GMID Drainage Management Strategy

July 2022

GOULBURN BROKEN CATCHMENT MANAGEMENT AUTHORITY

North Central CMA

Goulburn-Murray WATER

VICTORIA State Government | Environment, Land, Water and Planning

Fundamental changes to climate and irrigation in the Goulburn Murray Irrigation District (GMID) require a re-think of irrigation drainage management; and by adapting drainage to meet changing needs, Goulburn-Murray Water, Goulburn Broken CMA and North Central CMA can actively contribute to building the region's resilience.

Acknowledgement of Traditional Owners

We pay our respects to Elders past and present, and acknowledge and recognise Traditional Owners' obligations, rights and responsibilities to use and care for their traditional lands and waters.

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Acronyms

AgVic	Agriculture Victoria
AEP	Annual Exceedance Probability
ARI	Average Return Interval
BSMS	Basin Salinity Management Strategy
CMA	Catchment Management Authority
CSD	Community Surface Drain
CSWMS	Community Surface Water Management System
DCD	Drainage Course Declaration
DELWP	Department of Environment, Land, Water and Planning
ECL	Environmental Contribution Levee
EPA	Environmental Protection Authority
ESC	Essential Services Commission of Victoria
GL	Gigalitre
GMA	Groundwater Management Area
GMID	Goulburn Murray Irrigation District
GMW	Goulburn-Murray Water
ha	Hectare
IA	Irrigation Area
IDMoU	Irrigation Drainage Memorandum of Understanding
km	Kilometre
LiDAR	Light Detection and Ranging
LMIR	Loddon Murray Irrigation Region
LWMP	Land & Water Management Plan
MBDA	Murray Darling Basin Authority
MERI	Monitoring, Evaluation, Reporting and Improvement
ML	Megalitre
NRM	Natural Resource Management
O&M	Operation and Maintenance
RCS	Regional Catchment Strategy
SEPP	State Environmental Protection Policy
SIR	Shepparton Irrigation Region
SWMS	Surface Water Management Strategy
TO	Traditional Owners
UWA	Urban Water Authority
VCAT	Victorian Civil and Administrative Tribunal
VIDP	Victorian Irrigation Drainage Program
WfV	Water for Victoria
WQ	Water Quality

SECTION 1

STRUCTURE OF DOCUMENT

Irrigation drainage in the Goulburn-Murray Irrigation District (GMID) has to date been delivered through a long-standing partnership approach between Goulburn-Murray Water (GMW), Goulburn Broken CMA, North Central CMA, the Department of Environment, Land Water and Planning (DELWP), Local Government and landholders.

Drainage needs across the GMID are continuing to evolve and with multiple agencies and multiple objectives, a new approach to the future management of GMID irrigation drainage is needed to adapt to the changes. The GMID Drainage Management Strategy (the Strategy) has been developed to address that need.

This document sets out contemporary management strategies that aim to maximise the future economic, environmental, social and cultural benefits of GMID irrigation drainage systems.

The Strategy covers the diverse management issues of the surface and subsurface drainage systems across the GMID which could be applied by the respective drainage service providers.

There are four main sections to this Strategy document:

SECTION 2

Section 2 covers the Strategy Development and describes the need, objectives, scope, process and guiding principles of the Strategy.

SECTION 3

Section 3 deals with the Strategy context and sets out importance of irrigation drainage, the policy and regulatory framework, economics, and the changes shaping drainage.

SECTION 4

Section 4 covers the Strategy Directions and details the future drainage needs, management issues and the proposals.

SECTION 5

Section 5 sets out the Strategy Directions in Summary. This section provides a high-level overview of the Strategy Directions, with cross references to the relevant parts of Section 4 which provide supporting detail.

1.1 A note about terminology

This document deals with the future directions for management of irrigation drainage systems across the GMID. For simplicity, we use the terminology “drainage” to refer to irrigation drainage systems, and this may include either surface or subsurface drainage systems.

Also, it should be noted that irrigation drainage systems have been installed or developed in the past for the primary purpose of providing drainage services to irrigated land across the GMID in order to mitigate the risks of salinity, waterlogging and water quality impacts from irrigation activities.

The installation of drainage systems does however provide a range of additional benefits – non-irrigated land within the GMID benefits from access to drainage.

Drainage also delivers substantial environmental benefits and provides protection of public infrastructure like roads from water damage. Urban areas located within the GMID may also discharge storm water collected from within the urban area to irrigation drains.

The role drainage plays in reducing the adverse impacts of irrigation on the environment and third parties is explored in more detail in Sections 3 and 4 of this document.

Most of the key drainage management issues identified relate to GMW drainage systems. However, there are other important public and private drainage systems across the GMID which are managed for a range of purposes by the North Central CMA, community groups (CSDs), local government and landowners. The Bullock Creek drainage network in the Loddon Valley Irrigation Area is the most significant of these. This consists of a mix of waterways managed by the North Central CMA, community surface drains owned and operated by community groups and private on-farm drains serving one or more landholdings.

SECTION 2

STRATEGY DEVELOPMENT

2.1
Need for Strategy

Effective drainage, either natural or constructed, is a critical component of sustainable irrigated agriculture and delivers a range of environmental benefits. Surface and subsurface drainage measures reduce the agricultural risks and the risks of adverse environmental impacts of irrigation, such as inundation, waterlogging, reduced water quality and salinity.

Across the GMID, significant changes continue to occur to climate, water availability, irrigated area, land use, customer base, the channel system, on-farm water-use efficiency, catchment risks, costs, commodity prices, global markets, economics and beneficiaries. These changes are discussed in Section 3 of this document and how they have informed the development of the Strategy is set out in Section 4.

Future irrigation drainage activities need to be adapted to balance environmental and community benefits with that of irrigated agriculture.

GMID irrigation drainage management is an integral part of RCS's and LWMPs and delivers significant benefits. A key aim of the Strategy is to provide guidance on how to best manage the existing GMW, CMA, Local Government and community drainage schemes across the GMID that have been constructed in the past with the different mindsets of the time. The Strategy also look at extensions to the existing drainage networks, as well as how the existing drainage schemes could be used in future to enhance the health of the natural environment, over and above mitigating the negative impacts of irrigation.

There are 3,240 km of GMW surface drains across the GMID. The GMW drains serve some 5,600 properties covering a total area of more than 310,000 hectares. The current construction cost of the GMW drains is estimated to be in the order of $700 million. There is also some 347 km of waterways managed by the North Central CMA that are part of the drainage network in the Loddon Valley Irrigation Area, as well as a number of community owned drains constructed across the GMID with varying degrees of management and understanding of their current status.

There are 115 GMW owned public groundwater pumps installed in the Shepparton Irrigation Region (SIR) and they are capable of providing watertable control benefits to some 1,300 properties covering an area of 29,000 hectares. The current construction cost of the GMW public pumps is estimated to be in the order of $60 million.

Major re-adjustments of the physical, policy and economic settings of the GMID are occurring and the future of the GMID is looking very different to that of the past. Many of the fundamentals of surface and subsurface drainage in the GMID have changed and much of the past thinking around drainage no longer applies.

The nature and dynamics of these changes has highlighted the need to re-assess many of the basics of drainage management across the GMID.

This Strategy is intended to provide direction for the future management of surface and subsurface drainage services in the GMID. The objective is to incorporate the current understanding of changing physical, economic and policy settings and to develop a more resilient approach to GMID drainage that is effective in achieving desirable outcomes across the landscape into the future.

Surface and subsurface drainage is one element of broader multi-faceted catchment strategies that encompass irrigation efficiency, water reuse, salinity and nutrient management, native vegetation, wetland and floodplain conservation. The actions identified in this Strategy will be integrated with other regional catchment programs.

Although there have been significant changes in climate, irrigated areas and land use, there is still a need for additional drainage in some parts of the GMID. While the strategy was being developed, work was still ongoing to identify local drainage issues and consult with communities on their drainage service needs. There is considerable interest in the new, lower-cost drainage approaches proposed in this strategy. Appendix 1 provides a summary of the catchments and projects where these drainage improvement works could be implemented if funding is made available.

2.2

Vision, Objectives and Outcomes of Strategy

Vision

All stakeholders work collaboratively to manage GMID drainage systems adaptively to support viable agriculture, vibrant communities, and to enhance environmental and cultural values.

Objectives

The objectives of the Strategy are to:

- Support productive and sustainable irrigation
- Protect and enhance the environment
- Establish a GMID-wide approach to drainage management of irrigated lands
- Build an understanding of the risks, need for, and value of drainage now and in the future
- Develop a shared understanding of drainage infrastructure that is currently in-situ
- Provide high-level directions that each service provider can adapt to their own circumstances, without mandating specific outcomes
- Incorporate contemporary drainage management approaches and thinking
- Balance irrigated agriculture, environmental and community benefits of drainage activities
- Use resilience principles to underpin the strategy
- Identify opportunities to support the social, environmental and cultural benefits and opportunities of drainage systems
- Enable the integration of the programs and plans of catchment partners
- Ensure regulatory requirements are understood and cost effectively met
- Establish effective partnerships with Traditional Owners
- Support and guide CMA Land and Water Management Plans, GMW Drainage Service Planning and Local Government operational management
- Implement regional irrigation drainage in alignment with VIDP priorities
- Build monitoring, assessment and adaptation mechanisms into management processes.

Outcomes

The outcomes sought by implementing the Strategy are:

- Fit-for-purpose drainage services aligned and adapted to regional catchment and land use changes
- Strengthened collaboration between catchment partners
- Ongoing sustainable management of drainage schemes
- Cost-effective drainage services are commensurate to the catchment risks
- Communities understand and value drainage services and advocate their regional importance
- New drainage infrastructure is built and maintained where it is cost-effective
- Economic, environmental, social and cultural benefits of drainage systems are maximised
- Potential adverse offsite impacts of irrigation drainage effectively managed and mitigated
- Traditional owners are part of decision making on how water moves across the landscape
- Drainage is underpinned by appropriate pricing structures
- Drainage management is undertaken in accordance with Government policies and priorities
- GMID is an attractive and affordable place to farm
- Drainage management supports communities to be more resilient by minimising impacts and supporting integrated land management

2.3
Strategy Development Process

KEY POINTS

- **GMID drainage is delivered by strong inter-agency partnerships and their continued input is important.**
- **This Strategy needs to be aligned with the LWMPs of the CMAs and GMW's business priorities.**
- **The Strategy settings are focused on the medium-term outlook and adapting to continuing change.**

The policy context for strategy development

Surface and subsurface drainage are vital elements in Victoria's approach to protecting the environment and mitigating the potential impacts of irrigated agriculture. A range of regulatory measures have been put in place over time to ensure these impacts are recognised and managed. The VIDP is Victoria's state-wide irrigation drainage policy and has been running in various forms for approximately 25 years. Over this time, a range of policy responses have been implemented to support the development and management of fit-for-purpose surface and sub-surface irrigation drainage measures in Victoria. The development of this drainage management strategy has had appropriate regard for the range of legislative and policy measures relevant to irrigation drainage. The key policy and strategy programs relevant to drainage are shown in Figure 1. Section 3.7 also provides further detail on the policy and regulatory framework for drainage management.

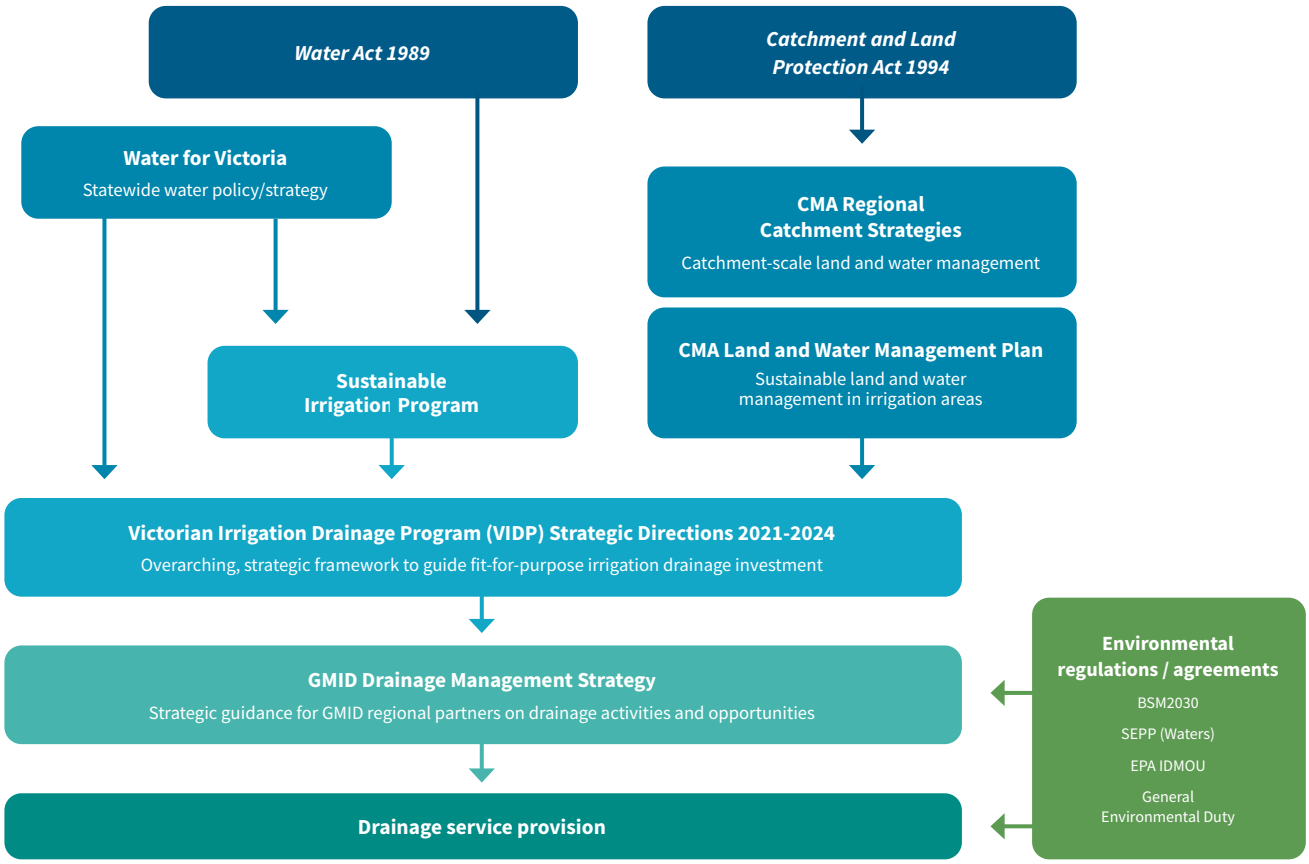

Figure 1: Key policy and legislative context for drainage management

Developing the strategy

GMW delivers drainage in partnership with the Goulburn Broken and North Central Catchment Management Authorities (Goulburn Broken CMA and North Central CMA) according to actions set by the CMA's Regional Catchment Strategies and Land and Water Management Plans (LWMPs) and priorities set by the Department of Environment, Land, Water and Planning (DELWP) Sustainable Irrigation Program. The conceptual framework for drainage management in the GMID region is shown in Figure 2.

