reference for duties. (Rod McLennan September 2021)

<sup>7</sup> Usually occurs early in calendar year, drawing on detailed analysis of critical attributes (internal documents on GB CMA’s sharepoint). (Rod McLennan September 2021)



revolution and global markets, and are open to the prospect of opportunities from change.

### Goal evolution<sup>8</sup>

*...to manage the salinity of land and water resources throughout Victoria in order to maintain and, where feasible, to improve the social well-being of communities, and the environmental quality and productive capacity of the regions.*

- [Shepparton Irrigation Region Land and Water Salinity Management Plan 1990](#)<sup>9</sup> (Goulburn Broken Region Salinity Pilot Program Advisory Council, 1989)

*...to support and grow the natural base that is vital for agriculture, biodiversity and people to jointly flourish.*

- [Shepparton Irrigation Region Land and Water Management Plan 2016](#) (GBCMA, 2016)

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<sup>8</sup> A potentially useful aligned goal:

[\*...to manage the salinity of land and water resources throughout Victoria in order to maintain and, where feasible, to improve the social well-being of communities, and the environmental quality and productive capacity of the regions.\*](#)

- Victorian Salinity Strategy 1988 (Department of Premier and Cabinet, 1988, p. 19)

<sup>9</sup> Draft Plan released in 1989 and became 'final' when Victorian Government responded to it in 1990.

## The adapting Plan<sup>10</sup>

1985	First regional Salinity Pilot Program launched in Goulburn Broken catchment.
1988	Victorian Salinity Strategy, Salt Action-Joint Action released. Murray-Darling Basin Commission established.
1990	Implementation of the Plan begins when the Victorian Government announces support for 1989 Draft Shepparton Irrigation Region Land and Water Salinity Management Plan.
1992	Plan partners have major stake in Goulburn Broken catchment's water quality pilot after blue-green algae blooms in many Murray-Darling Basin water bodies Australian, State and Territory governments' Decade of Landcare Plan released, building on Victoria's 1986 Landcare Program.
1994	Victoria's Catchment and Land Protection Act enacted; includes many lessons from SIR and Goulburn Broken catchment.
1995	First major Plan revision. SIR uniform planning controls adopted. SIR Surface Drainage Strategy released. Agreement to cap Murray-Darling Basin surface water diversions.
1996	Draft Goulburn Broken Water Quality Strategy completed.
1997	Catchment management authorities established (as per Catchment and Land Protection Act 1994), including former waterway management authorities, and sets path to holistic approach.
1997	Plan partners have major role in Victoria's pilot biodiversity strategy in the Goulburn Broken Catchment.
1999	Plan partners' have major role in Goulburn-Murray Water's water supply protection area plan for controlling groundwater level and salinisation. Prime Minister opens stage 1 of Muckatah drainage project.
2001	Major Plan review.
2003	Revised plan is SIR Catchment Strategy, adding floodplain management, climate change and soil health, consistent with the broadened scope of the updated 2003 Goulburn Broken Regional Catchment Strategy.
2004	Agency partner irrigation drainage memorandum of understanding developed to show irrigation drain management reduces impact on waterways.
2005	GB CMA appoints Indigenous Facilitator.
2006	Plan (as SIR Catchment Strategy) revised in context of lengthening dry sequence and becomes SIR Catchment Integration Strategy.
2007	Unbundling: separation of water from land in Northern Victoria's declared water systems.
2008	Plan partners play major role in \$2 billion Connections project (upgrade of irrigation delivery system that runs until 2020).
2008	Intergovernmental Murray-Darling Basin Agreement governs water sharing between Basin states.
2009	Victoria's Northern Region Sustainable Water Strategy released to navigate future droughts and the uncertainty of climate change.
2010	Farm Water Program begins, resulting in 81 gigalitres of water savings by 2018.
2011	Plan (as SIR Catchment Implementation Strategy) reviewed and updated.
2012	Murray Darling Basin Plan sets the amount of water that can be taken from the Basin each year.
2014	Salt and water balance project narrows main cause of shallow watertable rise to be rainfall (and not irrigation tailwater or wastage) on irrigated land. SIR drainage review pivots program to match drier conditions and reduce costs. <sup>11</sup> Land-use study shows transformational changes caused by water transfers out of Goulburn Murray Irrigation District.
2016	Major Plan review results in State-endorsed SIRLWMP 2016-20 that emphasises five critical attributes of resilience.
2020	Plan partners' major role in Goulburn Regional Partnership's Goulburn Murray resilience strategy

<sup>10</sup> References can be found for each of these. (Rod McLennan September 2021)

<sup>11</sup> Needs confirmation. Might yet be 2015 for this entry and the next.

# What difference has the Plan made to the region and beyond?

The Plan has led to exceptional levels of:

- onground action (page 6)
- long-term environmental, economic and social benefits (described throughout this report)
- regional capacity to cope with enormous forces of change (page 4 and below).

## Regional capacity built by communities and partnerships

The SIR's 1980s salt management pioneers left an enduring legacy of resilient partnerships to tackle new and often unforeseen natural resource challenges. Despite major social changes and numerous government agency restructures, communities and agencies have learned how to be good partners<sup>12</sup> and to persist with Plan processes through good and bad times by:

- helping each other and not competing
- understanding and respecting each other's role (as a community member or a government funder, regulator or scientist)
- supporting community leaders to genuinely lead.

The community-led SIRPPIC includes representatives from several government agencies and community and industry organisations, including Goulburn Broken CMA, Goulburn Murray Landcare, Goulburn-Murray Water, Murray Dairy, Agriculture Victoria, and Department of Environment, Land, Water and Planning.

## Partnership networks and trust

SIRPPIC connects with a diverse range of groups to integrate their involvement and needs as the Plan evolves. Through SIRPPIC, the Plan has helped spawn and connect many similar partner networks such as:

- Goulburn Broken CMA-led Local Government Agricultural Floodplains Reference Group, which is in its 27th year and has representatives from Moira Shire Council, Campaspe Shire Council, Greater Shepparton City Council and other stakeholders
- Goulburn-Murray Water-led drainage system partnerships with the Goulburn Broken CMA and other stakeholders
- Greater Shepparton City Council-led [RiverConnect](#) (Greater Shepparton City Council, 2021)
- SIR Combined Partner Network of senior agency representatives that has met quarterly since 1992.

SIRPPIC ensures actions remain locally relevant while meeting broader needs. Unity of purpose and trust between partners promotes efficient communication between the hundreds of people involved in Plan implementation. Trusting relationships also give governments the confidence to invest because they know regional people have worked together in finding the best responses.

Consulting the community about water or drainage is seldom straightforward. In the early 1990s, valuable consultation lessons were learned when surface drains were designed to flow through multiple properties and become 'community surface drains'. These lessons have translated into much of the Plan's implementation, such as whole farm planning and drainage course declarations.

See the back cover for a list of Plan partners and see SIRPPIC's organisational structure via the QR code inside the front cover or [click here](#) (GBCMA, 2021c).

## Leadership and influence

[The Plan and regional networks are recognised at state, national and international levels](#)<sup>13</sup> (Northage, 2014, p. 191). They reflect the quality of projects and people involved, including the regional community's best leaders.

The Plan often makes a difference by influencing the actions chosen by stakeholders. This important influencing role is often subtle and can be hidden. Plan partners have played major roles in advocating for large-scale opportunities and responses to changing circumstances, such as:

- *Catchment and Land Protection Act 1994*
- \$2 billion 429 gigalitre water savings project via regional irrigation delivery upgrade (Pitt & Neville, 2020)
- \$228 million, 81 gigalitre water savings project on farms (Farm Water Program) (GBCMA, 2019b)
- many regional employment programs following several natural disasters, industry crises and now COVID-19 (GBCMA, 2021a)<sup>14</sup>.

<sup>12</sup> Several papers have been produced by GBCMA and partners to describe partnerships and integrated catchment management.

<sup>13</sup> Many references for this. Geoff Spencer from the World Bank is quoted directly in one of them (to be confirmed again). (Rod McLennan September 2021)

<sup>14</sup> Unpublished [internal](#).

## Ongoing repositioning based on science and involvement

The Plan has been a constant map for working together. SIRPPIC caretakes the Plan and adapts it as circumstances, needs and opportunities change.

Together, agency staff and community members annually review progress and needs based on critical attributes (pages 20-28).

Regular evolution of the Plan (page 10) has helped manage water reform impacts and provide a way forward as the irrigated landscape transforms.

SIRPPIC's role and function are also annually evaluated and adjusted. In 2020, all community and agency participants rated SIRPPIC as meeting or exceeding expectations (GBCMA, 2021e).

*Plan partners appreciate the long haul: environmental improvements take time.*  
**Barry Croke**, farmer, scientist and SIRPPIC member

*It was the first time we got everyone kicking the same way.*  
**Pat Feehan**, consultant and former agency SIRPPIC member

*... we always maintained respect for others, and we went hard on the issue, not the person...*  
**Carl Walters**, SIRPPIC Executive Officer

*... it (the Plan) made the silos leak and information was shared freely between agencies.*  
**Terry Hunter**, watertable map creator and custodian 1982 to 2020 and former Goulburn-Murray Water manager of natural resources

## Major awards

Major awards involving Plan partners include:

- International Commission on Irrigation and Drainage Innovation and Technology WatSave Award 2017 for the Farm Water Program
- Member of the Order of Australia awarded to John Dainton in 2017
- Australian Water Association Program Innovation awards for the Farm Water Program: National 2015 and Victorian 2014
- Irrigation Australia Limited Maclean-Iedema Award 2010 for a lifetime of activity, achievement and commitment to Ken Sampson
- Banksia Foundation Water Award 2008 for Vision for the Broken River Basin
- International RiverFoundation Australian Riverprize Winner 2001 for outstanding river restoration achievements
- Banksia Foundation Land, Bush and Waterways Award 2000 and Institute of Engineers of Australia Victorian Award for Excellence for the Muckatah project
- Banksia Foundation Community Award 1999 for the Superb Parrot Project
- Landcare Australia Catchment Award for Victoria 1995 for the Plan
- For a complete list of award winners and further details scan the QR code inside the front cover or [click here](#) (GBCMA, 2021f).

# Partners' perspectives

*Salinity is not a problem that can be solved by the governments alone. It must be a joint effort by many sectors of the community.*

John Cain, Premier of Victoria, May 1988, in Salt Action: Joint Action (Victoria's salinity strategy) (Department of Premier and Cabinet, 1988).

## Heather du Vallon



Farmer, Murray Valley Water Services Committee Chair and SIRPPIC member

Heather du Vallon is a straight-shooter, a trait that's served her well over the years as the sole operator of a dairy farm.

Her direct approach is also highly regarded in her role as community representative on the Shepparton Irrigation Region People and Planning Integration Committee.

"It's challenging to get a group of diverse people thinking the same way. I'm inclined to try to get them thinking my way but it doesn't always happen," Heather laughed.

She was one of a handful of women in the region to run her own dairy farm.

"It wasn't the plan. My husband and I intended to farm together but he died suddenly weeks before we were due to take over the property."

These days she breeds stud cattle on her 20 acre parcel of land outside Cobram but remains passionate about drainage, sustainability and agriculture.

She said she had seen the Plan successfully adapt over the years.

"It has managed to move with the times. We won some and we lost some. We fought for the things that were really important and let the rest slide."

She said the Plan had provided a vehicle for communities in the Shepparton Irrigation Region to have their concerns heard.

"I always tend to look at issues from the farmers' point of view but now I understand the importance of looking from a conservation perspective."

The former dairy farmer said the Plan should continue to focus on salinity, effective drainage and the protection of paddock trees in the landscape.

"The Plan has achieved a lot and continues to. I wouldn't waste my time being involved if I didn't think we were achieving some good.

"Drainage has been my passion and I've seen the approach change over the years. We don't dig big drains anymore for water to rush down.

"We build meandering drains through reed beds which is great for wildlife and the whole environment."