This partnership approach with the key catchment stakeholders, CMAs, as well as DELWP and EPA, has proven over many years to be the most effective way to holistically manage drainage needs across the whole of the GMID and meet the regulatory obligations placed on GMW.

The VIDP Strategic Directions 2021-2024 give consideration for the need to adapt irrigation drainage activities to balance environmental and community benefits, while continuing to support the Victorian irrigation sector.

The Goulburn Broken CMA has responsibility for the SIR Land and Water Management Plan. It took the lead role in obtaining DELWP funding to develop, in partnership with GMW and North Central CMA, a strategy proposal for future surface and subsurface drainage across the GMID that incorporate the changing circumstances and emerging thinking on future service needs.

Development of the strategy commenced in 2019 and a workshop of key stakeholders was held in October 2019 which included DELWP, GMW, Goulburn Broken CMA, North Central CMA, AgVic and drainage customer representatives. This provided input and guidance about the fundamentals of the strategy, critical issues and potential directions.

The workshop identified a list of drainage issues that needed to be addressed at this time and nearly all of the priority issues were GMW related.

This is considered an important body of work. Many aspects of GMW's drainage management are still set in the context of the 1990s. Over the last three decades significant catchment and land use changes have occurred and there is a pent-up need to update drainage management for the future.

Drainage needs to respond to changes in irrigated agriculture and the Strategy has focused on the medium term. The transformation of GMW's irrigation business and the "Channel by Channel' project currently underway will set the longer term directions for irrigation and drainage will need to act in response.

The Strategy also builds on the drainage tariff review undertaken by GMW in 2015-16, which provided valuable insights. This drainage tariff work was overseen at the time by an internal GMW working group that comprised customer representatives from the six GMID irrigation areas and the Goulburn Broken CMA and North Central CMA. The review was placed on hold when it became apparent it was being overtaken by changing circumstances.

GMW is the largest owner of public surface drainage systems in the GMID with 3,240 km of constructed drains. The next largest drainage system is in the North Central CMA area with 347 km of waterways as part of the Bullock Creek drainage network. This network supports some 650 km of community surface drains owned and operated by community groups.

CMAs cannot levy rates on properties. The North Central CMA does not rate landholders within the Bullock Creek drainage network and does not have a source of revenue to undertake related management or maintenance activities.

Consequently, the Strategy proposals dealing with service issues, operations and maintenance (O&M) and management approaches are not currently applicable to the Bullock Creek drainage network. Renewal of the North Central CMA Loddon Murray Irrigation Region (LMIR) Surface Water Management Strategy 2022 (SWMS) will consider these issues for the Bullock Creek drainage network.

As part of the Strategy development an extensive amount of additional work was undertaken in 2019-20 to understand catchment changes, future drainage needs, operations and maintenance requirements, benefits, costs, economics, risks and service options.

This has included internal GMW workshops, discussions with GMW subject experts, front-line operational staff and field inspections over the irrigation season to test thinking. Economic inputs were provided by consultants RMCG.

The development process included analysis of available surface and subsurface data, DELWP policy directions and GMW, Goulburn Broken CMA and North Central CMA drainage strategies and plans.

An agency workshop was held in March 2021 to obtain input to the draft Strategy from DELWP, GMW, Goulburn Broken CMA, North Central CMA and AgVic. In September and October 2021 the draft Strategy was released for public consultation via the Victorian Government online consultation platform Engage Victoria. The Agency Coordination Group overseeing the development of the Strategy considered the feedback received and made adjustments to the final Strategy.

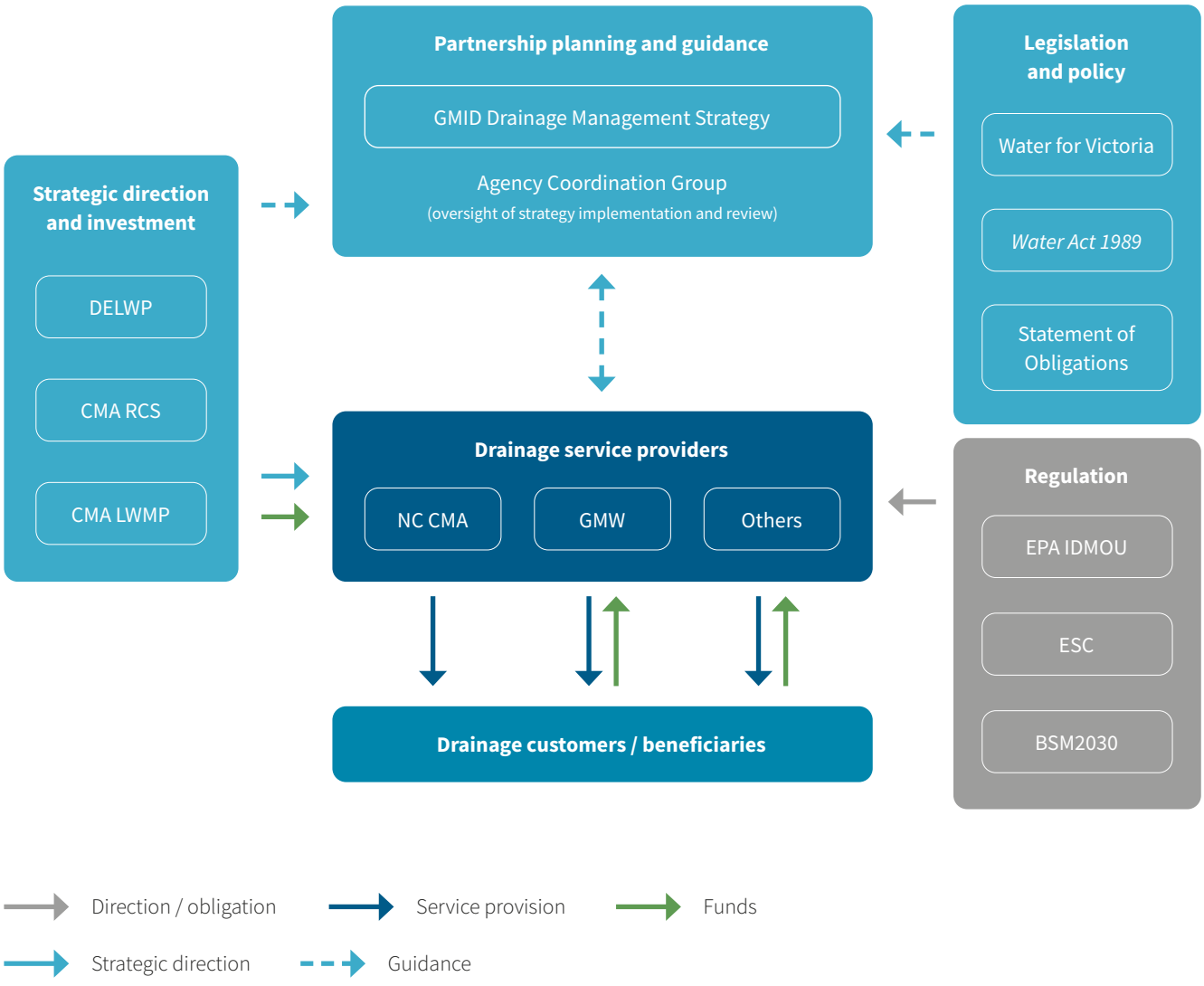

Figure 2: Future drainage management framework for the GMID region

2.4
Scope of Strategy

KEY POINTS

- **The strategy has holistically considered GMID irrigation drainage and seeks to achieve agricultural, environmental, and cultural heritage benefits through setting fit-for-purpose approaches for irrigation drainage management. The strategy has been informed by the priorities and goals set in the Goulburn Broken CMA and North Central CMA LWMPs. Wider catchment issues are dealt with in the respective Land and Water Management Plans.**
- **The extent of change to drainage management that is feasible at this time is an issue that GMW will need to consider.**

The Strategy takes a holistic view of GMID surface and subsurface drainage and considers the future needs of irrigated lands, existing and new drainage works, operating regimes and service requirements.

The Strategy encompasses:

- GMW primary drains, CSDs, hybrid-DCD schemes and subsurface drainage
- Bullock Creek drainage network and other areas
- Local Government CSDs and roadside drains
- Private landowner CSDs that are formally constituted

The Strategy is for the whole of the GMID and is focused on drainage systems in the Shepparton Irrigation Region Land and Water Management Plan area (eastern GMID which has surface and subsurface drainage systems) and the Loddon Campaspe Irrigation Region Land and Water Management Plan area (western GMID, which has surface drainage systems).

The Strategy covers the Shepparton, Central Goulburn, Rochester, Loddon Valley, Murray Valley and Torrumbarry Irrigation Areas and the GMW, CMA and Local Government drainage systems that are within these Areas.

The Campaspe, Nyah, Tresco, Tyntynder and Woorinen drainage systems are not part of the GMID and are not covered in the Strategy. These discrete drainage systems have different needs and customer issues to the GMID. These will be considered by GMW as part of development of detailed drainage service plans.

The Strategy does not deal with non-irrigation drainage infrastructure (rural) or private on-farm actions. These are taken up in the respective CMA Land and Water Management Plans. These Plans integrate the different elements of whole farm planning, extension and incentive programs from a whole of catchment perspective for irrigated and non-irrigated lands.

Climate and catchment changes are altering some of the environmental impacts of drainage. In particular nutrient and salt flows are now being increasingly driven by upstream dryland runoff after large rainfall events rather than by irrigation. These changes equally apply to dryland and irrigated catchments across the region and involve wider matters for Catchment Strategies to address.

Flood plain management and regional scale flooding issues are outside the scope of the Strategy and are dealt with through other planning processes. The 2016 Victorian Floodplain Management Strategy sets the direction for floodplain management in Victoria and implementation in the GMID region involves DELWP, Goulburn Broken CMA, North Central CMA and Local Councils.

The fundamental changes GMID drainage is facing raises questions about how much change to make at this time

The Strategy does not deal with drainage issues that individual properties may be experiencing. If landholders have specific drainage concerns, they are encouraged to raise them directly with their drainage service provider.

2.5
Resilience Thinking

KEY POINTS

- **With a more uncertain future there is a need to adapt decision making and build in more resilience.**
- **Resilience requires an adaptable learning management approach.**
- **Responding to uncertainty requires consideration of a range of possible, plausible futures.**

The external environment of the GMID is changing and it is difficult to predict what it will look like in future. The GMID will face more changes and challenges in the years ahead. In this uncertain world a range of futures are possible for the GMID. Drainage management needs to be adaptable to a more uncertain future and a range of potential futures.

The 2020 Goulburn Murray Resilience Strategy is an initiative to determine ways to strengthen the region, making it more resilient and able to respond to change. The GMID needs to prepare for and cope with a future which will be less predictable than the past. Resilience is not about a dogged determination to maintain the current situation or a return to some favoured point in the past.

The Goulburn Murray Resilience Strategy uses the following tenets to describe the characteristics of resilience.

- **Develop a complexity perspective.**

  In a region like the GMID, outcomes will depend on complex interactions between land, water, industries and people. Developing an understanding and capacity to plan and work with this complexity is a powerful tool to build resilience to future shocks and changes.

- **Develop governance that embraces change.**

  Governance approaches that embrace change help a region to prepare for, respond to and learn from change. One implication of governing for change is that organisations and the community will need to develop a preparedness to experience and accept some failures as part of the learning and adaptation process.

- **Foster cohesion, self-organisation and social responsibility.**

  Because no one group has control of a complex system, no one can build resilience on their own. Resilience building must be a system wide, collective process. Self-organisation, local decision making, and cohesion are important for addressing local scale problems.

- **Design for flexibility.**

  Flexibility offers long term regional resilience in the face of uncertainty by allowing for future adaptation at lower cost. Designing processes, programs, projects, infrastructure and institutions to be as flexible and responsive means they can adjust to change rapidly.

- **Manage networks and connectivity.**

  Connection and networks of contacts within and between people, organisation, institutions and places and various scales and across them are important for creating and managing change, creating new ideas and spreading innovations

- **Value, retain and build response and recovery capacity.**

  Buffers, reserves, diversity and redundancy provide long term shock absorption and rapid recovery capacity to systems.

- **Focus on slow variables, leverage and tipping points.**

  There are a number of slow variables that continue to play a critical role in shaping the Goulburn Murray Region (e.g. commodity prices, labour costs and regulations, climate change). Understanding the short and long-term dynamics and the presence of tipping points can generate important insights for dealing with the underlying cause of change.

- **Learn for change.**

  Managing uncertainty and change requires an approach to learning that is deliberate, structured and organised to probe, experiment, test assumptions, address knowledge gaps and to share and build new knowledge. Emphasis needs to be placed on setting clear objectives for actions intended to create change and designing monitoring and evaluation processes to understand how and why these objectives are (or are not) being achieved.

The Strategy has used these tenets to guide the thinking on interventions that increase the long-term resilience of the drainage system to a range of futures and can accommodate change without the need for fundamental and potentially costly revisions.

2.6
Guiding Principles for the Strategy

KEY POINTS

- **The Strategy needs to find the appropriate balance between the guiding principles.**

The drainage issues across the GMID are multiple layered and there is a need to be clear on what this Strategy is seeking to achieve. To this end, the Strategy has been based on achieving an appropriate balance between the following guiding principles, which came from the initial 2019 workshop of key stakeholders:

Supporting irrigated agriculture

- Aligns with modernised irrigation
- Deals with the uncertainties
- Provides future direction of drainage
- Protects and attracts regional investment
- Aligns with and supports the objectives of CMA land and water management plans.

Cost effective

- Lower cost approaches
- Measurable service performance
- Benefits exceed costs
- Clear customer value propositions.

Risk based

- Services matched with catchment and land use risks
- Balancing of risk, service and cost trade-offs
- Identification of need for targeted corrective action.

Equitable

- Meets needs of beneficiaries across the GMID
- Cost sharing basis aligned broadly with benefits
- Recognises seasonal and catchment viability impacts
- Cost reflective
- Deals fairly with legacy issues and the impacts of any changes.

Simpler

- Level of complexity is proportional to future need and added value
- Management regime commensurate with business importance
- High level of customer and staff understanding
- Administrative simplification, consolidation and streamlining.