## Bruce Lloyd AM



Federal Member for Murray 1971-96, Chair Australian Landcare Council 1997-2005

"I know many people were involved in the creation of the (Shepparton irrigation) region but three names – John Dainton, Russell Pell and Jeremy Gaylard – stand out with me.

The rapid spread of Landcare at that time was also significant in regards to the community recognition and response to the new awareness of land and water management."

## Allen Canobie



Allen Canobie, farmer and former SIR Implementation Committee Chair

Allen Canobie has two burning desires. He wants to leave his Numurkah property in a better condition than he when he bought it.

“And I want our region to remain productive and sustainable into the future,” the semi-retired farmer said.

They’re the reasons he joined the Salinity Program Advisory Council (SPAC) in the late 80s and became involved in the early development of the Plan.

“The Plan has led to improved farming techniques, better care for the environment and practices that seem normal now but weren’t even considered back in the late 90s,” Allen said.

“It was when we started to think about whole farm plans, surface drainage, sub-surface drainage, recycle dams and the conservation of paddock trees.”

He said for the first time, people came to realise there were advantages to productivity in looking after the environment.

“The Plan grew. It started with a salinity focus. When I became involved the main problem was rising water tables and the issue of salinity threatening our livelihoods.

“We set out to adjust our farming practices to remove water pondage on the surface.

“Then it grew to encompass a whole range of environmental issues as we gradually worked out all the problems were connected.”

As president of the former Numurkah Shire, Allen knew it was important that agencies involved in the Plan presented a united front.

“It was unique to the Plan that the agencies worked together for a common goal. This wasn’t seen anywhere else in Victoria at that time because each agency tended to jealously guard its own patch.

“They worked together and secured improved outcomes for farmers.”

## Helen Reynolds



Farmer, GB CMA Chair and former SIRPPIC Chair

Goulburn Broken CMA chair Helen Reynolds is firmly focused on the future when asked about the Plan.

“Our priority has to be our adaptation to climate change, working with less water availability and greater extremes in weather,” Helen said.

“We need to continue to focus on good soil management and ecosystem services as well as protecting our biodiversity across the region.”

Helen, who operates an irrigated cropping farm with her husband, said the Plan had succeeded because it worked at a regional scale.

“Over the years the Plan has expanded to where it’s now taking in biodiversity, soil management and water management.”

She said improved water quality was one of the Plan’s greatest achievements.

“We have seen an 80 per cent decrease in the phosphorus load across the region, which is a terrific accomplishment.”

## John Pettigrew



Retired orchardist and former SPAC, GB CMA Board and SIR Implementation Committee member

Retired orchardist John Pettigrew said there had been many winners from the implementation of the Plan but none bigger than the community.

“The Plan put the Goulburn Valley in a sustainable position when it comes to water management, particularly regarding salinity. It helped bring the community together,” John said.

The former Shepparton Preserving Company director said one key to the success of the Plan was getting the right people involved.

“We were very fortunate to have John Dainton. The strong community around him really helped build the groundswell of support we needed to get going,” he said.

“He was eager to get environmental people together in one group so they could contribute to the Plan – and that was the start of the Goulburn Valley Environment Group in 1989.”

He said having the right people on board also helped build trust in the Plan.

“One of the greatest challenges in the early days was winning the trust of the agencies, farmers, communities and councils.”

He said in the beginning some farmers were suspicious of the Plan’s motives.

“It was a struggle because when we identified areas where salinity was a problem, we came up against sensitivity because no-one wanted their farm to be identified as a salinity risk. We had to manage that carefully.”

Over the journey John said he could only recall a handful of blunders.

“The drainage scheme for the Muckatah Depression was an issue that comes to mind. We thought we had a wonderful plan but there was a lot of pressure from downstream people who were worried about flooding.

“Politically it brought the whole Plan to a head and it was a terribly difficult time but I believe we ended up with a much better plan.

“We have definitely made a few mistakes along the way. But That’s because in many ways we were breaking new ground.

Fortunately, there were no enormous mistakes and on balance we are on the right side of the ledger.”

## Neville Atkinson



Yorta Yorta man and Indigenous facilitator  
GB CMA

Neville Atkinson said the Plan had proactively sought input from the region’s Traditional Owners.

“Listening, learning and understanding the Aboriginal/Yorta Yorta holistic perspective to Country is crucial to achieve outcomes which nurture genuine inclusion and valued involvement from Yorta Yorta,” he said.

“The opening of the door has allowed Yorta Yorta Nation Aboriginal Corporation (YYNAC), the CMA, councils and the community to talk and develop genuine relationships.

“This has been a hugely positive shift in regional community development and policy-making.”

He said it was important that investment in joint projects with YYSAC continued as part of the Plan.

“Our cultural and spiritual relationship to country needs to form part of the decision-making.”

He said while the Plan had made great in-roads with Traditional Owner involvement, he cautioned there was still work to be done.

“As a community, we have come a long way over the last 15-20 years to better understand and value Indigenous history.

“Our shared history has not always been great but we continue to work together to forge a future of genuine social and economic equality for all.

“Realistically there is still a lot more to do and we need to be prepared to be honest and challenge ourselves, now and into the future.”

## Suzanna Sheed



Independent Member for Shepparton District 2014–

“The Land and Water Management Plan in the Shepparton Irrigation Region has provided for a coordinated effort in managing the impacts of irrigation across the highly productive irrigated landscape for many years. The shift from salinity management in the 1990s to a more holistic approach, which now includes water quality, natural features, and water availability, has been significant.

The continued efforts to bring the community and government departments together to encourage discussion and create an agreed plan reflects the region’s collaborative approach when responding to the challenges and taking up opportunities as they arise. Thirty years of consistency is an excellent achievement.”

## Bill O’Kane



Farmer and former Executive Officer of SPPAC, SPAC and Goulburn Broken Catchment and Land Protection Board, and former Chief Executive Officer of GB CMA

Few people would be more familiar with the Plan than former Goulburn Broken CMA CEO Bill O’Kane.

Bill oversaw the implementation of the Plan during his 19 years at the helm of SPAC and the GB CMA and is candid about its achievements and where it fell short.

He said the Plan was created to manage the rising watertable and salinity.

“We had a real problem in the fruit industry in the 70s with trees dying due to rising water tables. Groundwater was rising, productivity was under threat and things were looking pretty grim after a heap of wet years,” Bill said.

“So we knew there had to be a greater focus on irrigation water efficiency and a smarter approach to land management.”

Reflecting on 30 years of the Plan, Bill said he was proud to have been involved.

“The community supported it and the departments worked together successfully. I had never seen that happen before,” he said.

“There were bitter feuds between agencies when we started but Joan Kirner and the government put a stop to all that nonsense by empowering the community.”

He said the Plan’s greatest strength was its commitment to good science.

“Having that rigour right from the start was key to its success.”

He said that by its nature the Plan was flexible.

“For example, we had to adapt when there was a blue-green algae problem and we worked hard to address that ... mind you the drought pretty much fixed that problem for us.

“That flexibility continues now with environmental flows. We’re still trying to work out how to minimise damage to the river and achieve what we need downstream.”

Given his time again Bill said he’d push for a greater focus on equilibrium.

“We needed to do more work around how far you could push the system without breaking it. We should have introduced the resilience concept earlier.

“Having said that, the Plan has achieved plenty. Some of those things have happened because of the Plan and some in spite of the Plan but overall the outcome has been pretty good from an environmental perspective.”



## John Dainton AM



Retired farmer and former Chair of SPPAC, Irrigation Subcommittee of SPAC, Goulburn Broken Catchment and Land Protection Board, and GB CMA

John Dainton said he felt proud when he reflected on the achievements of the Plan.

“Personally I look back on my long involvement in the Plan with a fair bit of pride and it’s mainly around the success we had in getting the various departments, groups and landholders to work together.

“When we first started with the Plan, we operated like separate silos. Now we look at the whole picture, which is a very different approach from the early days,” he said.

John has led a number of industry and natural resource management organisations and has been a driving force in the management of salinity and weed action plans across the region for many years.

“When we first got going it was supposed to be a salinity plan but inevitably the droughts came and the floods came so the Plan had to adapt and if it couldn’t, it wouldn’t work.”

The former Goulburn-Murray Water chairman said farmers and the community had gained a lot of knowledge about the importance of conservation through the roll-out of the Plan.

“The Plan increased the understanding of complex environmental issues. For example farmers now know that drains don’t need to be in straight lines but rather meandering loops to help protect the environment,” he said.

But he said there was still work to be done.

“Climate change hasn’t been addressed properly. Hotter, drier conditions are going to mean a very different future for agriculture and the local economy. It doesn’t mean we’re going to be worse-off but it does mean we’ve got to be a lot smarter.

“We can do better. The loss of old trees in the irrigation area is one issue I’d like to see handled better.”

When reflecting on his involvement with the Plan, John recalled plenty of argy-bargy with department heads and said he quickly learned to pitch to his audience.

“I remember one day Premier Joan Kirner was coming to talk about the very controversial Girdgarre Evaporation Basin.

“The engineer showed me the speech he planned to make. It was boring and technical. I advised him to ditch that speech and just talk about how the trees were growing back and the birds were returning.

“He reluctantly took my advice and later Joan Kirner said he was the first person from State Rivers who’d ever made any sense,” he laughed.

“Knowing your audience is terribly important.”

## Denis Flett



Foundation Chief Executive Officer  
Goulburn-Murray Water and  
Foundation Chair Victorian  
Environmental Water Holder

I have positive memories of the zenith of community empowerment in natural resource management, as community-led working groups emerged in Victoria’s Salinity Program. They developed comprehensive action plans which morphed into effective regional and local land and water programs.

The Muckatah Catchment Strategy was, I think, an exemplar project that exhibited the key attributes necessary for success of the overall regional plan; it received unique recognition winning both a Victorian Engineering Excellence award, and a national, environmental Banksia award in the Land, Bush and Waterways category.

The key attributes included: a cooperative culture; effective and purposeful community engagement; genuine partnership with partners contributing unique, complementary skills and innovation; enthusiasm and fun; and celebration of success.

## Chris Norman



Chief Executive Officer NRM Regions Queensland, former GB CMA Chief Executive Officer and former Statewide Manager community relationships Department of Primary Industries Victoria

The Plan is an absolute credit to the Goulburn Broken CMA, its Implementation Committee, irrigators and indeed the whole local community living in the Shepparton Irrigation Region. It is the epitome of resilience and adaptive management.

There would be very few examples worldwide where a community-driven environmental management plan has achieved 30 years of successful implementation, adapting to continual political changes, climate change, significant structural adjustment of the irrigation industry, and changes in community leaders and agency staff.

The widespread adoption of whole farm planning, drainage programs, revegetation and waterway protection have continued despite these external drivers of change and has seen the region remain one of the most productive and sustainable regions in Australia.

The outstanding leadership from community leaders, such as Jeremy Gaylard, John Dainton, Athol McDonald, Russell Pell and Helen Reynolds have underpinned this success along with the strength of their relationships and commitment from staff such as Bob Wildes, Mike Young, Ken Sampson, Bill O’Kane, Carl Walters and Rod McLennan.

## Jane Ryan



State Government Executive and former Director Rural Water Policy and Programs, Department of Environment, Land, Water and Planning

The Land and Water planning process and implementation is the underrated champion of how best to walk the talk in communities acting for Country. It is still one of the best examples I know of how to get strong environmental outcomes and build commitments to local landscapes in a way that we know works.

It takes cumulative actions over decades from lots of different people to join First Nations leaders in this holistic approach – land owners, urban volunteers, students and school communities, agencies with legal obligations and their partners who want to be involved.

The Goulburn Broken CMA have been successful in tackling significant environmental impacts of the region’s changed land use, such as salinity, soil sodicity and reduced remnant vegetation.

By having the courage to back community leaders and support them to bring community and experts together, they built the commitment to undertake targeted work by the whole region. Getting people on the same page takes community empowerment – the Shepparton Irrigation Region People and Planning Integration Committee was that in spades. But it also takes formalising a plan for all to see and agree, and the SIR Land and Water Plan was robust, targeted and had agreed priorities that were delivered.

# Long-term impacts of the Plan: Details 1990 to 2020

This section describes changes in the SIR's resilience from 1990 to 2020 by referring to critical attribute condition and how the Plan has contributed. For further background on the ['resilience approach'](#) and [critical attributes](#), scan the QR code inside the front cover or click here (GBCMA, 2020a, pp. 137-8).

Critical attribute #1 and #2

# Water availability for the environment and agriculture

Resilience snapshot for water availability

Critical attribute	Contribution to SIR system		Long-term risk of tipping	
	1990	2020	With current support	With no support
Water availability for the environment	POOR	OK	MEDIUM	HIGH
Water availability for agriculture	EXCELLENT	POOR	VERY HIGH	VERY HIGH

Most of the Goulburn Broken Catchment’s water flows through the SIR. The Catchment generates [11 per cent of Murray-Darling Basin water](#) (CSIRO, 2008). [Extended dry sequences linked to climate change are reducing storage inflows](#) (DELWP, 2021a), while water demand has escalated to meet environmental requirements and the world’s [increasing food demands](#) (Fakhrul Islam & Karim, 2020). [Water is also being transferred out of the SIR](#) (DELWP, 2021b) to other parts of the system as Murray-Darling Basin water users and communities adjust to a different water future. Inter-valley transfers of water to help meet downstream demand, such as from the Goulburn to the Victorian, New South Wales or South Australian Murray systems, have caused high unseasonal flows, [impacting on streambank stability along the River Murray and lower Goulburn River](#). (Horne, et al., 2020).

## Water availability for the environment

Many of the SIR’s rivers, streams and floodplain wetlands are [internationally significant](#) (MDBA, 2010), [including the Ramsar-listed Barmah Forest](#) (DELWP, 2021c).

Water began being stored and deployed specifically for the SIR’s environment in the early 1990s<sup>15</sup>. There was mixed success in those pioneering years because the small volumes of water delivered for the environment also relied heavily on natural flooding to meet objectives, such as getting waterbirds to nest and raise their young through to the fledgling stage<sup>16</sup>.

The 6619 gigalitres of water delivered for the environment since the early 1990s has targeted diverse objectives and sites such as: public land

biodiversity of the Barmah-Millewa Forest floodplain, Kinnairds Wetland near Numurkah and Reedy Swamp near Shepparton; private land biodiversity of Brays Swamp near Kyabram; and water quality of the Goulburn River and Broken Creek (GBCMA, 2021a)<sup>17</sup>.

[More water has been made available for the environment by reducing losses in storage and delivery as well as purchase of water from irrigators](#) (GBCMA, 2016, p. 18). In recent years, a marked increase in water delivered for the environment (

[Figure 1](#) below) has reduced environmental risks, sometimes significantly.

## Water availability for agriculture

SIR [prosperity depends on water deliveries for irrigated agriculture](#) (Agriculture Victoria, 2020). Deliveries have declined significantly (

[Figure 1](#) below).

Downstream of the SIR, large horticultural enterprises continue to increase water-use for new permanent plantations and maturing trees. In drier years, horticultural enterprises usually outbid dairying and others for water, resulting in significant net trade of water downstream (RMCG, 2019)<sup>18</sup>.

However, the SIR remains [attractive for investment in water-use and irrigation development when low long-term costs are factored in](#), such as transporting goods to market and water delivery losses (Goulburn Regional Partnership, 2020, p. 7)<sup>19</sup>. Since 1990,

<sup>15</sup> Keith Ward (GBCMA) email 4 January 2021: *The first use of the Barmah-Millewa EWA was in 1998 where 97GL was delivered to Barmah and Millewa forests (paper appended). Prior to then, small amounts from the Vic Flora & Fauna EWA was delivered to Boals Deadwoods (early 1990s) but I don’t have records for those. They would have amounted to only a couple of thousand ML for ibis nesting.*

<sup>16</sup> Keith Ward (GBCMA) email 5 May 2021

<sup>17</sup> Unpublished [internal](#). Some data in annual reports.

<sup>18</sup> Unpublished [internal](#). Goulburn to Murray trade review [interim operating rules](#) sheet is a useful extra reference (DELWP, 2021e).

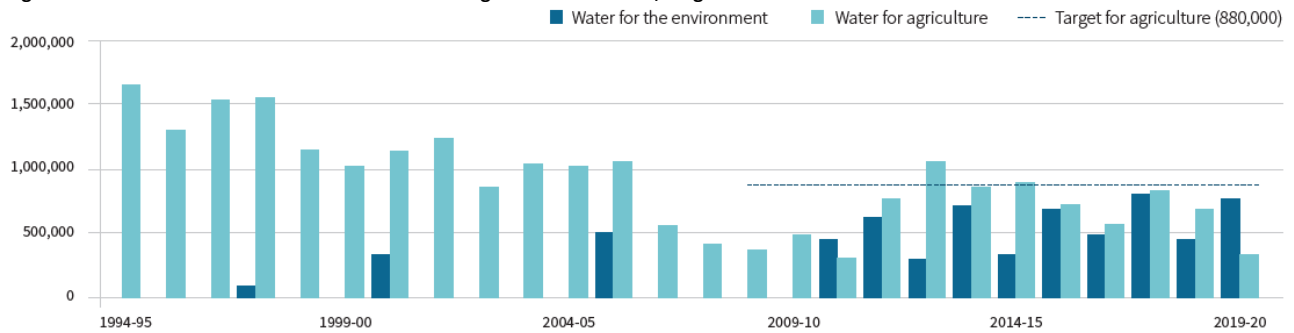
<sup>19</sup> Greater Shepparton City Council and Regional Development Victoria have documents with this sort of data. (Megan McFarlane September 2021)

irrigators have invested \$2 billion in farm works (RMCG, 2021)<sup>20</sup> and have increased production<sup>21</sup> while using less water (

Plan incentives for 4456 whole farm plans have translated into large-scale changes, such as laser levelling and installation of 3556 irrigation reuse systems, creating water-use efficiencies across 326,092 hectares (GBCMA, 2021a)<sup>17</sup>.

Figure 1 below). They continue to invest and innovate to adapt to reduced water availability and other changes.

Figure 1. Water delivered for the environment\* and agriculture in the SIR, megalitres<sup>17</sup>



\*Includes the New South Wales part of the Barmah-Millewa Forest

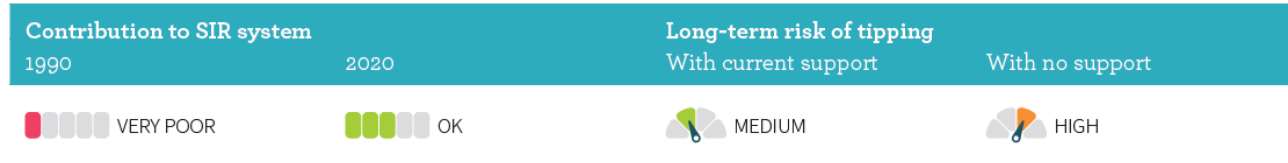
<sup>20</sup> Unpublished [internal](#).

<sup>21</sup> Unpublished. Reference being confirmed. (Rod McLennan September 2021)

## Critical attribute #3

## Water quality

## Resilience snapshot for water quality



SIR surface water is naturally of good quality and is generally suitable for various human and environmental uses (GBCMA, 2019a)<sup>22</sup>. [Water quality has also improved significantly since 1990](#) (GBCMA, 2020a, pp. 12-13). The Plan focuses on keeping water quality within defined thresholds for three categories:

- salinity in the River Murray
- nutrient loads
- other water quality issues.

SIR salt loads entering the River Murray from the SIR are minimal compared to contributions by downstream irrigation regions<sup>23</sup>. The SIR also contributes significantly [less salt than its allocated limit](#) (DELWP, 2019).

[The Plan balances farm salinity and productivity with removal of salt from the landscape for disposal](#) (Goulburn Broken Region Salinity Pilot Program Advisory Council, 1989) (GBCMA, 2016, p. 15). Saline groundwater and irrigation channel and drain flows are disposed of through tight operational procedures (GMW & GBCMA, 2021)<sup>24</sup>.

Since 1990, SIR salt loads have notably declined (Jacobs, 2018)<sup>25</sup>: a drier climate and large-scale water-use efficiency projects have significantly reduced water flows and associated salt in SIR channels and drains that outfall into the River Murray.

The [Goulburn Broken Water Quality Strategy](#) (Goulburn Broken River Environment and Water Quality Committee, 1997) implemented between 1996 and 2016 reduced nutrient loads and therefore blue-green algae blooms.

As for salt, nutrient loads have also been reduced by the decline in water volumes outfalling into streams from channels and drains (GMW, 2019)<sup>26</sup>. As well as a drier climate, actions directly implemented under the Plan or influenced by the Plan have been major contributors to nutrient reduction.

Actions include farm reuse dams, diversion storages, improved dairy effluent management, reduced streamside grazing, upgraded water treatment plants, improved drain design, improved streamflow management, and improved streamside native vegetation<sup>27</sup>.

The regularly reported five-year rolling average total phosphorus loads from both the overall Goulburn Broken Catchment and from irrigation drains (Figure 2 below) are below the long-term targets. Spikes in phosphorus loads are caused by significant rainfall events. Water quality strategy actions have helped to reduce the frequency and severity of these spikes in loads (GBCMA, 2017)<sup>28</sup>.

Waterways are well within the Environment Protection Authority's thresholds for most other water quality issues, and a watching brief is mostly appropriate (mainly for sudden events and negative long-term trends).

In the Goulburn River, regional agency partners are managing increasingly frequent [blackwater](#) events caused by upstream rainfall (GBCMA, 2018a)<sup>29</sup> (GBCMA, 2014, pp. 29, 55, 82, 91).

*Improvements in water quality has been a huge win for the community. We've seen an 80 per cent decrease in the phosphorus load, which is one of the Plan's real achievements.*

Helen Reynolds, farmer and GB CMA Chair

<sup>22</sup> Unpublished [internal](#).

<sup>23</sup> Information is within several 5-year reviews completed by Mallee and North Central CMAs. (James Burkitt September 2021)

<sup>24</sup> Unpublished [internal](#).

<sup>25</sup> Unpublished [internal](#).

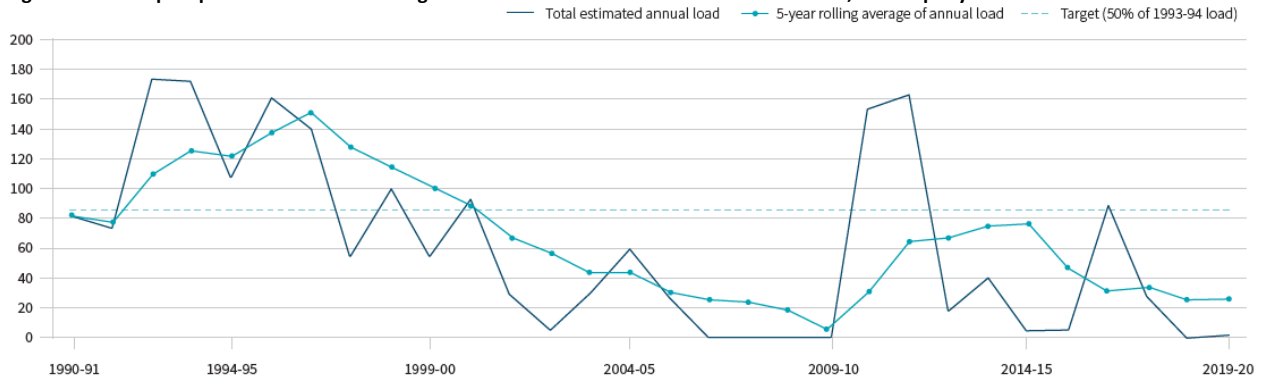
<sup>26</sup> Unpublished [internal](#).