Resilient

- Adaptable to a range of possible futures
- Flexible approaches
- Robust revenue base with higher resistance to shocks
- Structured monitoring, assessment and adaptation processes.

Sustainable

- Meets future needs
- Economically sound decision making
- Supports wider business directions of drain owners
- Financially sustainable
- Protects and enhances the environment
- Recognises Aboriginal connection to country.

Meets regulatory obligations

- Complies with regulatory requirements
- Reduced risk of adverse environmental impacts
- Protects cultural heritage values
- Lowest compliance cost.

SECTION 3

STRATEGY CONTEXT

3.1

Goulburn Murray Irrigation District

Goulburn Murray Irrigation District (GMID) is a large and economically important irrigation scheme in northern Victoria operated by GMW. It is Australia's most extensive irrigation network. Irrigation in the GMID is going through a period of profound change.

The GMID has recently undergone $2 billion of irrigation infrastructure modernisation. Over the last twenty years the area of the GMID being irrigated has reduced markedly and intensive irrigation is being consolidated into fewer and larger enterprises. Box 1 provides further details of the GMID.

Box 1: About the GMID

The GMID is a government owned irrigation scheme that covers an area of some 995,000 hectares in total. The total farm area within the District is approximately 830,000 ha and the GMID's extensive channel infrastructure is presently capable of irrigating an area of over 600,000 ha.

The GMID consists of six irrigation areas. Four irrigation areas source their water from the Goulburn system (Central Goulburn, Shepparton, Rochester-Campaspe and Loddon Valley) and two from the Murray system (Murray Valley and Torrumbarry).

The GMID irrigation system was first developed in the late 1800s to early 1900s and progressively expanded in area over the next half century. Development was strongly influenced by social policies of the time. The gross value of GMID irrigated agricultural production is currently around $1.4 billion per year. The main enterprises are horticulture, dairy, mixed cropping and grazing. A significant portion of the irrigation production in the GMID is exported or faces competition from imports and must respond to the challenges of global markets and competition

The GMID is located on the riverine plain and generally has flat grades with the prevailing gradient to the north and west of 1 in 2,000-3,000. Soils across the GMID vary from loams and sandy loams to heavier clays and clay loams. Many of these soils are well suited to dairy, horticulture, cropping and grazing.

Irrigation in the GMID is going through a period of fundamental and sustained change. The operating environment of the GMID is changing in response to a range of external factors, including unbundling of water entitlements, modernisation of the irrigation delivery system, water availability, new irrigation application methods, climate change, crop types, energy costs, on-farm automation and recovery of water for the environment.

The dry conditions experienced during the Millennium Drought (1997-2010) have had a profound and lasting impact on the GMID. Over the last twenty years, the GMID water deliveries have declined by almost 50% to around 1,000 GL/year. Approximately half of this decline is due to water recoveries for the environment and the other half is due to water trading out of the regions and climate change.

The reduction means that there will be markedly less irrigation in the GMID in the future and has important consequences for the economics of building and maintaining public drainage infrastructure. Irrigation enterprises are now larger in areas and smaller in number than in the past. Larger properties comprise 10-15% of the number of properties in the GMID but now use around 70% of the available water. Fragmentation of the residual land parcels has resulted in increasing numbers of non-irrigated properties and relatively small scale rural residential properties that are supported by off-farm income.

The GMID has recently undergone $2 billion of irrigation infrastructure modernisation funded by the Australian and Victorian Governments. The changes from modernisation of the supply system combined with on-farm investment have been transformational in the enabling efficient use of irrigation water.

3.2
Importance of Drainage

Waterlogging and salinity have long been recognised as the common and unwanted companions of irrigation development.

Drainage is fundamentally about risk management with the form of drainage tailored to the risk. Effective GMID drainage is seen as important to protect and attract investment in irrigated agriculture.

The linkages between effective drainage and the sustainability of irrigated agriculture in the GMID are summarised in Box 2.

Box 2: The Drainage Story

Too little or too much water are the most significant yield-limiting factors to crop production.

Excess water can negatively affect plant growth by the ponding of water on the soil surface, the build-up of water in the root zone and the accumulation of soluble salts in the soil.

Consequently, irrigation is often accompanied by drainage, which is the natural or man-made removal of surface and sub-surface water from a given area. Surface drainage is the removal of excess water from the surface of the land and subsurface drainage is the removal of water from the plant root zone.

The GMID is located on the riverine plains of northern Victoria and the land surface is generally very flat. Poor natural drainage is an inherent feature of many parts of the GMID and constructed drainage plays a key role in managing many of the adverse impacts of irrigation.

European settlement set in train a series of changes to the hydrological cycle in northern Victoria which have resulted in water tables rising, mobilising salt and creating waterlogging and salinity problems in the region's land and waterways. Clearing and removal of deep-rooted native vegetation meant that rainfall that infiltrated past the root zone of pasture grasses joined the watertable. The introduction of irrigation in the early 20th century added further hydrologic loading to the soil, increasing accessions to the water table.

Waterlogging and salinisation risks linked to high water tables emerged as issues in some parts of the GMID soon after large scale irrigation commenced in the 1900s. The problems became more widespread during the wetter second half of the 20th century. Drainage was installed in the worst affected areas from early in the 20th century and has continued ever since.

In an undrained catchment excess surface water can cause inundation of land, roads and crop losses. It also recharges groundwater and increases salinity and water logging risks. It can take months for water to be removed from low lying areas.

Without some form of managed drainage, inappropriate surface water disposal can cause third-party impacts such as road damage, damage to native vegetation and unmanaged nutrient and salt discharge to streams.

3.3
Drainage in the GMID

KEY POINTS

- **GMID salinity and waterlogging threats are driven by interaction of rainfall, evapotranspiration and irrigation.**
- **Poor natural drainage is an inherent feature of many parts of the GMID.**
- **Salinisation and waterlogging from high watertables is a threat to agricultural and environment.**
- **Drainage plays a key role in reducing the threat of inundation, waterlogging and salinity.**
- **GMW surface drainage is more concentrated in the eastern GMID (the SIR).**
- **GMW subsurface drainage is wholly concentrated in the SIR.**
- **The Bullock Creek drainage network is located wholly in the Loddon Valley Irrigation Area.**
- **Some of the drainage network feeds internationally recognised Ramsar wetlands.**

During the establishment phase of irrigation across the GMID, the importance of drainage was not fully recognised.

The sustainability of irrigated agriculture is closely linked to effective drainage which reduces the risks of inundation, waterlogging and salinity damage to properties, infrastructure and the environment. In the GMID these risks are driven by the interaction of rainfall and irrigation. Poor natural drainage is inherent in large areas of the GMID. Waterlogging and salinisation linked to high water tables emerged as issues in some parts of the GMID soon after irrigation commenced.

Publicly owned and operated surface drainage was installed in the worst affected areas in the 1910s and has continued to be expanded since that time.

Publicly owned and operated subsurface drainage installation occurred in the eastern GMID from the 1960s to the 2000s.

The original philosophy of the drainage program was equal access to surface drainage for the whole of the GMID and protecting all land at risk from high water tables. The implementation priorities focused on drainage in areas of major problems with high value crops.

The GMID drainage problems became more widespread during the wetter period which extended from the 1950s to the 1990s. From the 1980s, salinity and nutrient management became a community led initiative and significant government and landowner resources were devoted to raising awareness and understanding of the issues and developing responses. There was strong community demand for drainage and actions across the GMID ranged from an expansion of the public drainage network through to on-farm salinity management focus.

The 1988 Victorian Government policy *Salt Action: Joint Action* introduced community-based salinity management planning. In the 1990s this new approach evolved to integrate environmental, economic and social outcomes into planning.

Significant public and private investments were made across the GMID in surface and subsurface drainage works in areas of high value intense irrigation that had known problems. These areas were mostly devoted to dairy and horticultural enterprises. The works included surface drains, groundwater pumps and laser grading of irrigated land.

The hydrogeology of the GMID varies considerably from east to west. Consequently, approaches to drainage differ from east to west. Constructed surface and subsurface drainage systems are more concentrated in the eastern areas of the GMID.

The ability to drain the western areas of the GMID is limited and land use change and salt interception were key sustainability actions. The nature of irrigation enterprises in the western areas of the GMID means that the irrigated area can vary substantially from year-to-year.

Goulburn Broken CMA and North Central CMA have lead roles in identifying drainage and salinity mitigation needs through the development of Regional Catchment Strategies and Land and Water Management plans. GMW works in close partnership with the CMAs and is responsible for implementing drainage programs and also operates and maintains drainage systems.

Table 1: GMW drainage services

	GMID	GMW Surface Drainage	GMW Subsurface Drainage
Number of Serviced Properties	13,900	5,600	1,300
Area Served (hectares)	830,000	310,000	29,000

Within the Shepparton Irrigation Region (SIR) and Loddon Murray Irrigation Region (LMIR), surface and subsurface drainage works have been installed in accordance with the respective implementation plans driven by the Goulburn Broken and North Central CMAs, with works being undertaken as funds become available.

The construction of GMW primary surface drains and the installation of public subsurface drainage pumps, owned and managed by GMW, has been 100% government funded. GMW applies annual rates and charges to raise revenue for funding of the operation, maintenance and replacement of its drainage infrastructure.

Reduced government funding to support the GMID drainage program resulted in limited additional surface and subsurface drainage infrastructure since 2006/07.

The focus of GMW is now very much on its whole of business transformation and the bedding down of the modernised GMID supply system in a rapidly changing region.

Experience has shown that significant service changes can require a considerable commitment of time and resources to implement and deal with all the issues that arise. Management focus, customer and stakeholder consultation, regulatory approvals, business system changes, data needs, transitional issues and customer communication and education need to be considered.

GMW will need to understand and carefully consider the potential flow on consequences of any proposed surface and subsurface drainage changes and the commitment of resource and time required, as well as the potential implementation risks.

Although the number of GMID drainage customers is significant, the revenue collected for the provision of this service is a relatively small portion of GMW total revenue. Currently the annual O&M cost for GMID surface and subsurface drainage services is approximately $4 million in a $150 million business.

Nevertheless, drainage can be an area of high landholder focus in wet years. Effective management of drainage is seen as fundamental to protecting and attracting irrigated agriculture across the GMID in future.

GMW also understands that in the current environment, for many customers drainage can be a second order issue compared to the supply and delivery of irrigation water to their properties. An irrigation customer's drainage charges can be in the order of one-tenth of their irrigation charges. Drainage costs represent a lower percentage of the farm costs for horticulture, but a higher percentage for mixed grazing and cropping.

Customer service expectations and perceptions of the value of drainage have changed with less irrigated land and changes in farming practice. Drainage services need to match the future needs of the landscape, including drainage service for more prevalent summer rainfall events. One aspect of this would mean providing benefits commensurate with economic returns but it is known that there are widely differing customer views on the perceived value of drainage. Drainage catchments and sub-catchments can have unique service requirements with variations in farm operations, land use and landowner values for drainage service.

Some customers place a high value on drainage while others value it less, dependent on historical drainage complexity of the catchment. During extended dry periods the benefits of drainage may not necessarily be front of mind for all customers. During these times drainage may be considered akin to paying for an insurance policy. Drainage may not be fully valued until it rains and the drain is not working due to lack of adequate maintenance or when an extended wet period raises local watertables.

Surface Drainage

There is now extensive surface drainage coverage across the GMID which includes a diverse mix of GMW, CMA, Local Government, and privately constructed drainage networks, as well as natural drainage courses and waterways. Due to historical reasons, the different drain types include GMW primary drains, GMW Community Surface Drains, Local Government drains, Community surface drains owned and operated by community groups and private landholder drains serving multiple properties.

There are 3,240 km of GMW drains (Primary and CSD) cross the GMID. This figure excludes drains in the Campaspe, Nyah, Tresco, Woorinen drainage systems and the Barr Creek/Tutchewop drainage diversion scheme.

There are 347 km of waterways on the Tragowel Plains that are managed by the North Central CMA as part of the Bullock Creek drainage network. The former Bullock Creek River Improvement Trust undertook 'maintenance activities' to improve the drainage performance. This included de-snagging, removal of cumbungi and the clearing of deposited silt. The Bullock Creek drainage network supports some 650km of community surface drains owned and operated by community groups.

The North Central CMA, upon its formation, took over the roles and responsibilities of the Bullock Creek River Improvement Trust. However, the CMA, unlike its predecessor, cannot levy rates on properties and consequently has no source of on-going revenue to pay for management and maintenance it is responsible for as part of the Bullock Creek drainage network.

There are areas of the GMID served by Local Government and private drains that outfall to GMW drains or natural waterways. There is not good data on the coverage of these Local Government and private drains because of their formal and informal nature.

Some Local Government drains are CSDs constructed under the Local Government Act and are community managed. Other drains have been constructed informally in the past and there are no formal management arrangements. Indicatively, the length of Local Government drains across the GMID is estimated to be less than 50 km in total.

There are some definitional differences of what is described as a 'CSD' across the GMID. Whether they are linked property drains, an informal community arrangement or a formal legal entity. This can make reliably defining the lengths of CSDs using the information available from GMW, CMAs and Councils difficult.