<sup>27</sup> Actions are described and listed in several GBCMA strategic plans.

<sup>28</sup> Unpublished [internal](#).

<sup>29</sup> Unpublished [internal](#).

Figure 2. Annual phosphorus loads from all irrigation drains in the Goulburn Broken Catchment, tonnes per year



## Critical attribute #4

## Watertables

## Resilience snapshot for watertables



Saline watertables that are close to the land surface or that rise rapidly after a rainfall event can cause waterlogging and salinity, threatening agricultural and regional productivity as well as wetlands and streams locally and hundreds of kilometres downstream (Goulburn Broken Region Salinity Pilot Program Advisory Council, 1989) (GBCMA, 2012)<sup>30</sup>.

Over the Plan's life, watertable risks have reduced because of lower accessions (less water added to the watertable) and improved management when watertables are high or rising. Watertable accessions have reduced because of:

- water-use efficiencies on farms from major, [widely adopted improvements](#) (GBCMA, 2019b) (GMW, 2018) (GMW, 2020)
- water-use efficiencies in the regional irrigation delivery system from a [major upgrade](#) (GMW, 2018)
- [better surface water drainage systems](#) (GBCMA, NCCMA and GMW, 2015)
- [less rainfall directly on wet land](#) (GBCMA, NCCMA and GMW, 2015) due to a drying and changing climate<sup>31</sup>
- less water being available to irrigate (

Figure 1 page 21).

Improved management of high or rising watertables includes a stronger focus on protecting the rootzone within the soil profile. This has resulted in greater tailoring of solutions and targeting of areas rather than broadscale, heavily engineered approaches. The solutions are also less costly, adaptive, and integrate better with farm, local and regional needs (AECOM, 2018)<sup>32</sup>.

Goulburn Broken CMA and Goulburn-Murray Water jointly manage drainage to support agriculture and the environment. Drainage management is tailored to meet varying risks across the SIR's 460,000 hectares of irrigable land, and it remains a high

priority in sub-catchments covering [103,000 hectares](#) (GBCMA, NCCMA and GMW, 2015, p. 6).

Surface drainage and groundwater pumping buffer and manage watertable accessions resulting from intense rainfall events, which tend to be localised, random and increasingly occur in summer<sup>33</sup>.

[Hybrid drainage systems](#) developed and implemented through the Plan avoid the need for large excavated drains and involve removal of obstructions within natural flow paths to restore flow patterns (GBCMA, NCCMA and GMW, 2015).

Works achieved through the Plan include: 737 kilometres of drains built, 3567 irrigation reuse systems installed, 356 groundwater pumps installed, and 330,801 hectares of land laser levelled (GBCMA, 2021a).

Drier conditions in 2018 and 2019 resulted in further contraction in land areas with high watertables. In 1988, [the SIR had 188,000 hectares \(more than one-third\) with watertables within two metres of the surface](#) (one indicator of 'high' and being 'at risk') (Northage, 2014, p. 20). In 2020, this area had reduced to just 15,000 hectares, although it is prone to change: rainfall on a wet catchment is now known to cause both rapidly rising shallow watertables and the re-emergence of related threats, as happened in the wetter years of 2011 and 2016 (GMW, 2018)<sup>34</sup>.

In 2020, 296,000 hectares of the SIR remain 'at risk' in the long-term from waterlogging and salinity.

*...the drainage program of the plan achieved in 30 years what was going to take around 200 years.*

Pat Feehan, consultant and former agency SIRPPIC member

<sup>30</sup> Carl Walters searching for possibility of more recent reference than this version. (Rod McLennan 2021)

<sup>31</sup> Numerous references (such as from Bureau of Meteorology) are available to confirm the climate trend. (James Burkitt September 2021)

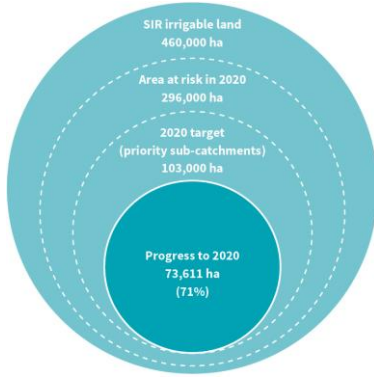
<sup>32</sup> Unpublished [internal](#).

<sup>33</sup> Pers. comm. James Burkitt 3 May 2021

<sup>34</sup> Unpublished [internal](#).



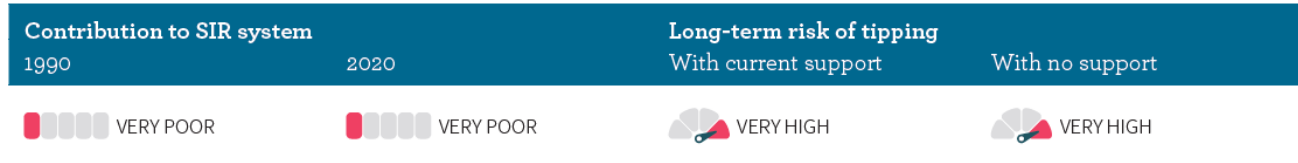
Figure 3. Progress in managing SIR salinity impacts



## Critical attribute #5

## Native vegetation extent

## Resilience snapshot for native vegetation extent



The loss of flora and fauna species impacts on the natural environment and our long-term productive capacity and quality of life.

During the twentieth century, the whole SIR system in terms of native vegetation habitat tipped and many species became extinct following widespread clearing for agriculture. [More than 97 per cent of plains grassy woodland on private land was cleared](#) (GBCMA, 2003, p. 48)<sup>35</sup>.

Remaining native vegetation on private land is largely fragmented and often lacks the shrubs, ground layer, fallen logs and other habitat elements for hosting diverse flora and fauna<sup>36</sup>.

Fortunately, the SIR has significant public land reserves with native vegetation, including:

- the river red gum-dominated, Ramsar-listed, [28,521-hectare](#) (GBCMA, 2012) [Barmah National Park](#) (Abel, et al., 2006)
- corridors along waterways such as the Broken-Boosey State Park and the [9310-hectare](#) (Murray-Darling Basin Authority, 2015) Lower Goulburn National Park
- corridors along roadsides.

Since 1990, native vegetation in these reserves has benefited from a general decline in grazing pressure thanks to initiatives such as private-public boundary land fencing programs and changed Crown frontage licence conditions.

Significant habitat benefits have also been gained on public and private land since 1990 by integrating native vegetation into complementary Plan activities, including:

- [drain design](#) (GBCMA, 2018b)<sup>37</sup>
- [whole farm plan design](#) (Sinclair Knight Merz, 2003)<sup>38</sup>

- [water for the environment flows](#) (GBCMA, 2020a, p. 46), especially for streambank vegetation and [specific wetlands](#) (GBCMA, 2021h) (GBCMA, 2018c).

Through the Plan, management plans have been developed and implemented for many significant wetlands, such as [Reedy, Doctors, Brays and Black Swamps, and for smaller reserves with native vegetation](#). (See a list of plans via the QR code inside the front cover or [click here](#).)

There are many examples of increased native vegetation extent along [roadsides](#), waterways and on [private land](#) (GBCMA, 2015a) (GBCMA, 2015b).

However, despite achieving high levels of stock management, revegetation and other native vegetation improvements through the Plan and other means (GBCMA, 2015d)<sup>39</sup>, the scale of change is not [enough to ensure long-term survival of all native species](#) (Radford, Bennett, & MacRaid, 2004).

[Many species are at very high risk now](#) (GBCMA, 2020b) (DELWP, 2021d) and the system is at very high risk of tipping into a further undesired state.

Clearing (particularly of paddock trees), invasive plants and animals, fire management and climate change continue to degrade native vegetation. Grazing, recreation and inappropriate watering regimes are also impacting on native vegetation quality on both public and private land (GBCMA, 2020b)<sup>40</sup>.

'Focus landscapes' are small habitat sub-systems within the SIR with the most potential for significant habitat to be protected, restored, and connected. Targeting works in these landscapes increases native vegetation extent, improves connectivity and provides many species with a bridge to the future.

Native vegetation extent has increased by 450 hectares across the nine focus landscapes of the SIR

<sup>35</sup> Data can vary depending on methodology, although all results indicate a similar amount of clearing. (Rod McLennan September 2021)

<sup>36</sup> Data is available and can be sourced if needed. (Rebecca Caldwell September 2021)

<sup>37</sup> c. 1992 guidelines were prepared by Nick Pangalo (RWC now GMW) and extension-style sheet by Rod McLennan (DELWP's predecessor) (Rod McLennan October 2021)

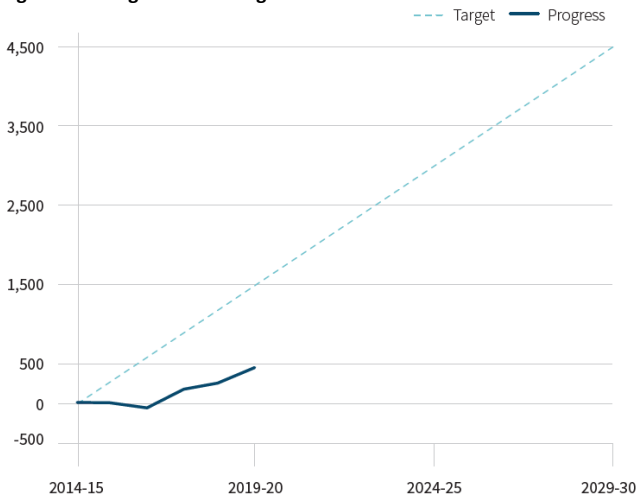
<sup>38</sup> Extension sheet for including environmental features in whole farm plans was prepared in early-mid 1990s (Rod McLennan October 2021)

<sup>39</sup> GBCMA annual reports have tables and [internal Excel workbook](#) record data (GBCMA, 2021i). (Rod McLennan September 2021)

<sup>40</sup> Also Environment Programs section of CMA website (GBCMA, 2021g) and (GBCMA, 2016) (Rebecca Caldwell September 2021)

since 2014-15. This is only 30 per cent of the 2019-20 target, placing us well behind schedule.

**Figure 4. Change in native vegetation extent across nine SIR focus landscapes, hectares**



## Critical attribute #6

## Farm and regional viability

## Resilience snapshot for farm and regional viability



Since 1990, farmers have faced a changing climate, variable domestic and world markets, and increasing costs of land, irrigation water, nutrients, energy and technology.

SIR farmers and irrigation-dependent industries have responded by continually innovating and diversifying

[Agricultural production has increased significantly](#)<sup>41</sup> (Murray Dairy, 2021) while using less water (

Figure 1 page 21) and impacting less on the landscape<sup>42</sup>.

Since the start of Plan implementation, [farmers have been supported to upgrade irrigation infrastructure and improve water-use efficiency](#) (GBCMA, 2019b). Between 2008 and 2020, a [\\$2 billion state-of-the-art irrigation delivery system](#) was installed (the Connections Project) (GMW, 2020). It has been complemented by [world-class farm infrastructure and management](#) (GMW, 2018).

Demands for advice on energy efficiency and soil moisture monitoring have grown in response to increased energy and water costs. Through Plan support, irrigators have assessed energy needs and have [installed soil moisture monitoring equipment](#) to better understand crop water requirements (GBCMA, 2020a, p. 72).

Indigenous participation in agriculture and natural resource management has increased through indigenous ownership of farmland, supported by SIRPPIC's involvement in the [Tri-State Alliance](#) (GBCMA, n.d.).

Plan initiatives are helping make the most of the SIR's natural advantages of sunshine, soils and a flat landscape, rainfall, readily available water and proximity to markets.

In 2017-18, the [gross value of agricultural production in the Shepparton region was \\$1.9 billion](#) (13 per cent of Victoria's \$15 billion) (ABS 2019) (ABARES, 2021).<sup>43</sup>

As a result of the Plan, people came to realise there were spin-off productivity benefits while protecting the natural resource base.