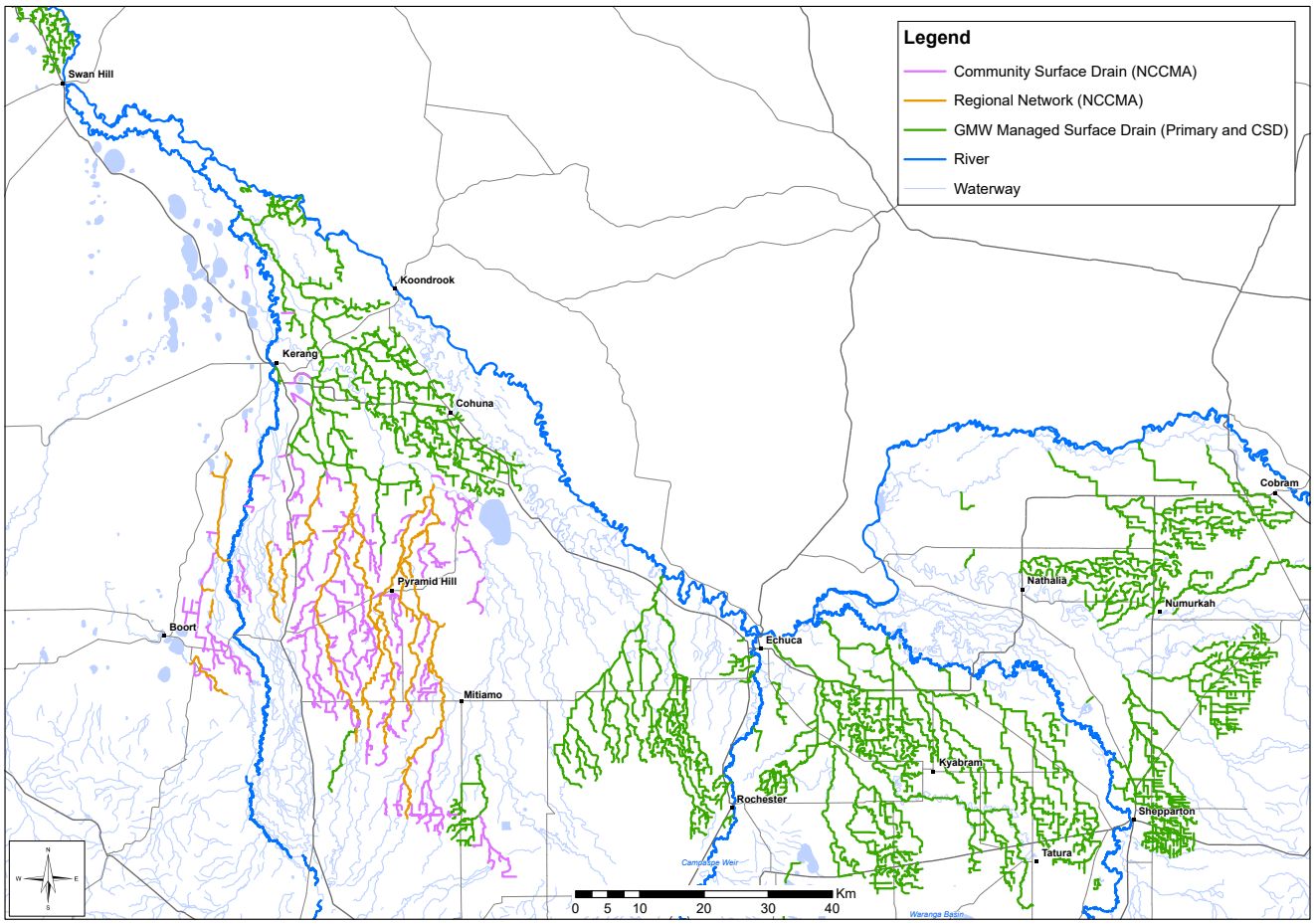

Figure 3: Major surface drainage systems in the GMID

Table 2: Lengths of major surface drainage systems in the GMID

Land & Water Management Plan	GMW Irrigation Area	GMW Primary Surface Drains (km)	GMW Community Surface Drains (km)	NCCMA Regional Network (km)	Community Surface Drains Loddon Valley (km)
Shepparton Irrigation Region	Shepparton	433	6		
	Central Goulburn	821	132		
	Rochester	523	0		
	Murray Valley	513	8		
	Sub Total	**2,290**	**146**		
Loddon Murray Irrigation Region	Loddon Valley	129	0	347	650
	Torrumbarry	675	0		
	Sub Total	**804**	**0**		
	Total	**3,094**	**146**	347	**650**

Privately constructed drainage schemes are more difficult to define because of their various forms. Some are formal CSDs, but most are informal co-operative arrangements that can consist of interconnected farm drains. Landowner and land use changes can also mean that some private drains may not be functioning for periods of time. Figure 3 shows the current coverage of major surface drainage systems in the GMID.

The total area of the GMID currently served by GMW drains (GMW Primary and GMW CSD) is estimated to be between 310,000 and 320,000 hectares.

GMW surface drains do not cover all of the GMID. There are areas being irrigated from the modernised channel system that are not currently served by GMW surface drains. The total area that can be drained by GMW's surface drain system now exceeds the total area that can be irrigated with the water available to the GMID in an average year. The areas currently being irrigated do not all align with the existing GMW surface drainage system.

In the past, land within the GMID has been classified at a high level as either drained, needing drainage or drainage not required. Because of the dynamic land and water use changes happening across the GMID, the value of such classifications is now considered doubtful. Consequently, the updating of land classifications has not been undertaken as part of the Strategy.

Primary Surface Drains

GMW Primary Surface Drains are the 'backbone' of the GMID surface drainage network. They provide outfalls for GMW and Private community surface drains and direct access for drainage water from farms.

Community Surface Drains

CSDs were an outcome of Land and Water Management Plans developed in the early 1990s. The concept recognised that sufficient government funds were not available to install a primary drainage service across the GMID and that such investment was no longer economically justifiable. Instead, landholder groups were encouraged to meet their local drainage needs by building their own community surface drains to connect their properties to GMW primary drains.

Landowner groups were supported by grants from the Government, with the groups meeting 10% of design, 50% of construction and 100% of O&M costs. AgVic facilitated the grants and supported landowner groups, with capital finance provision offered by GMW.

CSDs have historically been operated and maintained by landowner groups, GMW, CMAs or Local Government. During the 1990s, CSDs were generally being operated and maintained by Local Government. After 2000, most CSDs in the eastern GMID progressively transferred under GMW management following a formal process, as irrigation drainage was seen as one of its core functions and that GMW was considered better placed to deal with the O&M issues arising and ongoing compliance. The CSDs in the western GMID have mostly remained under community or local government operation.

CSDs are designed to the same service level as contemporary GMW primary drains. Standards of CSD construction have evolved over time and are now comparable to GMW primary drains. Original plans were for an extensive network of CSDs across the GMID which did not eventuate in the east. Following the Millennium drought and the significant reduction in water use and irrigated area, the cost of continued construction of CSDs could no longer be economically justified.

In anticipation of a large network of CSDs, separate financial services were established by GMW in each of the GMID irrigation areas, but the changing circumstances meant that only relatively short lengths of CSDs were constructed in most of the irrigation areas. Some areas have no CSDs at all.

Figure 4: GMW community surface drain construction

Hybrid DCD-based schemes

A new concept of lower cost 'hybrid-drainage' focusing on drainage course declaration (DCD) and associated obstruction removal programs has been developed to meet the surface drainage needs of productive, but currently undrained, areas of the GMID. The intent of hybrid DCD drainage is to remove rainfall runoff from properties by connecting natural drainage lines, as an alternative to a traditional constructed drain.

The hybrid-DCD concept recognises that the natural drainage lines across the GMID are not always sufficiently defined and may need to be supplemented by short shallow connecting drains at some locations. These drains could only outfall to a DCD at natural surface level and would be subject to approval based on the Earthworks Control document. The opportunity for shallow connecting drains is minimal in DCD implementation.

This approach involves the removal of artificial obstructions to drainage lines using formal drainage course declarations (DCDs) in areas that have been modified to such an extent that their natural drainage paths are not effectively connected (refer Figure 5). DCDs provide the regulatory mechanism for removal of obstructions that impede surface water flows in natural drainage lines and the on-going authority to ensure the DCD extent remains unimpeded as prescribed in the associated management plan.

Recent programs, which have successfully delivered DCDs and obstruction removal programs, have demonstrated they are much lower cost to implement than traditional constructed drains (refer Figure 6). For some catchments in the SIR the implementation of DCD's has shown a benefit-cost ratio of up to 2. Estimates of current construction costs for GMW drains are shown in Table 3. These are order of magnitude costs, with actual costs varying with individual projects, depending markedly on the drain capacity, length and associated structures.

Table 3: Indicative drainage construction costs

Drain Type	Indicative Construction Cost
GMW primary drain	$220,000/km
GMW CSD	$140,000/km
Hybrid-DCD	$55,000/km

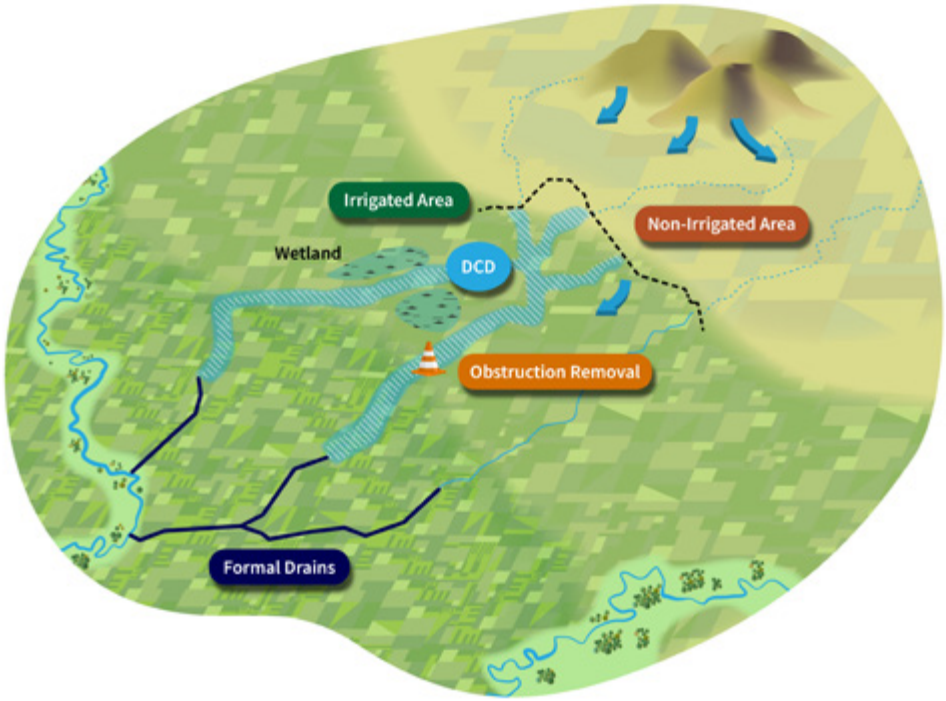

Figure 5: Hybrid-DCD conceptual arrangement

The hybrid DCD concept is flexible and adaptable to an uncertain future and it is projected that the total length of hybrid drains (as DCDs) across the GMID could potentially be 200 - 400 km depending on the level of landowner support and the availability of government funding.

As flow capacities differ across natural drainage lines, the level of service provided by a DCD will vary depending on the drainage attributes of the local topography. Consequently DCD's will provide a lower level of drainage service (in many cases, a much lower level of service) than a GMW primary or CSD drain.

DCDs are unlikely to be adequate to wholly protect intensive horticultural areas from the risks of waterlogging and salinity. The intent is to keep 'reasonable' water flows moving along drainage lines following major rainfall events.

Under the current SIR drainage program, DCD-based hybrid systems are being pursued in catchments where benefits clearly exceed costs and landowner support is strong. Currently the design and implementation costs of systems are being funded 100% by Government, with in-kind contributions from landowners.

In undrained areas many landholders have undertaken farm mitigation actions to reduce the losses caused by a lack of drainage. This includes not using areas subject to inundation and implementing drainage reuse and redirection on farm.

Figure 6: Hybrid-DCD drainage with installation of road culverts to remove obstructions and open up the flow path along a natural drainage line.

Subsurface Drainage

Watertables commonly experience cycles of rising and subsiding. In the SIR, water table behaviour is driven by interaction of irrigation and rainfall. When wet climatic conditions exist, the shallow groundwater system is recharged and the regional watertable rises. Where groundwater levels approach the surface, land salinisation and waterlogging of soils can threaten economic, environmental and social values.

Controlled pumping from shallow groundwater systems can be a very effective salinity migration measure at a local farm scale. In the SIR, targeted sub-surface drainage is provided by employing private groundwater pumping, public groundwater pumping and tile drainage in high-risk areas.

Historically, salinity and high watertables have had major impacts in the SIR. During the very wet years of the mid-1970s an estimated 30% of the region's horticultural plantings were lost due to salinity and waterlogging damage. In response to these issues, significant public and private investments have been made to manage and control salinity.

These investments assumed shallow watertables and associated salinity threats would be a permanent feature of the SIR irrigated landscape.

GMW operates a network of 115 public groundwater pumps to lower watertables to mitigate the effects of salinity and waterlogging across the Shepparton, Central Goulburn, Rochester and Murray Valley Irrigation Areas (i.e. the SIR). These pumps discharge either into surface drains, irrigation supply channels or evaporation basins, and serve around 29,000 hectares of horticulture and pasture in the SIR (refer Figure 7). Pumps are operated in accordance with the Basin Salinity Management 2030 Strategy and the SIR Land and Water Management Plan (SIRLWMP).

Private pumping of shallow groundwater for conjunctive irrigation use also provides regional salinity control benefits and plays an important part in the SIR salinity mitigation program. GMW public groundwater pumps are designed to integrate with and complement the network of over 800 privately owned and operated groundwater pumps across the eastern GMID. GMW public groundwater pumps were installed where private groundwater pumping was not considered viable, the area was affected by high watertables and where the proposed pump installation was supported by the benefiting landholders.