However, farmers and communities continually grapple with questions around how to adapt and thrive in the face of rapid changes, including a future with even less water. Continued government incentives and extension services are still needed to help farmers and the community know when to persist with current approaches and when to adapt or transform.

As farm systems and irrigation-dependent industries transform, many localities experience uncertainty and stress. This threatens both the social fabric that enables communities to cohesively adapt and the viability of farm enterprises that allows them to invest in change and the environment. [Small family farms that dominated the land-ownership mix in 1990 are being increasingly replaced by larger enterprises](#). (Goulburn Regional Partnership, 2020, p. 7) (LG Valuation Services & HMC Valuers, 2010)<sup>44</sup>. This forces [adaptation of approaches in engaging people](#) in the Plan (Goulburn Regional Partnership, 2020, pp. 26-28).

Awareness of the benefits of living in areas like the SIR has grown during the COVID-19 pandemic. This will create significant opportunities and challenges for our agricultural systems, environment and communities.

*... food production and processing derived from irrigated agriculture still dominate the SIR economy.*

Allen Canobie, farmer and former SIR Implementation Committee chair

<sup>41</sup> Production figure trends depend on timeframe covered. (Megan McFarlane October 2021)

<sup>42</sup> The agricultural landscape is becoming more of a mosaic, with significantly more areas of low intensity agriculture, including opportunistic irrigation, while some small areas are becoming more intensive. Farm practices are also generally less impacting. (Carl Walters September 2021)

<sup>43</sup> Figures had been updated to 2018-19 after printing of 30 years done! and 2017-18 figures were not readily available. However, the value again was \$1.9 billion in 2018-19, although Shepparton's was now 12 per cent of Victoria's \$15.9 billion.

<sup>44</sup> Draft unpublished land and water use mapping will be referenced when available (expected soon). (Rebecca Caldwell September 2021)

Updated 19 October 2021

## Case study of integrated catchment management<sup>45</sup>

# Time for trust is the key in Muckatah

The Muckatah surface water management scheme shows what can be done at a large scale when community members, farmers and staff from various government agencies persist for many years to find a way.

Over 70 years ago irrigation was introduced to much of the flat 60,000 hectare Muckatah catchment. Irrigation channels were built to supply water but no provision was made for drainage, which was typical of the day.

Watertables rose from 20 metres below to within 1 to 2 metres of the surface across a large area of the region and the resulting salinisation and waterlogging reduced agricultural productivity and degraded infrastructure and environmental features.

In 1990 the Muckatah Community Drainage Committee formed to provide drainage and by 1999 had developed a model approach for the irrigation industry.

The Muckatah Surface Water Management Scheme provides more than waterlogging and associated salinity relief. It also enhances environmental features and reduces downstream flooding and water quality impacts.

The most important ingredient for success was to achieve trust between authorities and the community. Although the broader community was involved during the design phase, extensive large-scale mediation was also needed to establish the level of trust required to proceed. The scheme's design was able to adapt to meet multiple needs because the lines of communication were always kept open.

As part of the mediation agreement, nine dilapidated weirs along the Broken Creek were replaced to allow regulation of flows. Fishways integrated into the weirs' design have also been very successful in improving fish passage.

The Muckatah Surface Water Management Scheme was built between 1997 and 2020. It includes 60 kilometres of primary drain (mainly aligned with the existing depressions) and connecting drains to service the catchment.

The scheme helps protect 2295 hectares of remnant vegetation, 1638 hectares of on-line depression wetlands, and 727 hectares of off-depression wetlands. The scheme tailors wetting and drying

regimes in wetlands to enhance their environmental features while meeting other needs.

*We thought we had a wonderful (Muckatah) plan but there was a lot of pressure from downstream people who were worried about flooding. Politically it brought the whole plan to a head and it was a terribly difficult time but I believe we ended up with a much better plan.*

John Pettigrew, retired orchardist and former SPAC and SIR Irrigation Committee member

## Integrating from farm to Catchment scale

When the surface water management scheme was built, the Muckatah Catchment supported 400 farming enterprises, including dairying, horticulture, beef cattle, sheep, irrigated and dryland cropping. Land use was 52 percent dry farming, 30 percent mixed farming, 17 percent dairying and 1 per cent horticulture.

As for other Shepparton Irrigation Region sub-catchments, whole farm plans have been prepared and implemented for many properties and are beginning to be updated (modernised) to reflect changing circumstances. A whole farm plan includes a layout that integrates the farm's productivity with broader catchment needs, such as irrigation delivery, drainage and environmental enhancement: in effect, it is a 'regional strategy at a farm scale'.

Detailed plans for specific features within the Muckatah Catchment are being implemented to provide multiple benefits. For example, the hydraulic design for the 93 hectare Kinnairds Wetland supports native vegetation and wildlife, retards minor floods, and reduces discharge into the nearby Broken Creek while factoring in walking and cycling tracks and birdwatching areas. At the upper end of the catchment, a spillway and 12 kilometre floodway now also provide a tailored wetting and drying regime for the 291 hectare Dowdle Swamp in the Upper Muckatah Catchment.

The 'Muckatah' is one of 23 Shepparton Irrigation Region sub-catchments. Significant lessons from the approach in the Muckatah have been used in other sub-catchments as part of regular Shepparton Irrigation Region People and Planning Integration Committee reviews of the surface water management program.

The Muckatah's surface water is also managed within the context of the broader 300,000 hectare Broken, Boosey and Nine Mile Creeks system. In the 1990s the

<sup>45</sup> Information mostly from (GBCMA, GMW, Department of Natural Resources and Environment, 2002).

community, the Goulburn Broken CMA (and its predecessors), Goulburn-Murray Water and other agencies instigated programs to stabilise the creeks, control woody weeds, revegetate and fence the creeks, replace ten weirs, incorporate fishways, and restore major wetlands.

*The Plan has led to improved farming practices that we take for granted these days but weren't even considered back in the 90s. Things like whole farm plans, surface drainage, sub-surface drainage and recycle dams – the list goes on.*

**Allen Canobie**, farmer and former SIR Implementation Committee chair

Plans and strategies are needed at different scales for different purposes. The Shepparton Irrigation Region People and Planning Integration Committee helps community and agency partners link local action with broader needs and integrate solutions to multiple problems. The Committee plays a key role in streamlining the complexity of connections between whole farm plans, sub-catchment plans, the Shepparton Irrigation Region Land and Water Management Plan, the Goulburn Broken Regional

Catchment Strategy and sub-strategies, Murray-Darling Basin Plan and various state and national frameworks.

### And wait, there's more...

Apart from the original watertable benefits expected, the surface water management scheme and the processes it spawned played a large part in:

- helping the catchment adapt to a future with less water
- water for the environment being readily supplied to creeks and significant wetlands
- installation of a state-of-the art irrigation delivery system
- helping agricultural land uses to diversify and transition, including providing confidence for multi-million dollar investments in intensive horticulture
- building opportunities for groundwater to be used as a resource
- creating opportunities for indigenous-led partnerships to protect Aboriginal heritage sites
- promoting community involvement in environmental projects.

*Photo: The Muckatah Surface Water Management Scheme between Yarrowonga and Numurkah was the first of its type for rural drainage schemes.*



*Photo: Shepparton Irrigation Region Implementation Committee partners' Muckatah project won the 2000 national Banksia Land, Bush and Waterways award and the 1999 Institute of Engineers Australia Environmental Excellence award. Pictured here are Denis Flett (Goulburn-Murray Water), Justin Sheed (Goulburn Broken CMA), The Hon. Sherryl Garbutt MP (Minister for Environment and Conservation), and Allen Canobie (SIR Implementation Committee Chair).*



*Photo: The Broken Creek is an important breeding site for Murray Cod in Victoria that flows into the Murray River in the internationally significant (Ramsar-listed) Barmah-Millewa Forest.*



*Photo: Prime Minister John Howard and school children plant trees at Kinnairds Wetland in 1999.*



# Reflections and lessons

SIRPPIC partners commit to the vision of the Plan knowing external forces cannot always be controlled, mistakes will be made, and compromises and adjustment will be needed. Implementation over the 30 years has therefore not always gone to plan, although we are extremely proud of overall achievements.

Partners cannot dwell on every ‘if only’ or rest on past successes, although a checklist is useful when considering what needs to be done next. This section summarises responses from a survey considered by 40 SIRPPIC members and other Plan stakeholders (GBCMA, 2021e)<sup>46</sup>.

## What’s been surprising and significant onground

### Water efficiency actions

Water efficiencies have been a key part of the Plan since 1990. They address salinity and watertable problems and became important when problems of nutrients in waterways and water scarcity emerged.

From 2010 to 2018, water savings from improved farm irrigation layouts include [81 gigalitres from redesigns \(via the Farm Water Program\)](#)<sup>47</sup> (GBCMA, 2019b) to connect to the [2008 to 2020 upgrade of the regional delivery system](#) (GMW, 2020).

Water quality problems are now significantly reduced. Water availability remains a significant challenge.

The 2007 unbundling (disconnection of water from land) catalysed widespread changes in irrigation systems and movement of water between farmers.

### Watertables

Surface water and groundwater are now manageable thanks to primary and community drains, coordinated public and private groundwater pumping and extended dry sequences. We have learned that watertable and salinity risk is largely driven by climate. Hybrid drainage systems have become the new way to provide long-term protection. These involve removing obstructions within natural flow paths to restore flow patterns while avoiding the need for large excavated drains.

### Biodiversity integration

Native vegetation and wetlands have been enhanced by integrating them into drain design since 1991.

Habitat at-risk from watertables and salinity was mapped in the early 1990s, creating the platform for

incentives targeting broader biodiversity challenges in the SIR, such as providing water for environment.

Despite the high value of agricultural land, the uptake of environmental works remains strong. Landowners continue to protect, enhance and revegetate areas and often permanently protect them via covenanting.

### Cultural heritage integration

Indigenous heritage features have been included in whole farm plans and drainage design since the early 1990s.

### River and streams environment

Thousands of logs have been returned into streams!

Water can be added to stream flows for environmental purposes.

Grazing has been removed along hundreds of kilometres of streams.

## Thankfully...

### ...we have

- an enduring shared vision and an ongoing, decades-long community passion
- strong and resilient community and agency partnerships, including diverse partners with often competing interests, and an efficient way for many people on many committees to develop and implement projects and get outcomes
- strong community engagement, advocacy and governance
- strong school education networks through SIRPPIC-supported programs Landcare, RiverConnect and Waterwatch
- long legacies from projects such as environmental management plans
- science-based decisions to build on
- rigorous continuous improvement processes, including annual critical attribute risk assessments.

### ...and we have had

- great chairs and passionate executive officers supported by able staff and community members
- a great consultative process for community drainage that paved the way, including for our new drainage course declarations
- great supervision of the [\\$170 million Farm Water Program](#) (GBCMA, 2019b).

<sup>46</sup> Unpublished [internal](#).

<sup>47</sup> Reference states it is 82 gigalitres.



## Where would we be without the Plan?

The region would be more precariously placed without the Plan and joint action...

### Capacity of the people would now have been

- fragmented and divided; regionally voiceless; reactive and less adaptive; less innovative; frustrated.

### Onground there would have been

- less investment and fewer NRM works
- serious local salinity and waterlogging problems
- less environmental flows and connection
- more disputes between landholders and government.

### Flow-on effects would have seen us

- poorer economically and environmentally
- with more unproductive and vacant farms
- with degraded irrigation infrastructure (perhaps no Connections Project and fewer irrigation upgrades)
- with less flow on benefits from irrigation upgrades
- with less research applied to irrigated land via whole farm plans, extension and innovation.

## But if only...

... we had 'sold' the Plan's approach more, despite state, national and international recognition, so that we could have:

- retained the level of community influence (community role in SIRPPIC has become more advisory)
- monitored biodiversity and supported it better, especially native vegetation
- kept control of regional research so it could be directed to better link environmental and agricultural science with evolving industries and local needs
- ongoing farm improvement incentives that enable the SIR to continue adapting to a future with less water
- influenced land tenure, land use and rural adjustment more as production systems evolved
- kept the emphasis on triple bottom line cost-benefit analysis
- extended beyond the SIR the value of long-term 'public good' over 'private good' outcomes in decision making
- maintained regional education programs (and avoided the demise of Saltwatch)
- stopped more water from leaving the SIR (by better anticipating the impacts of unbundling of water from land).