Figure 7: GMW salinity control groundwater pump

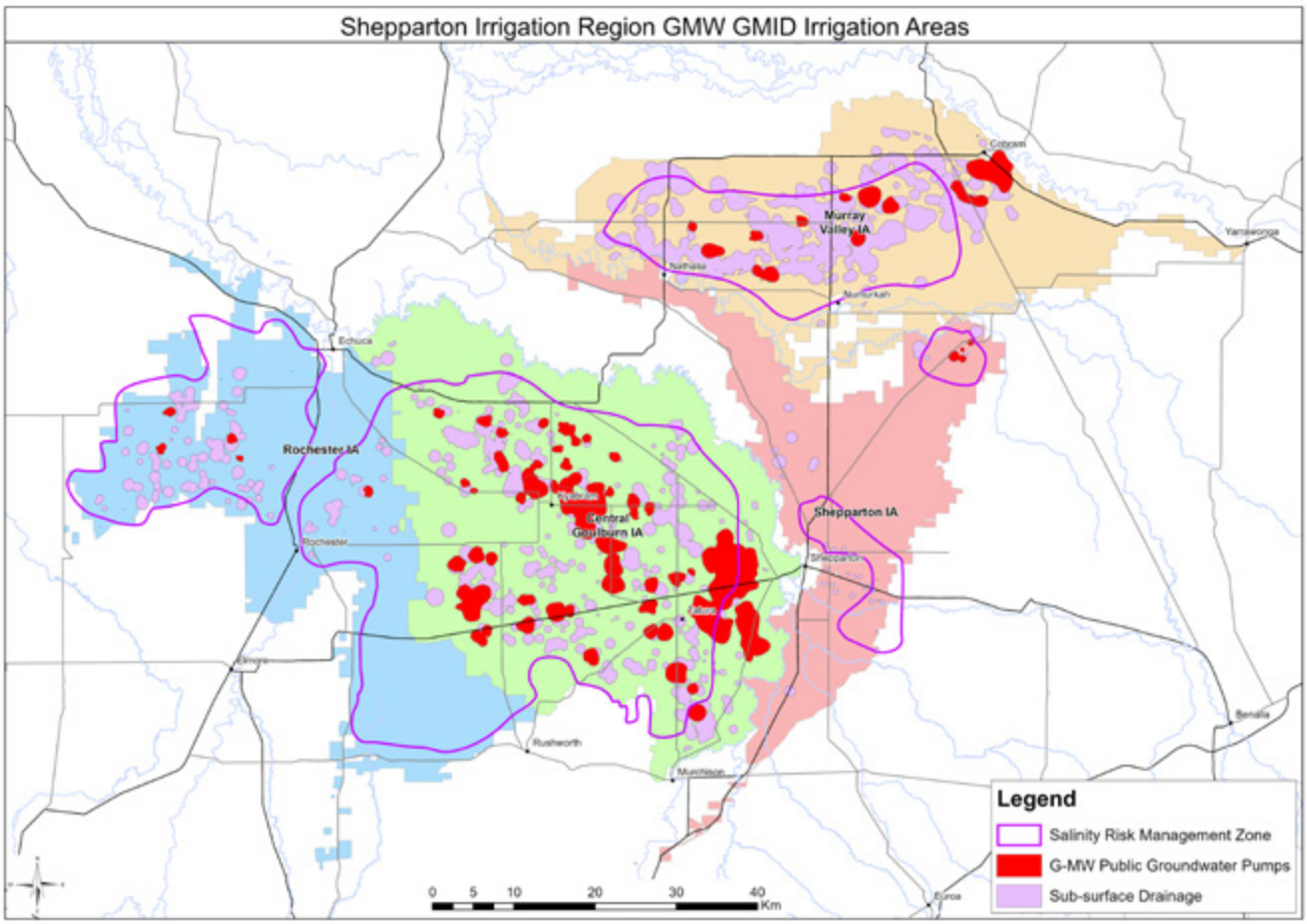

Figure 8: SIR subsurface drainage

Groundwater levels are monitored in approximately 1,000 observation bores in the SIR groundwater management area (GMA). There were 3,500 observation bores at one time, but these have been rationalised over the last decade back to a network of about 1,000. An annual watertable map is produced enabling watertable changes and trends to be understood.

Historically GMW public groundwater pumps disposed of the moderately to highly saline groundwater into the drainage and channel network. In the channel system, groundwater is diluted to a level which allows it to be used by irrigators downstream from the pump site during the irrigation season. Modernisation of the channel system has made management of channel salinities difficult and disposal from many GMW public groundwater pumps has been relocated away from channels to drains. Disposal guidelines are in place to ensure downstream salinity levels are kept within agreed limits.

The area of the GMID with groundwater levels within two metres of the surface fell substantially during the Millennium drought with some increases following the high rainfall in years 2010-12.

These changes mean that there is now sufficient land with low groundwater levels or existing groundwater protection to accommodate the future expected extent of irrigation. However, the footprint of the currently irrigated areas does not fully align with the protected areas.

Currently, the costs for operation and maintenance of subsurface drainage services are met by customers in the Shepparton Irrigation Area and from local beneficiaries in Central Goulburn, Rochester and Murray Valley Irrigation Areas. Local Government also contributes to funding the service. Groundwater level monitoring costs are shared by GMW customers and the Goulburn Broken CMA.

There are no GMW public groundwater pumps in the Loddon Valley or Torrumbarry Irrigation Areas due to the unsuitable hydrogeology and the high salinity of the shallow groundwater. Others works such as drainage diversion and salt interception schemes have been established to manage the downstream impacts.

3.4

Drainage Beneficiaries

KEY POINTS

- **The impacts of inundation, waterlogging and salinity on the natural and man-made environment are generally disruptive at best or destructive at worst.**
- **Surface and subsurface drainage serves multiple functions and has multiple beneficiaries.**
- **Effective drainage is seen as important in maintaining irrigators' social licence to operate.**
- **GMID drainage provides significant benefit to the region, protecting its productive capacity and community confidence in the future.**

Surface Drainage

Surface drains can receive water from a number of sources, they can serve a range of functions and can have multiple beneficiaries. Table 4 provides a high-level view of GMW surface drainage functions with past/current/future beneficiaries.

The three major beneficiaries are:

- **Agriculture**

  Surface drainage provides sustainable agriculture benefits through reducing the risks of crop losses from inundation, water logging and salinisation, and maximising the value of agricultural production from the available water. Both irrigated and non-irrigated lands receive a benefit from drainage. The main difference is the value of production at risk.

- **Roads**

  Deterioration of sealed and unsealed roads can occur after large rainfall events. Roadside drainage can reduce the risks of road damage, higher road maintenance costs, reduced road surface life and higher road user costs.

- **Environment**

  GMW drains are designed and managed to have a positive environmental impact wherever possible. This can include protecting remaining wetlands, providing flow to and removing excessive flow from natural features, the restoration of more natural wetting and drying regimes and creating opportunities for re-vegetation and nutrient interception.

Without some form of drainage management, high rainfall leads to waterlogging losses and/or inappropriate surface water disposal to roads, crown land or GMW channels. Inappropriate disposal may cause third party impacts such as road damage, social disruption, weed growth, damage to native vegetation, increased accessions to watertables and unmanaged nutrient and salt discharge to waterways.

Table 4: Surface drainage beneficiaries

Input	Past	Current	Future	Beneficiary
Irrigation tailwater	✓	X	X	Irrigators
Moderate rainfall runoff from irrigated land	✓	X	X	Irrigators
Operational channel outfall	✓	X	X	GMW
Emergency channel outfall	✓	✓	✓	GMW
Large rainfall event	✓	✓	✓	Multiple
Public groundwater pump discharge	✓	✓	✓	Multiple
Urban stormwater drainage	✓	✓	✓	Local Gov
Urban water authority emergency wastewater treatment plant discharge	✓	✓	✓	UWAs
Industrial waste discharge	✓	✓	✓	Industries
Roadside drainage	✓	✓	✓	Local Gov
Environmental site water management	✓	✓	✓	Environment
Environmental water delivery	X	✓	✓	Environment
Inter-Valley Transfer delivery	X	X	?	Water traders
Access to drainage water for irrigation	✓	✓	?	Irrigators

Subsurface Drainage

When agricultural crops, infrastructure and sensitive environmental features are exposed to salt in high concentrations it can cause damage. The negative impacts of salinity and waterlogging include:

- **Reduced agricultural production**

  The growth of plants is reliant on water being taken in through their roots. Salty groundwater in close proximity to plant zoot zones restricts the plant's ability to take in water. Plant growth is also reliant on well-structured soil and salt can alter the structure of soils. In addition, some deeper rooted horticultural crops are susceptible to waterlogging caused by shallow watertables. This can lead to decline in plant health and losses in agricultural productivity.

- **Damage to constructed infrastructure**

  Most constructed infrastructure is in contact with the ground and exposure to salty water increases the rate of deterioration of roads, bridges, concrete structures and footings of buildings compared to exposure to non-saline water.

- **Loss of biodiversity**

  Salinity effects plants and the animals that are dependent on them. As the more salt sensitive plant and animal species die off, the diversity of the remaining species diminishes, and the biodiversity of an area can be lost.

3.5
Environmental Aspects

In the past, the focus of GMID drain management has primarily been on removing water from properties as quickly and efficiently as possible. The focus on agricultural benefits of drainage often meant constructing drains along the lowest points in the landscape, which sometimes impacted on wetlands and environmental features.

Drain alignments were sometimes diverted from natural depressions to provide a practical and economic outfall, with little consideration given to ecological, cultural heritage or impacts on downstream water quality.

GMID drainage management in future needs to look beyond standard agricultural drainage approaches. Environmental considerations have for a number of years been built-in to the design and construction of surface drains, such as the drain alignment and connection to areas of environmental value. This can be done at the time of construction or by retrofitting an existing drain. Details are set out in Drain Design Guidelines.

Management of drainage systems across the GMID should take a wider catchment focus and seek to provide multiple benefits wherever possible.

These opportunities include:

Mitigating the environmental impacts of irrigation such as irrigation salinity, saline groundwater discharge to waterways, nutrients mobilised to waterways, waterlogging and biodiversity loss.

Generating environmental benefits through irrigation drainage:

- Protects groundwater and surface water
- Protects the landscape from waterlogging and damage to soil structure caused by salinity
- Prevents the accumulation of salt from irrigation water, and the mobilisation of salt to the soil surface
- Protects terrestrial and aquatic ecosystems, and associated biodiversity, from salinity, waterlogging and water quality impacts
- Connects and restores natural drainage lines
- Increases the opportunity to reconnect the landscape by conveying excess water, from irrigation and rainfall, from irrigated land to natural waterways and wetlands
- Increases the opportunity to restore natural wetland wetting regimes by removing non-natural obstructions from drainage lines
- Increases connectivity between the floodplain and the rivers that provides for ecological processes.

Too much as well as too little water can adversely impact wetlands. In drained catchments it can be possible to use the drainage system to regulate water to and from wetlands enabling more natural wetting-drying cycles to occur.

In more recent times, new GMW drains (e.g. the Muckatah system in Murray Valley Irrigation Area) and hybrid-DCD systems have incorporated significant measures to protect and enhance environmental values whilst at the same time providing drainage benefits. GMW drains in the Deakin system have also recently been used to deliver environmental water into the Kanyapella Basin.

Drain owners need to monitor and manage the environmental impacts of their drainage schemes, including water quality, nutrient exports, soil erosion, impacts on wetlands and downstream hydrological impacts. Drain owners also need to have in place management and maintenance processes that encompass both the agricultural and environmental values of a given drainage area.

The North Central CMA network is different in nature to constructed GMW primary drains and CSDs and the environmental aspects of management are different.

The Bullock Creek drainage network is based on natural waterways that cross the Tragowel Plains. The watercourses include Blind Creek, Bullock Creek, Calivil Creek, Pompapiel Creek, Seven Months Creek, Welches Creek and the Western Depression. These waterways are important natural assets supporting populations of animals and plants.

GMW constructed drains consist of an excavated waterway on grade, a low bank along both sides and inlet structures. The drain is designed to discharge a designated flow and not retain water.

3.6
Design Standards

Surface Drainage

The current GMID design standard for both GMW primary drains and GMW CSDs is the removal of runoff from an irrigated catchment within a 5 day period of a 24 hour summer storm with an Average Recurrence Interval of 1 in 2 years (this is approximately 50 mm of rainfall). GMID primary drains can have different design standards depending on the year of construction and the reality today is that the drainage network in an individual catchment may have a mix of design standards.

The design of GMW primary drains and CSDs has been founded on assumptions about catchment conditions which are no longer applicable. The crops irrigated now are different to those irrigated when the drain design standards were first developed. Given the practical difficulties of now distinguishing the performance of GMW drains with differing design standards, the practice has been to treat them the same and not differentiate on the basis of the original design standard.

The design approach for DCDs considers the individual catchment, land use, environmental requirements and the outfall capacity rather than standard design criteria.

There are some 347 km of waterways managed by the North Central CMA in the Loddon Valley Irrigation Area that form a key part of the Bullock Creek drainage network. Works on these waterways were carried out by the former Bullock Creek River Improvement Trust from the 1970s to 1990s and primarily involved shallow excavation along the bed of the natural waterways to improve flow capacity by removing man-made obstructions and silt build up that have occurred since the establishment of irrigation.

The Bullock Creek drainage network supports some 650 km of community surface drains (CSDs) that were constructed in the 1990s.

The Bullock Creek drainage network was not based on an engineering design standard and does not have a service level that can be defined as such. Flow capacities differ across the different waterways and the level of service varies depending on the drainage attributes of the local landscape (refer Figure 9).

The design of the private CSDs that discharge to the Bullock Creek drainage network were based on the average recurrence interval standard of 1:2 years.

Figure 9: Culvert on Bullock Creek

Box 3: Surface Drainage Design Standards

Inflows to surface drains are driven by rainfall intensity and catchment conditions. GMID surface drains can have different design standards depending on the year of construction. Surface drain construction in the GMID commenced in the 1930s and it is not clear what the design basis was at that time. By the 1960s, the surface drain design basis was removal of a 24 hour summer storm with an Average Recurrence Interval (ARI) of 1 in 10 to 1 in 15 years (75 mm in 24 hrs) within 5 days. This was the standard up until the 1990s. At that time, a 1 in 2 year rainfall event (approximately 50 mm of rainfall) was adopted and this is the current design standard for GMW surface drains, both primary drains and community surface drains. This change was made to reduce the capital cost and improve the benefits-cost ratio of new drains.

Different design standards used in the past means that in theory there are different levels of service across GMID surface drainage systems but in practice the performance differences have been found not to be as significant as initially thought. Surface drains are dynamic systems and while the design level of service is defined at the time of construction there are a range of factors at play that influence the real-world service performance. These include the rainfall event, catchment conditions, weed growth, the drain size and grade and on- farm storage and discharge rates to the surface drain.

The GMID surface drain design approach is based on theoretical assumptions that include rainfall and catchment uniformity. While this may have been applicable to the conditions in the past, the drying catchments and more extreme rainfall events has meant that there are now significant temporal and spatial variations of flows across the GMID surface drainage system. The current design standard was selected because a non-irrigated catchment would take 50 mm to wet up and a 1 in 2 year standard drain was considered adequate to deal with the resulting irrigation induced rainfall runoff. Economic considerations also come into play and analysis in the 1990s showed the economic benefits to irrigated lands were very similar for 1 in 2 year drains compared to 1 in 10 year drains. Accordingly, the current pricing structure developed at that time does not differentiate between the two standards of design.

For GMID surface drainage systems the reality today is that a drainage network can have a mix of design standards. Surface drain construction commences at the bottom of a catchment and progressively moved upstream. Construction can span a decade or more. Consequently, the design of the trunk drain at the lower end could be based on a 1 in 10 year event and the upper end on 1 in 2 year event. Spur drains coming off the trunk could be based on 1 in 10 or 1 in 2 depending on the year of construction.

Real world experience has shown that drains rarely perform as designed in theory and the lower reaches of surface drains have been the most impacted, particularly where there are long catchments. Extensive land forming means that water now reaches drains more quickly and water gets to lower reaches quicker than the past. Fortunately, where the lower reaches of drains were designed on the 1 in 10 year basis this has helped to mitigate the impacts. In large rainfall events, the rainfall intensity can exceed the infiltration rate of the soil and both irrigated and non-irrigated lands can produce higher rainfall runoff amounts than the design standard assumes. The removal of silt and weeds over many years using excavators has resulted in the deepening and widening of the design section of some drains.