*... so many people can work together on a committee (21 on SIRPPIC) and still get outcomes.*

Heather du Vallon, farmer and SIRPPIC member

# What's next: meeting the challenges ahead



**Carl Walters**

Executive Officer,  
Shepparton Irrigation Region People and Planning Integration Committee

When you look across the SIR it's plain to see what the Plan has achieved in its 30 years: a vast amount of onground, physical works, but the pace of change has been rapid and it promises to keep accelerating.

Ongoing changes in climate, water availability, farm production systems, markets, technologies and social structures and expectations force us to grow the region's resilience so that we can continue to thrive. Natural resources are fundamental to this resilience.

Our challenge is to keep abreast of what's changing and collectively shift our region to a new future by influencing the actions of the many key players, new investors, government and farmers of all scales.

We must continue harnessing the power of information technology to increase participation in the development of knowledge. This will expand our collaborative approach and help us create responsive and relevant solutions. While the COVID-19 induced levels of social and economic upheaval create additional risks, they also create opportunities and we are seeing increased focus on the region.

Thankfully 30 years of partnerships and Plan implementation have helped the region to remain highly desirable as a place in which to live, work and invest.

I have been fortunate that the groundwork was done early on by the likes of Ken Sampson, Bill O'Kane, Bob Wildes, Bill Trehwella and John Dainton. These people set the standard to genuinely engage the community in decisions around priority actions for the region. I also acknowledge huge contributions of the several hundred agency staff who have implemented the Plan and actively committed to the partnership approach. In 2021, it is timely for SIRPPIC to formally update the Plan.

Central to updating the Plan will be to:

- adapt our processes to fully engage our increasingly diverse landowners, which will help reinforce community and partner agency trust and reinvigorate SIRPPIC's role as a fearless and respected community voice
- advocate the benefits of SIRPPIC's role in providing high-level policy advice and in directly influencing government policy and priorities
- recognise what other changes in approach are needed so that we either persist with existing approaches, adapt them, or fundamentally transform them
- identify the new opportunities and design a way of capturing these for our region.

For details on [specific challenges and opportunities to be considered in the Plan update](#), scan the QR code inside the front cover or [click here](#).

# Plan Committee 1990 to 2020

[The Salinity Pilot Program Advisory Council \(SPPAC\) first met in 1986 after being established by the Victorian Government in 1985. SPPAC appointed Dryland and Irrigation sub-committees soon after to develop salinity plans for the sub-regions. John Dainton chaired SPPAC and Leon Heath chaired the Irrigation Sub-committee](#) (Northage, 2014).

[Stuart Brown, Graeme David, Bill Trehwella, Peter Alexander and Leon Heath led the drafting of the irrigation region plan, which included significant consultation](#) (Northage, 2014).

The draft Shepparton Irrigation Region Land and Water Salinity Management Plan and the draft Goulburn Broken Dryland Salinity Management Plan were developed in 1989, and the Victorian Government announced its support for their implementation in June 1990.

The Salinity Program Advisory Council (SPAC) replaced SPPAC in January 1991, with Jeremy Gaylard the Chair and Bill O’Kane the Executive Officer. SPAC’s role was to oversee implementation of the two plans, while SPAC’s Irrigation and Dryland sub-committees ‘did the work of SPAC’ by implementing the plans and developing policies for their implementation. [SPAC’s Communications Committee marketed the plans to the broader community](#) (Northage, 2014).

SIRPPIC has operated under the Goulburn Broken CMA Board since 1997. (See Committee name changes on the next page.)

SIRPPIC leaders are shown here. Chairs have been community members and executive officers have been agency staff.

## Chairs



**John Dainton**  
1991-1993



**Athol McDonald**  
1993-1997



**Noel Russell**  
1997-1998



**Allen Canobie**  
1998-2001



**Russell Pell**  
2001-2006



**Peter Gibson**  
2006-2010



**Roger Wrigley**  
2010-12

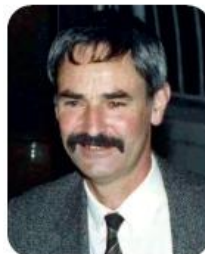


**Helen Reynolds**  
2012-2017



**Kelvin Bruce**  
2017-2020+

## Executive Officers



**Dr Bob Wildes**  
1991-1994



**Ken Sampson**  
1994-2009



**Carl Walters**  
2009-2020+

*Note: The position was termed Plan Coordinator until 1999*

## Committee name evolution

### Plan development

1985 Salinity Pilot Program Advisory Council and its Irrigation Sub-committee

### Plan implementation

1991 Irrigation Sub-committee of the Salinity Program Advisory Council

1995 Irrigation Committee of the Goulburn Broken and North Central Catchment and Land Protection Boards

1997 Irrigation Committee of the Goulburn Broken and North Central CMAs

1999 SIR Implementation Committee of the Goulburn Broken and North Central CMAs

2000 SIR Implementation Committee of the Goulburn Broken CMA

2012 Sustainable Irrigation Program Advisory Group of the Goulburn Broken CMA

2015+ SIR People and Planning Integration Committee of the Goulburn Broken CMA



## Salinity Program Advisory Council 1991 (SPAC; original membership)

The new Salinity Program Advisory Council. Back row, from left: Mr Ian Robinson, Cr Jeremy Gaylard, Mr John Dainton (Chairman), Mr Jock Wallis and Mr Ian Wardrop. Centre row, from left: Mr Ken Whan, Mr John Pettigrew, Mrs Gwen Jensen, Mr Craig Madden and Mr Gordon Weller. Front row, from left: Mr Athol McDonald, Cr Allen Canobie, Ms Dianne McPherson, Mr Angus Howell, Mr Ian Elder. (Unknown author, 1991) (Photograph from Country News, February 21, 1991)

## SPAC Irrigation Sub-committee 1991

John Dainton (Chairman), Dianne McPherson, Jeremy Gaylard, Ian Robinson, Geoff Witten, John Pettigrew, James Rorke, Gordon Weller, Ken Chester, Noel Russell, Athol McDonald, Allen Canobie, Maurice Holland, George Trew, Gwen Jensen.<sup>48</sup>

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<sup>48</sup> Reference to be confirmed. (Rod McLennan September 2021)

## Shepparton Irrigation Region Implementation Committee 2008



Peter Gibson, Nick Ryan, Ken Sampson, John Gray, Helen Reynolds, Allen Canobie, Roger Wrigley, Peter Howard, Terry Batey, James Burkitt, Stephen Farrell. Absent: John Wenske

## Shepparton Irrigation Region People and Planning Integration Committee 2021



Photo of Teams meeting during COVID-19 includes agency support staff. Committee members in 2021 are: Kelvin Bruce (Chair), Alastair Whittington, Alfred Heuperman, Andrea Smith, Barry Croke, Doug Brown, Heather du Vallon, Jennifer Savage, Katrina Glover, Kevin L’Huillier, Murray McDonald, John Laing, Carl Walters, Megan McFarlane, Vicki Mackenzie, Chris Nicholson, James Burkitt, Bek Caldwell, Steve Wilson, Mark Turner, Neville Atkinson, Bec Pike, Simon Cowan, Sasha Johnson, Bonnie Glaister, Peter Hacon.

For [more photographs, membership lists of committees, working groups and agency staff](#), scan the QR code inside the front cover or [click here](#).

## Our Partners



### Goulburn Broken Catchment Management Authority

168 Welsford Street, Shepparton  
PO Box 1752, Shepparton VIC 3632  
Phone: (03) 5822 7700 Fax: (03) 5831 6254  
Email: [reception@gbcma.vic.gov.au](mailto:reception@gbcma.vic.gov.au)  
[www.gbcma.vic.gov.au](http://www.gbcma.vic.gov.au)

September 2021

## References

- ABARES. (2021, August 3). *Shepparton Victoria*. Retrieved September 10, 2021, from About my region: <https://www.agriculture.gov.au/abares/research-topics/aboutmyregion/vic-shepparton>
- Abel, N., Roberts, J., Reid, J., Overton, I., O'Connell, D., Harvey, J., & Bickford, S. (2006, May). *Barmah Forest: a review of its values, management objectives, and knowledge base*. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/downloads/Wetlands/Barmah\\_Final\\_20060522.pdf](https://www.gbcma.vic.gov.au/downloads/Wetlands/Barmah_Final_20060522.pdf)
- AECOM. (2018, July). Shepparton Irrigation Region Salt and Water Balance Project Final Summary Report. Unpublished GBCMA sharepoint. Retrieved September 10, 2021, from <https://goulburnbrokenma.sharepoint.com/programs/Irrigation/Projects/Forms/By%20Project.aspx?id=%2Fprograms%2FIrrigation%2FProjects%2FSalt%20%20Water%20Balance%20GBCMA%20%28Final%29%20Report%2Epdf&parent=%2Fprograms%2FIrrigation%2FProjec>
- Agriculture Victoria. (2020, April). *Why invest in Goulburn Valley agriculture and food processing?* (Department of Economic Development, Jobs, Transport and Resources) Retrieved September 22, 2021, from Invest in Victorian Agriculture: <https://invest.agriculture.vic.gov.au/#/region/gou>
- CSIRO. (2008, May). *Water Availability in the Goulburn-Broken*. Retrieved September 2, 2021, from <https://publications.csiro.au/rpr/download?pid=legacy:697&dsid=DS1>
- DELWP. (2019). *Victoria's Comprehensive Report 2019 Basin Salinity Management Strategy 2030*. Retrieved September 15, 2021, from [www.water.vic.gov.au](http://www.water.vic.gov.au): [https://www.water.vic.gov.au/\\_\\_data/assets/pdf\\_file/0028/452908/Victorias-Comprehensive-Report-2019-BMS2030.pdf](https://www.water.vic.gov.au/__data/assets/pdf_file/0028/452908/Victorias-Comprehensive-Report-2019-BMS2030.pdf)
- DELWP. (2021a, 19 July). *How climate change impacts Victoria's water*. (State of Victoria) Retrieved September 2, 2021, from <https://www.water.vic.gov.au/climate-change/adaptation/how-climate-change-impacts-victorias-water>
- DELWP. (2021b). *Water trading/Allocation trading*. Retrieved September 9, 2021, from <https://www.waterregister.vic.gov.au/water-trading/allocation-trading>
- DELWP. (2021c, June 3). *Significant wetlands*. Retrieved September 3, 2021, from <https://www.water.vic.gov.au/waterways-and-catchments/rivers-estuaries-and-waterways/wetlands/significant-west>
- DELWP. (2021d, September 2021). *Flora and Fauna Guarantee Act Threatened List*. Retrieved September 22, 2021, from <https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list>
- DELWP. (2021e). *Goulburn To Murray Trade Review 2021-22 Operating rules and monitoring*. Retrieved September 23, 2021, from Water Register: [https://www.waterregister.vic.gov.au/images/documents/G-M-Fact-Sheet\\_Interim-year-for-operating-rules-and-monitoring.pdf](https://www.waterregister.vic.gov.au/images/documents/G-M-Fact-Sheet_Interim-year-for-operating-rules-and-monitoring.pdf)
- Department of Premier and Cabinet. (1988). *Salt action: joint action - Victoria's strategy for managing land and water salinity*. Retrieved October 8, 2021, from [https://www.ccmaknowledgebase.vic.gov.au/soilhealth/soils\\_resource\\_details.php?resource\\_id=3853](https://www.ccmaknowledgebase.vic.gov.au/soilhealth/soils_resource_details.php?resource_id=3853)