The current GMID surface drain design removal period of 5 days is based on summer rainfall on irrigated permanent pasture. The objective was to remove the water before it caused significant damage to plant yield and accessions to the water table. The impact on a plant depends on the duration and frequency of inundation, the plant tolerance, the plant growth stage and seasonality. Crops irrigated now are different to those when the drain design standards were first developed. Annual crops now dominate with modern, higher yielding plant varieties. Almost all high value crops such as horticulture and summer crops are more sensitive to inundation and waterlogging than pastures.

A range of factors influence the time period a surface drain will take to remove water from a property and the actual performance of drains across the GMID fall more into a band rather than a single level. Some of these factors are outside of GMW's control. Changes in farm design may inhibit or accelerate water movement to a drain inlet point and the speed that water can drain from a property. Central re-use storages on properties can mean that there is only a single active drain inlet while other inlets are not being fully utilised.

Given the practical difficulties of now distinguishing the performance of GMW drains with differing original design standards the practice has been to treat all GMID surface drainage systems the same and not differentiate on the basis of the 1 in 10 year (75 mm) or 1 in 2 year (50 mm) design standard.

Subsurface Drainage

The investigation, design and construction standards for GMW public groundwater pumps have evolved over time. Nearly all the public groundwater pumps in the SIR are multiple spear-point systems connected to a surface-mounted centrifugal pump.

SIR public pumps protecting horticulture are operated to maintain watertables at safe levels. Historically the standard operating criteria for the SIR public pumps protecting pasture was to achieve two 60-day periods of continuous operation per year to provide leaching and salinity control. Given the more variable water table conditions and salt accumulation currently prevailing, operation is now based on local salinity risk conditions.

Lowering watertables draws groundwater away from the root zone of plants, and it also provides a buffer to allow any salt that may have accumulated in the soil above the watertable to be flushed downwards and away from plant root zones by rainfall moving through the soil over the winter and spring months.

The cost of establishing the public groundwater pump sites has been funded by Government. The annual costs of the public pumps are recovered through customer tariffs and Local Government contribution.

The shape formed on the surface of the watertable by pumping groundwater can be thought of as a cone with the deepest part being at the borehole where pumping is occurring and the sides of the cone extending out in all directions until a point is reached where there is no change from the original groundwater level. In the highly variable Shepparton shallow groundwater formation the drawdown is not uniform and cannot be precisely determined.

Local beneficiary tariff rating is based on a property's average level of service. This is derived from the observed groundwater drawdowns during the first 60-day period of continuous operation and applying relative benefits to areas within drawdown categories. Because of the different tariff structures, local beneficiary ratings have been undertaken for public groundwater pumps in the Murray Valley, Rochester and Central Goulburn irrigation areas but not the Shepparton irrigation area.

3.7
Policy and Regulatory Framework

KEY POINTS

- **Drainage in the GMID is important to Basin, State and regional natural resource management.**
- **Surface and subsurface drainage management has regulatory requirements.**
- **The Strategy has to be consistent with Regional, State and National legislation and policies.**
- **Water for Victoria is an important document that sets the Governments water management directions.**

Under the *Water Act 1989*, GMW is responsible for providing appropriate drainage management services where they relate to the delivery of irrigation water, and it can charge for the provision of those drainage services.

Catchment Management Authorities cannot levy rates on properties.

Drains and drainage courses connect catchments to rivers and ownership of surface and subsurface drainage systems brings with it accountability for their downstream impacts.

GMW delivers drainage in partnership with the Goulburn Broken CMA and North Central CMA. GMW's drainage function operates within an established regulatory framework and there are expectations and obligations placed on GMW to minimise the environmental and health impacts of drainage water on receiving waters. Adverse impacts could mean GMW faces a more prescriptive system of regulation and enforcement with higher compliance costs.

GMW operates as a statutory corporation constituted under the provisions of Victoria's *Water Act 1989*. Government legislative and regulatory provisions impose obligations on GMW. Managing drainage is one of those obligations and GMW's activities need to align with and support the Murray Darling Basin (MDB), State and Regional policies and priorities.

GMW prices are regulated by the Essential Services Commission (ESC) and service, tariff and price changes need to be approved by the ESC. GMW is required to provide a pricing submission to the ESC, setting out its proposals and the customer consultation that has been undertaken.

GMW uses the development of Service Plans for each of its service groups to inform its strategic business decisions and pricing submissions. This includes the detail around specific service requirements, cost sharing, forecasts of operating costs and capital requirements, tariff options and price paths. GMW's Drainage Service Plan will feed into the development of GMW's Water Plan 6 (2024-28) which will be submitted to the ESC in 2023.

The Environment Protection Authority also exercises regulatory oversight of drainage management through a consultative process under the Irrigation Drainage Memorandum of Understanding.

Effective ongoing management of GMID drainage systems is fundamental to delivering Victorian Sustainable Irrigation Program objectives and Catchment Management outcomes.

The principal regulations and policies concerning drainage are:

- *Water Act 1989*
- Water for Victoria (WfV)
- *Catchment and Land Protection Act 1994*
- *Environment Protection Act 1970*
- *Commonwealth Water Act 2007*
- DELWP Sustainable Irrigation Program
- State Environment Protection (EPA) Policy (SEPP Water)
- *Aboriginal Heritage Act 2006*
- Basin Salinity Management 2030 Strategy (BSM2030)
- *Safe Drinking Water Act*
- Irrigation Drainage Memorandum of Understanding (IDMOU)
- SIR & LMIR Land and Water Management Plans

3.8 Legal Aspects of Surface Drainage

Drain ownership brings with it legal liabilities and drain owners needs to navigate the legal aspects to lower the risk of claims for damage or loss caused by drainage flows. This was very apparent in the high rainfall years of 2010 and 2011.

Intense rainfall events can create short term inundation and surface drains by their very nature capture, concentrate and aggregate water flows. Drains need to be constructed to an appropriate engineering design standard and maintained in a condition that provides at least the service capacity for which they were designed.

Drainage compensation claims are rarely simple or clear cut. The free flow principle provides that a lower landowner is obliged to receive a 'natural' flow from higher land. Sections 16 and 157 of the *Water Act 1989* (Vic) set out some of the legal aspects around this.

Section 16 provides that a person who causes a flow of water onto other land which is characterised as 'not reasonable' can be liable for the loss or damage caused by the water.

Section 157 covers the flow of water from an authority's works and an authority can be liable where it is established that the flow was caused by the authority's 'negligent or intentional' conduct. There is a reverse onus on the authority to prove that the flow was not negligent or intentional.

The Victorian Civil and Administrative Tribunal (VCAT) hears and determines claims for property damage and economic loss under sections 16 and 157 of the *Water Act*.

The legal basis for the new type of lower cost hybrid-DCD schemes is a drainage course declaration (DCD) under Section 218 of the Act. This provides formal recognition and control of natural drainage lines that traverse private land.

The declaration gives the designated responsible authority the right to require the removal of obstructions to the flow of water in the natural drainage course. It also requires that a person must not, except with the consent of the responsible authority, interfere with or obstruct the flow of water in the drainage course. The designated responsible authority can recover its cost of administering a drainage course and to that end the authority can impose annual charges on benefiting properties for the service provided.

The legal liabilities of the DCD authority revolve around allowing 'reasonable' water flows as defined under the *Water Act* to pass along the drainage course.

3.9 Flood Mitigation

Irrigation drainage can intersect with floodplain management and the purpose and practical limitations of the GMID surface drainage network needs to be noted.

GMID surface drains are not primarily designed to mitigate large scale flooding events. The drainage network may assist in dealing with small scale local flooding, but it may take weeks to remove the water. Large scale regional flooding will overwhelm the drainage network and relying on the drainage network alone, it may take months to remove the water.

The limited ability of the drainage network to deal with flooding events is evident in the different scale of rainfall events. The current design standard for GMW drains is a rainfall event with a 1 in 2 year average recurrence internal (ARI) which is a 50% annual exceedance probability (AEP). Major flooding events are frequently defined as having a 1 in 100 year ARI which is a 1% AEP.

To manage the potential for adverse downstream impacts, the outfall capabilities of many GMID drains are limited to the drain design capacity. Further limiting issues arise where drain outfalls are pumped or drains discharge through levee banks and river levels are high.

Drainage system managers need to ensure that landholders are aware of these limitations on drain performance and ensure that landholders don't develop expectations of drain performance that cannot be met.

3.10
Victorian Drainage Strategies

Water for Victoria sets the overall policy directions for water management and drainage across Victoria and included actions for the development and updating of drainage strategies in rural dryland and irrigation areas.

The Victorian Irrigation Drainage Program (VIDP) is the Sustainable Irrigation Program's state-wide irrigation drainage policy, and has been running in various forms for approximately 25 years.

The VIDP seeks to mitigate the risk of salinity, waterlogging and water quality impacts to surface water and groundwater from irrigation activities in Victoria, by removing excess water from irrigated areas.

The VIDP has implemented various irrigation drainage measures (e.g. subsurface drains, primary and community surface water drains, tile drainage, groundwater pumping, Drainage Course Declarations (DCD) and on-farm drainage reuse).

The VIDP Strategic Directions 2021-2024 set the program priorities, provides strategic guidance for the regional implementation of the VIDP and establishes a framework to prioritise fit-for-purpose irrigation drainage activities.

The VIDP Strategy Directions 2021-2024 set the following priorities for the VIDP:

- Adapt irrigation drainage activities to balance environmental benefits and community benefits, and to build resilience to climate change, while continuing to support the Victorian irrigation sector
- Recognise, understand and protect, Indigenous water values and interests by collaborating with Traditional Owners in planning and delivering irrigation drainage activities and projects
- Ensure proposed irrigation drainage activities are supported by the community
- Manage offsite impacts of irrigated agriculture within agreed targets and, where possible, further reduce environmental and third-party impacts of irrigation
- Promote agriculture adaptation practices to build resilience to climate change within the irrigation sector
- Empower irrigators to make informed decisions about best practice irrigation drainage management
- Increase responsiveness and uptake of rural water policy across the irrigation sector
- Undertake research and monitoring activities to address knowledge gaps
- Ensure compliance and consistency with relevant statutory obligations, policies and strategies
- Promote appropriate long-term governance, operation and management of irrigation drainage investment.

In 2018, the Victorian Government released the Victorian Rural Drainage Strategy which sets out roles, responsibilities and obligations of landholders and government agencies in managing drainage in dryland agricultural areas. The strategy supports the implementation and management of dryland rural drainage systems for the purpose of improved farm productivity.

The GMID, as a constituted irrigation district, is outside of the intended coverage of the Victorian Rural Drainage Strategy.

3.11
Climate Change

Apart from a couple of short spikes, the climate in the GMID region has been getting warmer and drier, most notably since the late 1990s. The future GMID climate is predicted to be more variable. Overall it is expected to be hotter and drier but there is likely to be more frequent and more intense rainfall events and intermittent extended wetter periods. Risks of disruption, loss of productivity and damage to crops and infrastructure from inundation and flooding events will still exist and are predicted to be more exaggerated into the future.

Box 4 provides details of the climate risks forecast for the GMID region. Decision making needs to be responsive to the latest information.

The residual mass rainfall graph of the last 120 years (refer Figure 10) shows broadly three distinct climatic periods.

Box 4: Climate risks for the GMID

The GMID climate has varied in the past and will continue to vary in future. This means that some periods are cooler and wetter than average (as was the case in the 1970s), while others are hotter and drier (such as during the Millennium Drought from 1997 to 2010).

However, due to climate change, long-term average temperatures and rainfall are changing and the future climate will be different from the past.

In the future the GMID region can expect the following climate risks:

- Higher temperatures year round
- More frequent hotter days
- Overall decrease in rainfall
- Less rainfall in autumn and winter
- Increased summer rainfall
- Longer drier periods
- More frequent and more intense rainfall events occurring at different times of year
- Intermittent extended wetter periods
- Fewer frosts and fewer very cold days

Many of these risks are not new to the GMID. However, there are likely to be changes in duration, frequency and severity of weather events.

It is projected that by 2050, the climate of Shepparton could be more like the climate of Griffith now, Echuca could be more like Swan Hill and Swan Hill could be more like Hay is now.

The potential impacts of the changes relevant to irrigation drainage include:

- Reduced water availability and security
- Decline in irrigated area due to reduced water availability
- Increasing seasonal variability
- Changed crop and pasture varieties with more spring and autumn irrigation
- Changed planting and harvesting times
- Extended irrigation seasons
- Variable catchment, watertable and surface drain behaviour
- Increased evaporation and reduced soil moisture, runoff and groundwater accessions
- Lower annual drainage flows
- More time spent in drought
- Increased incidents of inundation and flooding events
- Increased loss of productivity and damage to crops
- Increased social disruption and damage to infrastructure