- Fakhrul Islam, S., & Karim, Z. (2020). World's Demand for Food and Water: The Consequences of Climate Change. In M. Farahani (Ed.), *Desalination Challenges and Opportunities* (p. Chapter 4). Singapore: IntechOpen. Retrieved September 10, 2021, from <https://www.intechopen.com/chapters/66882>
- Farmanco, Hydrotechnology & Northage and Associates. (1995). *Transition to an integrated catchment approach in natural resource management: report to the Goulburn Broken Catchment Community Reference Group*. Tatura: Farmanco?
- GBCMA. (2003, December). *Victorian Government Library Service*. Retrieved September 22, 2021, from [https://www.vgls.vic.gov.au/client/en\\_AU/search/asset/1295031](https://www.vgls.vic.gov.au/client/en_AU/search/asset/1295031)
- GBCMA. (2005). *SIR Achievement Report 1990-91 to 2000-01*. (K. Sampson, Ed.) Retrieved September 23, 2021, from GBCMA: <https://www.gbcma.vic.gov.au/downloads/SIRCatchmentStrategy/SIR10YearReview.pdf>
- GBCMA. (2012). *Shepparton Irrigation Region Catchment Implementation Strategy Review 2005-2006 and Implementation Plan 2010-2011 yet to be put onto web??* Retrieved September 2021, from Publications: to be done??
- GBCMA. (2012, June). *The Living Murray Barmah-Millewa Icon Site Annual Report 2010-11*. Shepparton: GBCMA. Retrieved October 6, 2021, from [https://www.gbcma.vic.gov.au/downloads/annualreports1011/bmf\\_icon\\_site\\_annual\\_report\\_2010-2011\\_final\\_june\\_2012.pdf](https://www.gbcma.vic.gov.au/downloads/annualreports1011/bmf_icon_site_annual_report_2010-2011_final_june_2012.pdf)
- GBCMA. (2014). *GBCMA\_Waterway\_Strategy\_2014-2022\_Part\_A\_-\_Regional\_Overview.pdf*. Retrieved September 10, 2021, from [https://www.gbcma.vic.gov.au/downloads/GB\\_Waterway\\_Strategy\\_2014\\_-\\_2022/GBCMA\\_Waterway\\_Strategy\\_2014-2022\\_Part\\_A\\_-\\_Regional\\_Overview.pdf](https://www.gbcma.vic.gov.au/downloads/GB_Waterway_Strategy_2014_-_2022/GBCMA_Waterway_Strategy_2014-2022_Part_A_-_Regional_Overview.pdf)
- GBCMA. (2015a, September 28). *Incentive Project Protecting Woodlands and Wetlands on Private Property*. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/downloads/Outcome\\_Stories\\_Case\\_Studies/Protecting\\_Woodlands\\_-\\_28.09.2015.pdf](https://www.gbcma.vic.gov.au/downloads/Outcome_Stories_Case_Studies/Protecting_Woodlands_-_28.09.2015.pdf)
- GBCMA. (2015b). *A Fruitful Job-Program Partnership - Fruit Industry Employment Program 2013-2014*. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/downloads/Outcome\\_Stories\\_Case\\_Studies/A\\_Fruitful\\_Job.pdf](https://www.gbcma.vic.gov.au/downloads/Outcome_Stories_Case_Studies/A_Fruitful_Job.pdf)
- GBCMA. (2015d, September 28). *Goulburn Broken Indigenous Seedbank - Region's Biodiversity in Good Hands*. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/downloads/Outcome\\_Stories\\_Case\\_Studies/Seedbank\\_-\\_28.09.2015.pdf](https://www.gbcma.vic.gov.au/downloads/Outcome_Stories_Case_Studies/Seedbank_-_28.09.2015.pdf)
- GBCMA. (2016). *Shepparton Irrigation Region (Agricultural Floodplains) Land and Water Management Plan 2016-2020 – Growing the Natural Advantage Part A*. Retrieved October 6, 2021, from <https://www.gbcma.vic.gov.au/downloads/Publications/Agricultural%20Floodplains%20%20Land%20and%20Water%20Management%20Plan.pdf>
- GBCMA. (2017). *Goulburn Broken Water Quality Strategy Review*. (P. Feehan, Ed.) Shepparton: Unpublished GBCMA sharepoint. Retrieved September 10, 2021, from [https://goulburnbrokenma.sharepoint.com/:w:/r/programs/river/\\_layouts/15/Doc.aspx?sourcedoc=%7B37ED07D0-1DEE-4462-8C66-77ADAE008BEB%7D&file=Water%20Quality%20Strategy%20Review%202016.docx&action=default&mobileredirect=true&DefaultItemOpe](https://goulburnbrokenma.sharepoint.com/:w:/r/programs/river/_layouts/15/Doc.aspx?sourcedoc=%7B37ED07D0-1DEE-4462-8C66-77ADAE008BEB%7D&file=Water%20Quality%20Strategy%20Review%202016.docx&action=default&mobileredirect=true&DefaultItemOpe)



- GBCMA. (2018a). *Goulburn Broken Water Strategy 2014-2022 Interm Review 2018*. (R. McLennan, Ed.) Shepparton: Unpublished GBCMA sharepoint. Retrieved September 10, 2021, from <https://goulburnbrokencma.sharepoint.com/programs/river/Strategy/2018%20Waterway%20Strategy%20review%20reports/GB%20Waterway%20Strategy%20Interim%20Review%202018.pdf>
- GBCMA. (2018b, January 20). *Health Land and Water*. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/downloads/Outcome\\_Stories\\_Case\\_Studies/2018%20-%20January%20-%20Healthy%20land%20and%20water.pdf](https://www.gbcma.vic.gov.au/downloads/Outcome_Stories_Case_Studies/2018%20-%20January%20-%20Healthy%20land%20and%20water.pdf)
- GBCMA. (2018c, January 20). *Healthy Landscapes - Healthy Rivers*. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/downloads/Outcome\\_Stories\\_Case\\_Studies/2018%20-%20January%20-%20Healthy%20Rivers.pdf](https://www.gbcma.vic.gov.au/downloads/Outcome_Stories_Case_Studies/2018%20-%20January%20-%20Healthy%20Rivers.pdf)
- GBCMA. (2019a). *SIR Water Quality Critical Attribute SEPP Assessment 2019*. Unpublished GBCMA sharepoint. Retrieved September 10, 2021, from <https://goulburnbrokencma.sharepoint.com/:b:/r/programs/Irrigation/Projects/SIR%20Water%20Quality%20Critical%20Attribute%20SEPP%20Assessment%202019.pdf?csf=1&web=1&e=qT4Khm>
- GBCMA. (2019b, August). *Farm Water Program*. Retrieved September 20, 2021, from Farm Water Program Evaluation Results: [https://www.gbcma.vic.gov.au/downloads/Farm\\_Water\\_Program/Farm%20Water%20Program%20Evaluation%20Results%20All%20Rounds%201-5%20August%202019.pdf](https://www.gbcma.vic.gov.au/downloads/Farm_Water_Program/Farm%20Water%20Program%20Evaluation%20Results%20All%20Rounds%201-5%20August%202019.pdf)
- GBCMA. (2020a). *Goulburn Broken Catchment Management Authority Annual Report 2019-20*. State of Victoria. Shepparton: GBCMA. Retrieved September 10, 2021, from [https://www.gbcma.vic.gov.au/downloads/AnnualReports/GBCMA\\_Annual%20Report\\_2019-20\\_WEB.pdf](https://www.gbcma.vic.gov.au/downloads/AnnualReports/GBCMA_Annual%20Report_2019-20_WEB.pdf)
- GBCMA. (2020b). *Biodiversity assets in the Goulburn Broken*. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/our-region/land\\_and\\_biodiversity/biodiversity\\_assets](https://www.gbcma.vic.gov.au/our-region/land_and_biodiversity/biodiversity_assets)
- GBCMA. (2021a). *SIRLWMP Target, Outputs and Charts 2020-21*. Unpublished GBCMA sharepoint Excel workbook. Retrieved September 10, 2021, from [https://goulburnbrokencma.sharepoint.com/:x:/r/corporate/business/\\_layouts/15/Doc.aspx?sourcedoc=%7B8DFFCCE4-867F-47A4-887E-8E8DE9439FB2%7D&file=SIRCIS%20Targets%2C%20Outputs%20and%20Charts%202020-21.xlsx&wdLOR=cEFE85B65-00F4-40CA-9F51-659E6F937E8A&action](https://goulburnbrokencma.sharepoint.com/:x:/r/corporate/business/_layouts/15/Doc.aspx?sourcedoc=%7B8DFFCCE4-867F-47A4-887E-8E8DE9439FB2%7D&file=SIRCIS%20Targets%2C%20Outputs%20and%20Charts%202020-21.xlsx&wdLOR=cEFE85B65-00F4-40CA-9F51-659E6F937E8A&action)
- GBCMA. (2021c, September). *SIRLWMP Implementation Structure*. Retrieved October 8, 2021, from <https://www.gbcma.vic.gov.au/downloads/SIRLWMP/SIRLWMP%20implementation%20structure.pdf>
- GBCMA. (2021d, March). *SIR Crisis employment data*. Unpublished GBCMA sharepoint Excel workbook including case studies from annual reports. Retrieved from <https://goulburnbrokencma.sharepoint.com/:x:/r/programs/Irrigation/Strategy/SIR%20crisis%20employment%20data.xlsx?d=w4718c94b00fb4f8799fd42ec09674049&csf=1&web=1&e=zbYzDq>
- GBCMA. (2021e, March). *Shepparton Irrigation Region People and Planning Integration Committee (SIRPPIC) 2020 Performance Evaluation*. Unpublished GBCMA sharepoint. Retrieved from <https://goulburnbrokencma.sharepoint.com/:w:/r/programs/Irrigation/Strategy/SIRPPIC%202020%20Performance%20Evaluation%20Report-%20January%202021.docx?d=w315a37b88ce040f5aed4990728f95f00&csf=1&web=1&e=m48Nq5>

- GBCMA. (2021f). *Shepparton Irrigation Region Awards and Recognition since 1990*. Retrieved October 8, 2021, from <https://www.gbcma.vic.gov.au/downloads/SIRLWMP/SIR-awards-and-recognition-since-1990.pdf>
- GBCMA. (2021g). *Environmental Programs link*. Retrieved September 22, 2021, from Sustainable Irrigation webpage: [https://www.gbcma.vic.gov.au/our-region/sustainable\\_irrigation](https://www.gbcma.vic.gov.au/our-region/sustainable_irrigation)
- GBCMA. (2021h, September 24). Retrieved October 6, 2021, from SIR Environmental Management Plans: <https://www.gbcma.vic.gov.au/downloads/SIRLWMP/SIR-Environmental-Management-Plans.pdf>
- GBCMA. (2021i). *AR202021 Native vegetation long-term graphs*. Unpublished GBCMA sharepoint Excel workbook. Retrieved October 11, 2021, from <https://goulburnbrokencma.sharepoint.com/:x:/r/corporate/business/Annual%20Report/2020-2021%20Annual%20Report/AR2021%20Native%20vegetation%20long-term%20graphs.xlsx?d=w6a4deddb56ac4ad3a1791ede0a70f77d&csf=1&web=1&e=Ob276E>
- GBCMA. (n.d.). *East-West Alliance*. (F. Johnson, Ed.) Retrieved September 6, 2021, from Tri-State Murray NRM Regional Alliance: [https://www.gbcma.vic.gov.au/downloads/OtherPublications/Tri-State\\_Flyer\\_EastWestAlliance\\_FINAL.pdf](https://www.gbcma.vic.gov.au/downloads/OtherPublications/Tri-State_Flyer_EastWestAlliance_FINAL.pdf)
- GBCMA. (n.d.). *GBCMA RCS Resilience Factsheet*. Retrieved September 21, 2021, from [https://www.gbcma.vic.gov.au/downloads/Current\\_Issues/GBCMA\\_RCS\\_Resilience\\_Factsheet.pdf](https://www.gbcma.vic.gov.au/downloads/Current_Issues/GBCMA_RCS_Resilience_Factsheet.pdf)
- GBCMA, GMW, Department of Natural Resources and Environment. (2002). *Rehabilitation of the Broken Creek System*. Shepparton (GBCMA): Nomination for a Banksia Foundation Environmental Award.
- GBCMA, NCCMA and GMW. (2015, October). *Shepparton Irrigation Region Drainage Program Review Overview*. Retrieved September 6, 2021, from [https://www.gbcma.vic.gov.au/downloads/SIR\\_Documents/GBCMA\\_DrainageProjectReview\\_WEB.pdf](https://www.gbcma.vic.gov.au/downloads/SIR_Documents/GBCMA_DrainageProjectReview_WEB.pdf)
- GMW & GBCMA. (2021, April 9). *Shepparton Irrigation Public Groundwater Pump Operational Triggers Revision 2021*. (S. Cowan, & M. Potter, Compilers) Shepparton: Unpublished GBCMA sharepoint attachment 1 to internal memorandum endorsed by SIR People and Planning Integration Committee. Retrieved from [https://goulburnbrokencma.sharepoint.com/:b:/r/programs/Irrigation/Projects/SIRPPIC%20Meeting%2021-2\\_9%20April%2021%20%20SIR%20Public%20Groundwater%20Pump%20Operational%20Triggers%20For%20endorsement%20\(A4006597\).pdf?csf=1&web=1&e=kf7TD8](https://goulburnbrokencma.sharepoint.com/:b:/r/programs/Irrigation/Projects/SIRPPIC%20Meeting%2021-2_9%20April%2021%20%20SIR%20Public%20Groundwater%20Pump%20Operational%20Triggers%20For%20endorsement%20(A4006597).pdf?csf=1&web=1&e=kf7TD8)
- GMW. (2018, October). *Shepparton Irrigation Region Sustainable Irrigation Program August 2018 Watertable Study*. Unpublished GBCMA sharepoint. Retrieved September 10, 2021, from <https://goulburnbrokencma.sharepoint.com/programs/Irrigation/Projects/Forms/By%20Project.aspx?FilterField1=Project&FilterValue1=Watertables&FilterType1=Text&FilterDisplay1=Watertables&id=%2Fprograms%2FIrrigation%2FProjects%2FAUGUST%20WATERTABLE%20STUDY%20>
- GMW. (2018, February). *Connections project Fact sheet*. Retrieved September 6, 2021, from [https://assets.website-files.com/5acc4fc47901611c43b43018/5ae26ad1a1776fdb3b65db09\\_Fact-Sheet-About-Connections.pdf](https://assets.website-files.com/5acc4fc47901611c43b43018/5ae26ad1a1776fdb3b65db09_Fact-Sheet-About-Connections.pdf)
- GMW. (2019, November 25). *Shepparton Irrigation Region Surface Drain Water Quality Annual Review 2018-19*. Unpublished GBCMA sharepoint. Retrieved September 10, 2021, from <https://goulburnbrokencma.sharepoint.com/:b:/r/programs/Irrigation/Projects/2018->

19%20SHEPPARTON%20IRRIGATION%20REGION%20SURFACE%20DRAIN%20WATER%20QUALITY%20ANNUAL%20REPORT%20(A3640117).pdf?csf=1&web=1&e=oLwGeS

- GMW. (2020, August). *Connections project Update*. Retrieved September 6, 2021, from [https://assets.website-files.com/5b35d890852a6d732774b5a5/5f643775db399435c682da69\\_CP%20Newsletter%20Aug20.pdf](https://assets.website-files.com/5b35d890852a6d732774b5a5/5f643775db399435c682da69_CP%20Newsletter%20Aug20.pdf)
- Goulburn Broken Region Salinity Pilot Program Advisory Council. (1989, August). *Shepp\_Land\_and\_Water\_Salinity\_Management\_Plan\_Draft\_Aug\_1989.pdf*. Retrieved September 10, 2021, from [www.gbcma.vic.gov.au](http://www.gbcma.vic.gov.au): [https://www.gbcma.vic.gov.au/downloads/SIRCatchmentStrategy1989/Shepp\\_Land\\_and\\_Water\\_Salinity\\_Management\\_Plan\\_Draft\\_Aug\\_1989.pdf](https://www.gbcma.vic.gov.au/downloads/SIRCatchmentStrategy1989/Shepp_Land_and_Water_Salinity_Management_Plan_Draft_Aug_1989.pdf)
- Goulburn Broken River Environment and Water Quality Committee. (1997, June). *Goulburn Broken Water Quality Strategy Addendum to Draft Strategy*. Retrieved September 6, 2021, from Publications: [https://www.gbcma.vic.gov.au/downloads/WaterQuality/GB\\_Water\\_Quality\\_Strategy\\_June\\_1997.pdf](https://www.gbcma.vic.gov.au/downloads/WaterQuality/GB_Water_Quality_Strategy_June_1997.pdf)
- Goulburn Regional Partnership. (2020). *Goulburn-Murray Resilience Strategy 2020*. Greater Shepparton City Council. Shepparton: State of Victoria. Retrieved October 7, 2021, from [https://greatershepparton.com.au/assets/files/documents/planning/strategic/GMID\\_Resilience\\_Strategy\\_-\\_1\\_June\\_2020.PDF](https://greatershepparton.com.au/assets/files/documents/planning/strategic/GMID_Resilience_Strategy_-_1_June_2020.PDF)
- Greater Shepparton City Council. (2021, September 20). *RiverConnect*. Retrieved September 20, 2021, from <https://riverconnect.com.au/>
- Horne, A., Webb, A., Rumpff, L., Mussehl, M., Fowler, K., & John, A. (2020). *Kaiela (Lower Goulburn River) Environmental Flows Study*. Retrieved September 2, 2021, from [gbcma.vic.gov.au](http://www.gbcma.vic.gov.au): [https://www.gbcma.vic.gov.au/downloads/Environmental\\_Water/Kaiela-Goulburn\\_Eflows%20Final%20Report.pdf](https://www.gbcma.vic.gov.au/downloads/Environmental_Water/Kaiela-Goulburn_Eflows%20Final%20Report.pdf)
- Jacobs. (2018, January 30). *Shepparton Irrigation Region – Salinity effect on the Murray River at 2015 levels of development – Five year Review of the MDBA Salinity Register Entry*. Unpublished report for Goulburn-Murray Water on GBCMA sharepoint. Retrieved September 10, 2021, from <https://goulburnbrokencma.sharepoint.com/programs/Irrigation/Projects/Forms/By%20Project.aspx?FilterField1=Project&FilterValue1=BSM2030&FilterType1=Text&FilterDisplay1=BSM2030&id=%2Fprograms%2FIrrigation%2FProjects%2FSIR%205%20YEAR%20REVIEW%20%2D%20SALINI>
- LG Valuation Services & HMC Valuers. (2010, July). *Changing land use in the GMID 2006-2010*. Shepparton: HMC Property Group. Retrieved September 24, 2021, from Report for the Northern Victoria Irrigation Renewal Project and the Department of Primary Industries: <https://www.gbcma.vic.gov.au/downloads/CatchmentEconomy/Changing%20land%20use%20in%20the%20GMID%202016-2010%20FINAL.pdf>
- MDBA. (2010). *Appendix B Hydrologic indicator sites Goulburn-Broken region*. Retrieved September 4, 2021, from Guide to the proposed Basin Plan Technical background Part II: [https://www.mdba.gov.au/sites/default/files/archived/guide\\_pbp/Goulburn-Broken-region.pdf](https://www.mdba.gov.au/sites/default/files/archived/guide_pbp/Goulburn-Broken-region.pdf)
- MDBA. (n.d.). *MDBA Historical Timeline*. Retrieved September 20, 2021, from A path to water reform: Timeline of water resource management in the Murray-Darling Basin: <https://www.mdba.gov.au/sites/default/files/pubs/MDBA-Historical-Timeline.pdf>

- Murray Dairy. (2021). *Murray Dairy Trends Report 2019-20*. Retrieved September 22, 2021, from Dairy Australia: <https://www.dairyaustralia.com.au/murray-dairy/resources-repository/2021/04/14/murray-dairy-trends-report-2019-20#.YUqyOVUzaUI>
- Murray-Darling Basin Authority. (2015). *Goulburn River reach report Constraints Management Strategy*. Canberra: Australian Government. Retrieved October 6, 2021, from <https://www.mdba.gov.au/publications/mdba-reports/goulburn-river-reach-report>
- Northage, J. (2014). *John Dainton's Role in Mending the Goulburn Broken*. Retrieved September 6, 2021, from GBCMA/IrrigationSalinity: [https://www.gbcma.vic.gov.au/downloads/IrrigationSalinity/john\\_dainton\\_s\\_role\\_in\\_mending\\_the\\_goulburn\\_broken%202021.pdf](https://www.gbcma.vic.gov.au/downloads/IrrigationSalinity/john_dainton_s_role_in_mending_the_goulburn_broken%202021.pdf)
- Pitt, K., & Neville, L. (2020, October 20). *Connections Project to deliver 429 gigalitres in water savings*. Retrieved September 15, 2021, from Joint media release Australian and Victorian Ministers for Water: <https://minister.awe.gov.au/pitt/media-release/connections-project>
- Radford, J., Bennett, A., & MacRaid, L. (2004, October). *How much habitat is enough?* Retrieved September 22, 2021, from Deakin Research Online: <https://dro.deakin.edu.au/eserv/DU:30015303/radford-howmuch-2004.pdf>
- RMCG. (2019, June 5). *Future irrigation scenarios and what success might look like*. Shepparton and Tatura: Unpublished discussion paper for Goulburn Broken CMA and Goulburn Murray Water on GBCMA sharepoint. Retrieved October 5, 2021, from [https://goulburnbrokencma.sharepoint.com/:w:/r/programs/Irrigation/\\_layouts/15/Doc.aspx?sourcedoc=%7B2F2DDD0D-4E18-4716-A5EF-F671B03DA6E5%7D&file=Future%20Irrigation%20Scenarios%20%20GM%20region%20RMCG%20Final%20June%202019%20final%205%20June%202019.docx&](https://goulburnbrokencma.sharepoint.com/:w:/r/programs/Irrigation/_layouts/15/Doc.aspx?sourcedoc=%7B2F2DDD0D-4E18-4716-A5EF-F671B03DA6E5%7D&file=Future%20Irrigation%20Scenarios%20%20GM%20region%20RMCG%20Final%20June%202019%20final%205%20June%202019.docx&)
- RMCG. (2021, September 29). *SIRLWMP - Estimates of costs and benefits 1990 to 2020*. Bendigo: Unpublished for GBCMA on sharepoint. Retrieved October 5, 2021, from [https://goulburnbrokencma.sharepoint.com/:w:/r/programs/Irrigation/\\_layouts/15/Doc.aspx?sourcedoc=%7B681B2F2C-EC43-4466-BD77-0FBDDAC36130%7D&file=30%20years%20SIRLWMP%20Estimate%20of%20costs%20and%20Benefits%20RMCG%20September%202021.docx&wdLOR=cA846E370-](https://goulburnbrokencma.sharepoint.com/:w:/r/programs/Irrigation/_layouts/15/Doc.aspx?sourcedoc=%7B681B2F2C-EC43-4466-BD77-0FBDDAC36130%7D&file=30%20years%20SIRLWMP%20Estimate%20of%20costs%20and%20Benefits%20RMCG%20September%202021.docx&wdLOR=cA846E370-)
- Sinclair Knight Merz. (2003). *Floodplain Management Guidelines for Whole Farm Plans within the Shepparton Irrigation Region*. Shepparton: Report for GBCMA and NCCMA. Retrieved September 22, 2021, from [https://www.gbcma.vic.gov.au/downloads/FloodplainManagement/Mar2003\\_FinalWFPGuidelines.pdf](https://www.gbcma.vic.gov.au/downloads/FloodplainManagement/Mar2003_FinalWFPGuidelines.pdf)
- Unknown author. (1991, February 21). Salinity Program Advisory Council. *Country News*.