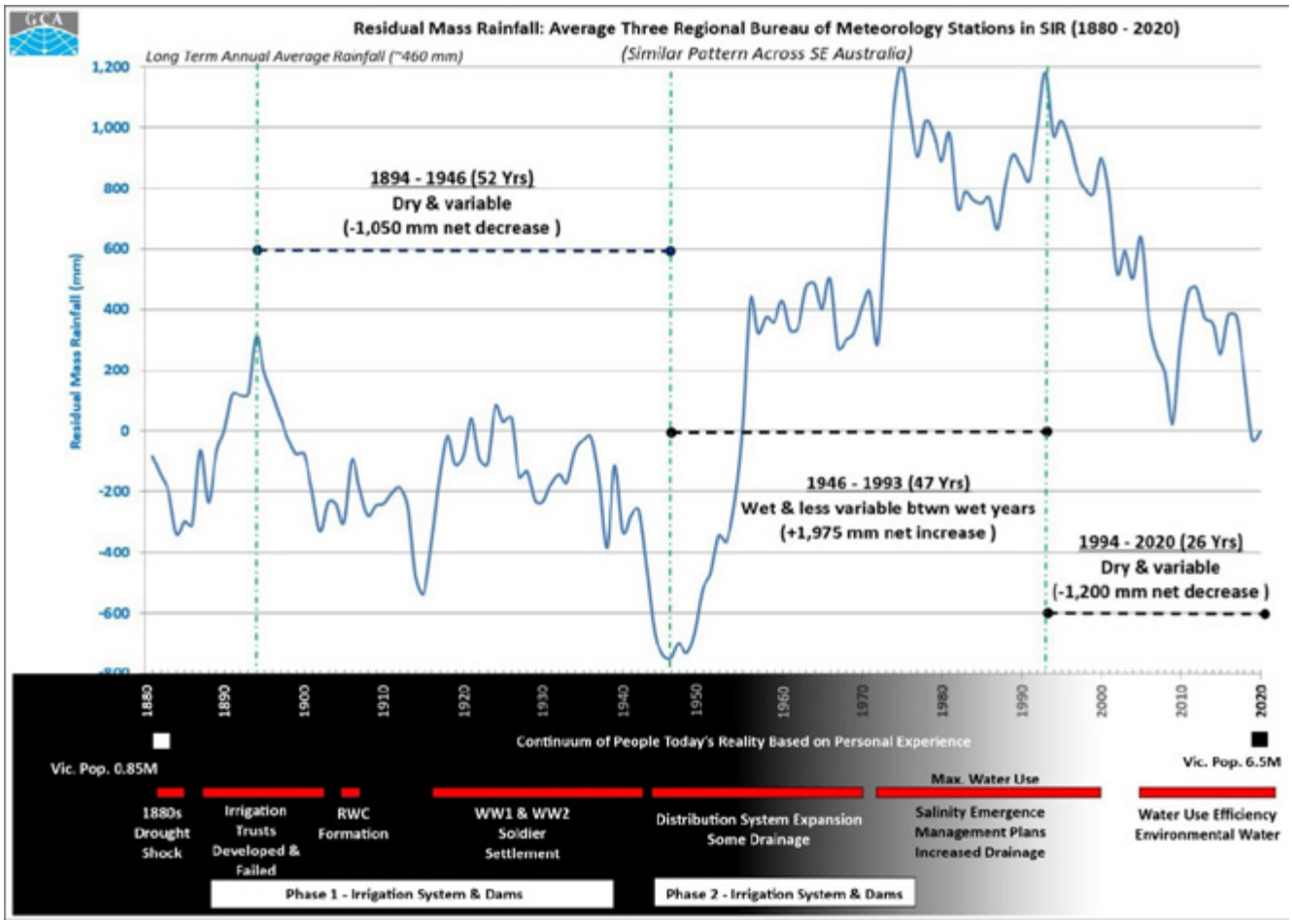

Figure 10: Residual mass rainfall graph 1880-2020

3.12
Current GMW Expenditure Levels

Total capital expenditure in 2019/20 on GMW drainage infrastructure in the GMID was:

- Surface Drainage - $0.5 million
- Subsurface Drainage - $0

Total GMW recurrent expenditure in 2019/20 on drainage operations and maintenance in the GMID was:

- Surface Drainage - $3.9 million
- Subsurface Drainage - $0.6 million

The total length, age and condition of GMW surface drains in each Irrigation Area varies significantly and the capital and O&M expenditure levels vary markedly between Areas.

The North Central CMA cannot levy rates on properties and consequently has no source of on-going revenue to pay for management or maintenance of the water courses within Bullock Creek drainage system.

3.13
Economics

KEY POINTS

- **The need for constructed drainage has reduced as the risks of drainage problems have reduced.**
- **Benefits of drainage have been on a declining trend.**
- **Drainage still provides important benefits, especially to horticulture.**
- **There is wide variability in the benefits of drainage amongst landholders, depending on their irrigation intensity.**
- **The cost of constructing new GMW standard surface drains can no longer be economically justified.**
- **Lower capital cost drain options are needed (such as hybrid DCD-based drains).**
- **Regional economic benefit of existing GMW surface drains greatly exceeds annual costs.**

New Drainage Infrastructure

The overall change in land use to lower value less intensive agriculture means that for most of the GMID the risk of drainage problems developing is continuing to decline. These regional trends reduce the benefits of drainage services and the customer willingness to pay for new drainage services.

The economic assessments of new surface drain proposals in the GMID have shown that in most cases now the capital cost of the past approach of constructing a GMW primary drain or a GMW CSD will not be justified by the benefits. This is mainly due to the decreasing agricultural benefits with reduced irrigation. Lower cost approaches are needed to meet the surface drainage needs of productive but currently undrained areas of the GMID.

Existing Surface Drains

A 2020 assessment of the benefits of the existing GMW surface drains (GMW primary drains and GMW CSDs) within the GMID identified that the gross regional economic benefit is close to $15 million/year.

At a regional level the value of benefits of existing GMW surface drains are around 4 times greater than their current annual O&M costs.

Figures are not available for other GMID surface drainage systems.

GMW Surface Drainage Systems	Total Area Served	GMW Surface Drainage
SIR	240,000	$11.5 million/year
LMIR	70,000	$3.1 million/year
Total GMID	**310,000**	**$14.6 million/year**

The $15 million/year benefit compares with an average O&M cost in the order of $4 million/year. Overall, the result for the GMID remains very positive. This is at a regional scale and there are local catchments where the assessed benefits are less positive.

Benefits were calculated for agriculture, roads and environment, assuming a low watertable environment. The assessment quantified only the major direct benefits of drainage and should be considered conservative. The figures exclude social costs and non-GMW drains. Urban drainage benefits which can be locally important are not included.

The agricultural benefits are based on the reduction in inundation, waterlogging and salinity costs by land use. Road benefits are based on the reduction in maintenance costs for the length of roads in each catchment. The environmental benefits are based on the length of natural waterways and area of wetlands.

The social costs of a lack of drainage are more difficult to quantify, such as improved property accessibility, lessened personnel hardship and reduced travel distances. With a clear way to remove excess surface water there should be less conflict between landholders and fewer disputes. This can make communities more functional, resilient and confident in the future.

The GMID is a mix of high intensity irrigation, low intensity irrigation and non-irrigated areas and the drainage needs and benefits vary across the GMID catchments. Land use is more dynamic than in the past with significant year to year changes possible. The benefits to individual landowners also vary with the level of benefit an order of magnitude higher for intensely irrigated versus non-irrigated land.

The benefits of surface drainage are now estimated to be around 60% of the 1990s level of benefits and are on a declining trend. The relative benefit distribution of drainage for agriculture, roads and the environment have changed. The total value of agricultural benefits has reduced appreciably due to the decrease in the extent of irrigation while the road and environmental benefits have reduced marginally.

The relative benefits at a regional scale have moved to a more even share between agriculture, road protection and the environment.

Subsurface Drainage

The economics around subsurface drainage benefits is a more complex picture and work on how to best assess benefits in a more variable future has not yet been undertaken. This also needs to be considered in the context that the O&M cost of subsurface drainage at present is $0.6 million/year and the current program of deactivating designated groundwater pumps is projected to reduce the cost to less than $0.4 million/year.

3.14
Cost Sharing for GMW Drains

KEY POINTS

- **GMID drainage costs are shared between the GMW customers, State Government and Local Government.**
- **The current cost share basis is considered to be broadly appropriate.**

The main beneficiaries of GMID drainage systems are agriculture, roads and the environment. These beneficiaries make their cost share contribution in a number of different ways. These include direct capital contributions, direct operations and maintenance and annual rates and charges.

Agriculture includes intensive irrigation, broadacre, cropping and dryland. Land use is now more dynamic than in the past with significant year to year changes possible. Benefits vary between catchments within the GMID.

Drainage can reduce the safety risks of water over roads and the potential for accelerated road deterioration following large rainfall events. An economic assessment identified roads as a significant beneficiary of drainage, but the assessment was at a regional scale and the road benefits across the GMID at an individual catchment or sub-catchment level are expected to differ greatly. There are wide variations in road categories, traffic loads, construction quality and standards of materials used on roads across the GMID. Lower quality material and construction standards put roads more at risk of poor performance from wet conditions.

The drainage system provides benefits to Local Government and ratepayers by protecting infrastructure, alleviating flooding, protecting the region from the impacts of salinity and making the region an attractive place to invest.

A lack of adequate drainage can adversely impact rural and urban infrastructure, leading to social and economic disruption and cost. It can cause damage and reduced life spans of roads, bridges, public buildings, housing, gardens, parks and sporting fields. Many towns in the GMID outfall urban stormwater runoff to GMW drains. These towns can generate relatively large amounts of runoff to the drains and receive significant benefit.

Local Government in the SIR (Campaspe, Moira and Greater Shepparton) make an annual contribution of 17% of the operation, maintenance and management costs of all public drainage works installed after 1990 under the Shepparton Irrigation Region Land and Water Salinity Management Plan. A similar contribution is not made by Local Government in the LMIR because works under the Loddon Murray Land and Water Management Plan have primarily been on-farm and not public works.

The environments cost share is met by Government which contributes to the capital cost of new drains and has paid 100% of primary drains and 50% of CSDs. Government also contributes funding to the GMID drain monitoring partnership, the strategic and adaptive planning of irrigation drainage needs and risks, new investment opportunities and the development of the regions' LWMPs.

3.15

GMW Business Complexity

KEY POINTS

- **There are multiple customer groups, financial accounts, pricing structures and legacy issues adding business complexity, cost and risk.**
- **The different approaches would have had a basis at the time the decisions were made, but the GMID has undergone significant change since then.**
- **There is scope for simplification, consolidation and streamlining of drainage administration.**

There are a range of different services, rating divisions and pricing structures that GMW applies to GMID drainage, and their development has occurred at different times in the past. These services relate to GMW primary surface drainage, GMW and private CSDs, drainage diversion and public sub-surface drainage.

The key service and pricing structures were largely developed in the 1990s and they reflect the business, climate, farming and community needs and institutional settings of that time. The current pricing structure for CSDs was implemented in 2000 as an interim measure pending a full review of the surface drainage tariffs.

GMW currently maintains 10 separate financial entities covering GMID surface drainage and 4 separate entities covering GMID subsurface drainage. The GMID has 7 surface drainage related tariff types with 20 individual rates and 3 subsurface drainage tariff types with 8 individual rates. Different locational charges are currently applied to drainage services across the GMID (refer Table 5).

Surface Drainage

The realities that GMID drainage now faces are very different to the past when there was high water use and the administrative focus was foremost on the fair and equitable sharing of costs across the wide range of GMID circumstances at that time.

There are now multiple GMW customer groups, financial accounts, tariffs, rating divisions and legacy issues. Nearly 85% of GMID properties now fall into just two of the eight surface drainage rating divisions.

Variations in drainage O&M expenditure are driven by external factors, primarily seasonal conditions. The relatively small budgets of some drainage services make them less able to absorb and smooth out fluctuations in expenditure. For GMW primary drains and GMW community surface drains there are differences in the average O&M unit costs ($/km) across the six GMID irrigation areas. There are also differences in the O&M unit costs of individual drains within each irrigation area. The question is what level of cost aggregation is considered appropriate?

Table 5: GMW drainage charging arrangements

Service	GMID Fees & Charges
GMW Primary Surface Drains	Different charges apply for each of the six irrigation areas
GMW Community Surface Drains	Same charges apply for each of the six irrigation areas
Drainage Diversion – Low Flow	(i) Same charges apply for Shepparton, Central Goulburn, Rochester and Murray Valley (ii) Same charges apply for Loddon Valley and Torrumbarry
Drainage Diversion – High Flow	Same charges apply in each of the six irrigation areas
GMW Public Groundwater Pumps	Different charges apply in each of the four irrigation areas of the SIR

GMW CSDs and GMW primary surface drains are designed and constructed to similar standards. Operationally the two types of surface drains are treated essentially the same in the field. GMW primary surface drains and GMW CSDs are currently administered as separate financial services. The separation was initially done for cost transparency when GMW took over management of CSDs from Local Government in the early 2000s, and to recognise the different landowner capital cost contributions.

Plans at the time were for an extensive network of GMW CSDs across the GMID and in anticipation of this separate CSD financial services were established in each of the six irrigation areas. Changing circumstances meant that only relatively short lengths of GMW CSDs were constructed and it is not expected that this will materially increase in future. The revenue and customer base of GMW CSD services is relatively small and this leaves the GMW CSD customers vulnerable to price shifts over time.

There are currently a combination of beneficiary and contributor pays pricing structures, with different fixed and variable combinations and a range of different rates and charges applied across the six GMID irrigation areas in many cases for essentially the same service provided.

Legacy issues and exemptions mean that some drainage services do not attract charges and some only have part of the tariff component applied. Determining the correct drainage division for a property is a complex manual calculation.

Separate financial accounting for each customer group creates additional budgeting, recording and reporting workloads. The transfer of costs between services also adds complexity. Property data can be difficult to keep up to date. A property's rating division essentially represents a 'snapshot' in time and in many cases does not reflect actual changes to properties that have subsequently occurred. Issues arise when subdivisions and amalgamations of properties occur.

This adds business complexity to GMW's management of GMID drainage and while this was appropriate in the past, such complexities can be difficult for GMW customers to understand and may now be disproportionate to the benefit.

Subsurface Drainage

The subsurface drainage tariffing arrangements in the SIR have evolved over time. A number of adjustments made since 2015 mean that who pays and how it is charged currently varies between Irrigation Areas for essentially the same service.

Direct beneficiaries of GMW public groundwater pumping cannot be precisely defined. In the Shepparton Irrigation Area, there is no specific subsurface beneficiary drainage tariff, while in the Central Goulburn, Rochester and Murray Valley Irrigation Areas there is a local beneficiary tariff.

Central Goulburn, Rochester and Murray Valley Irrigation Area charges are based on local benefit; land area for Murray Valley and water use and land area for Central Goulburn and Rochester.

Identified beneficiaries in the Central Goulburn and Rochester Irrigation Areas pay two charges, a local benefit area fee and a local benefit water use fee. The local benefit area fee is based on the amount of land within the area of influence of a pump and the local benefit water use fee is based on the volume of water delivered to a property within the area of influence of a pump. In calculating charges, different levels of service are defined based on land use, amount of groundwater level drawdown and duration. Murray Valley Irrigation Area identified beneficiaries pay a local benefit area fee.

Over time a number of issues have evolved in assigning service levels. In cases where private groundwater pumps had been installed prior to 1996, recognition has been given to the potential benefit that these pumps provided, resulting in a reduction in the service level attributed to the property. Where private pumps were installed after 1996 no adjustment is made to the service level for the property. As a result, an average level of service is calculated for a property using the defined levels of service.

This is done by assigning the appropriate relative benefit to the area within each service level and the total of benefits is then averaged over the whole property. The calculated average level of service is used in applying the beneficiary charges to each property.

There are currently three subsurface drainage rating divisions and the highest is for horticultural land use. The calculation of these divisions is a manual exercise based on the extent of groundwater water level drawdown to indicate the divisions for the level of benefit being achieved.

Beneficiary charges in the Murray Valley, Rochester and Central Goulburn irrigation areas apply to a property regardless of whether the pump for which they are defined a beneficiary is operating or not. GMW does not monitor land use change and properties that remove their orchards or vineyards need to notify GMW to have their rating reassessed.

Although the method of calculating the amount payable in the Murray Valley, Central Goulburn and Rochester Irrigation areas are the same, there are differences in the amount payable for the same service between irrigation areas.

The average level of service can be calculated on individual properties or on multiple non-contiguous properties owned by the same landholder. In Central Goulburn and Rochester Irrigation Areas where local benefit water use fees apply and there are multiple non-contiguous properties, landholders can potentially reduce the amount they pay by getting the average property service level calculated on an individual property basis.

There are significant costs incurred in determining the levels of service to 0.1 metre drawdown increments provided by GMW public groundwater pumps. The administration and monitoring of private groundwater pumps installed pre and post 1996 and the uncertainty regarding their service and operation has introduced administrative costs and inefficiencies.

Because of the complexities involved customer understanding of the rating structures is limited. The different application of charges confuses GMW customers and administrative effort is required to answer customer queries relating to how much they are paying, why they are paying and why others are not paying.

3.16

Regional Changes Shaping Drainage

KEY POINTS

- **Approaches to drainage in the GMID have evolved over many decades.**
- **GMID is going through a period of sustained and fundamental change.**
- **The irrigation landscape of the GMID will look very different in future.**
- **A range of futures are possible for the GMID.**
- **Drainage management will need to continue to adapt to meet the changing needs.**

The development of current GMID drainage services, tariff structures and pricing largely date back to the 1990s. Since the 1990s, major changes have occurred and are continuing to impact the nature of surface and subsurface drainage needs across the GMID.

The climate, hydrology, economics and beneficiaries of drainage have fundamentally changed and much of the thinking of the 1990s no longer applies. Water use, irrigation area, drain flows, salinity threat and benefits have all reduced.

- **Climate patterns**

  The GMID region has been getting warmer and drier, with reduced overall rainfall. Less cool season rainfall, more extreme events, longer drier periods and more intense rainfall are forecast in future. Access to drainage will be important in mitigation the impacts of high rainfall events.

- **Availability of irrigation water**

  The amount of water being delivered into the GMID has fallen substantially in the last 20 years. Large volumes of water have been permanently traded out of the GMID to the environment and to irrigators' further down-river. Indicatively at a regional scale, catchments have changed from having in a typical year two-thirds of the area irrigated and one-third unirrigated in 1990s, to now having broadly one-third irrigated and two-thirds unirrigated.

- **Profitability**

  Changes in costs, commodity prices and global markets means that there are now large variations in returns per hectare across the GMID than in the past. Particularly for individual seasons and businesses, and non-irrigated land and those properties that have low commercial value.

- **Land use**

  The land use of the GMID is changing with the decline of dairy, larger farming enterprises, farm inactivity and increased opportunistic irrigation, life-style farms and new drylands. The area of summer active irrigation has significantly reduced. Land use change is more dynamic than in the past driven by markets, water availability and industry demands. The drying off of previously irrigated land or its change from regularly irrigated to irregularly irrigated seems not to be following a pattern that reflects land suitability, service level or access to drainage. Rather it appears more related to individual farm business decisions. What has emerged is an indiscriminate mosaic pattern of drying off across the GMID. In terms of total numbers, the majority of GMID customers now do not irrigate. There has been substantial growth in rural-residential properties that are supported by off-farm income with less commercial need for drainage.

- **Modernisation of the channel system**

  The GMID channel system, previously a significant contributor to the drainage system, has been modernised and there are now little or no operational channel outfalls to drains. Reduced cost contribution to O&M of surface drains.

- **On-farm water use efficiency improvements**

  The high value of water has meant that there are commercial drivers for irrigators to minimise any loss of tail water and pursue reuse. Farms have become much more water-efficient with nearly all irrigation properties now able to contain and re-use their irrigation tail-water. In the 1990s it was estimated that some 20% of applied irrigation water ran off from farms to the GMW drainage system.

- **Minimal irrigation induced runoff**

  In the past, flow volumes in drains were significantly influenced by irrigation tailwater runoff and rainfall runoff from irrigated areas. Drains now mostly provide relief from larger rainfall events. There is now much less distinction in drain inflows generated from irrigated and non-irrigated rainfall runoff than in the past.

- **Surface and Subsurface Drainage**

  The need for drainage and the irrigated area at risk has reduced with decreased runoff and lower groundwater accessions. Increased variability of catchment, groundwater and surface water behaviour. The area drained is more than the area that can be irrigated with the water available. Changed land use and differing levels of benefit are making it increasingly difficult to meet existing requirement of a high level of landowner agreement to install new drainage infrastructure. High value irrigated agriculture continues to place value on drainage.

- **Drain flows**

  The amount of water in drains has reduced enormously since the 1990s. Base flows in drains are all but non-existent. The runoff to drains is much lower for smaller events. Drains are increasingly being under-utilised. The drain design rainfall event now produces little input. For intense storms where irrigated and non-irrigated land produce similar runoff there is little change in the peak drain flows. Drain flows are dominated by larger rainfall events and most water in drains is now generated from the runoff from non-irrigated lands within the GMID. Climate change may mean that intense storms become more frequent.

- **Environmental**

  Drainage water impacts have reduced significantly across the GMID. While drain owners may well be meeting their regulatory requirements now, societal expectations around drainage management continue to increase and legislative changes should be anticipated in future. Drainage managers can expect environmental awareness and scrutiny to be much higher than in the past. There are also changing views on the way water is managed across a landscape to protect and create environmental benefit.

- **Traditional Owners**

  Traditional Owner groups are seeking to be partners in NRM matters the same as other agencies and bodies. Indigenous water values and interests need to be recognised and protected. Drain owners need to be working in collaboration with Traditional Owners in the planning and delivery of drainage management activities and projects.

- **Drain maintenance needs**

  The different drain flow behaviours than the past means that there are now different management issues and different maintenance needs.

- **Salinity threat**

  Watertables have fallen across the GMID and the area of land affected by watertables less than two metres from the surface has reduced significantly. Changes in land use, water availability and water use efficiency and drier, more variable climate conditions have reduced, but not eliminated, salinity and high watertable risks across the GMID in all but the lowest elevation areas in the landscape. It is difficult to predict when and where future salinity threats may arise because of climate variability and increasingly dynamic land use.

- **Economics of drainage**

  Significant change across the GMID has altered the economics of drainage. The benefits have substantially reduced from what they were in the 1990s and are continuing to decline. Drainage benefits varying widely at a catchment and individual landowner level. Whole farm planning and on-farm re-use systems are reducing the need and benefits of off-farm drainage. In most cases now the capital cost of constructing new conventional surface drains is no longer justified by the benefits. Non irrigation and irregular irrigating landholders value drainage less. Notwithstanding these changes, the value of benefits of existing GMW surface drains are still at least four times greater than O&M costs.

- **Roadside Drainage**

  There are locations across the GMID where landowners discharge excess surface water to roadside table drains or crown lands. A typical example would a private drain discharging to a road table drain which in turn discharges to a GMW drain. This may have been accepted by some Councils in the past, but unmanaged drainage discharges are increasingly becoming an unacceptable practice to Councils because of the road damage and safety risks it can cause.

The cumulative drain flow plot in Figure 11 shows fairly constant drainage flows in the 1980s. Drainage flows declined significantly during the Millennium drought and have not returned to pre drought levels.

Deakin Drain irrigation season cumulative flow 1984 to 2019

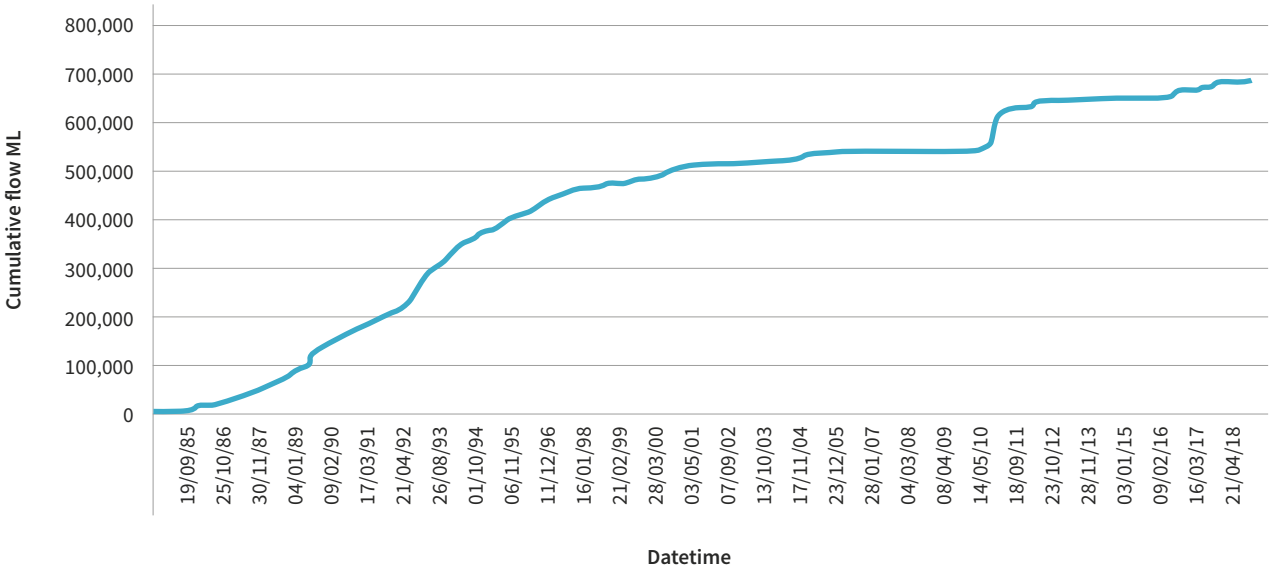

Figure 11: Cumulative drain flows example

3.17

Analysis of Current Position

How drainage was managed in the 1990s is longer applicable to a future GMID. The long-term drainage requirements of the GMID are continuing to evolve and this Strategy is intended to guide decisions in relation to future drainage service requirements, costs, risks and pricing structures.

To better understand the future operating environment an analysis of strengths, weaknesses, opportunities and threats (SWOT) has been compiled for GMID drainage (see Box 5).

This was developed from an October 2019 workshop of key stakeholders which included drainage customer and agency representatives.

Drainage is relativity small part of GMW with annual costs of about $4 million in a $150 million business. The GMID has an extensive drainage network that can mitigate inundation, waterlogging and salinity risks. The GMID is however going through a period of fundamental change and drainage services need to be better matched to catchment needs and more proportional to the benefits.

Box 5: GMID SWOT analysis

Strengths

- Modernised low energy irrigation supply system.
- Extensive and capable land suited to a variety of irrigated agriculture.
- Mix of farming systems that can adjust to changing water availability.
- Extensive drainage network that can mitigate inundation, waterlogging and salinity risks.
- A drier, more variable climate has reduced but not eliminated, salinity and watertable threats.
- Drainage services are valued by most landholders and currently experience very few service issues.
- The amount of water in surface drains has reduced enormously.
- The environmental impact of drainage water has significantly decreased over the last decade.

Weaknesses

- Under-utilised drainage infrastructure and drains not matched to the modernised irrigation footprint.
- Total area of GMID that can potentially be irrigated from the channel system is some 600,000 ha.
- Total area of GMID that can be irrigated intensely with the now available water is around 200,000 ha.
- Total area of GMID that is currently drained by the GMW drain network is some 300,000 ha.
- Higher value intensive irrigation is spread across the GMID and not in concentrated areas.
- Not all of the GMID that can be irrigated from the modernised channel system is served by drainage.
- Drainage needs have changed and costs may now exceed benefits for some customers.
- In most cases the cost of constructing new GMW surface drains are not justified by the benefits.
- Existing pricing structures are complex to administer.
- New dry land areas value drainage less but very few drain catchments are solely dryland.
- Some misalignment between beneficiaries and who is being rated by GMW.
- Relatively small sizes of irrigated land parcels when the markets demand large-scale production.
- Mixture of commercial & non-commercial properties facing differing consequences from a lack of drainage.

Opportunities

- More than half of the previously irrigated land in the GMID is now under-utilised.
- Drainage service levels better matched to catchment needs and more proportional to benefits.
- New lower-cost hybrid-DCD surface drainage approach.
- Reset of current mismatches between who pays and who benefits.
- Simplification and streamlining of business processes and administrative costs.
- Align drainage with the strategic directions of the channel-by-channel approach.
- Potential for service and cost changes if there is a higher risk appetite.
- Drainage attractive to new irrigation developments.

Threats

- Environmental awareness is much higher and irrigation is under more scrutiny that in the past.
- Drainage benefits have reduced and vary widely at local, catchment and regional scales.
- GMID is going through a period of fundamental change and long term drainage needs are not clear.
- Changing service expectations around drainage and reduced willingness to pay by some customers.
- Drainage is not always valued until it rains and drainage is not working.
- Likelihood of further reduction in irrigation intensity through trade downstream.
- Climate uncertainty and variability.
- Downward pressures on commodity prices through global markets and competition.
- Widening gap in profitability and affordability between customer groups.
- Half or more of the previously irrigated GMID is currently underutilised or inactive.
- Societal expectations of environmental health continue to increase.
- Likely that there will be redundant or underutilised infrastructure that will need specific action.

SECTION 4

STRATEGY

The drainage needs of the GMID are changing and it is timely to review drainage management to ensure that it is fit for future purpose and continues to support the needs of sustainable irrigation.

Substantial changes in land use, water availability, climate, system modernisation, water use efficiency, greater understanding of catchment risks across the GMID and recognition of the opportunities for drainage networks to value add environmental benefits have highlighted the need for changes to the way current surface and subsurface drainage services are provided.

An adaptive management approach is now seen as being critically important and the form of drainage needs to be appropriate to contemporary inundation, waterlogging and salinity risks.

Implementing contemporary management arrangements for drainage means looking for greater opportunities to achieve environmental and cultural benefits.

Previous strategies focused largely on building new drainage infrastructure. The future focus needs to be on identifying opportunities to adaptively manage the existing GMID drainage systems to achieve added economic, social and environmental outcomes.

The issues involved are multi-layered and have various moving parts. The multi-layered issues include existing drainage infrastructure, intensively irrigated and irregularly irrigated areas, catchments that are undrained and areas that are no longer being irrigated.

The moving parts include the service-price-risk trade-offs, the different ways of managing drainage risks at landowner-public level and the variability across the GMID. The variables include the year-to-year water availability, market forces and production costs, wet and dry climate sequences, the shifting mosaic pattern of irrigation and the changing levels of benefit.

Ongoing active management of GMID drainage systems will help build the region's resilience but ultimately the long game for drainage will be driven by the future directions taken by irrigation.

4.1
New Surface Drains

KEY POINTS

- **The number of undrained areas of the GMID at risk of drainage problems are continuing to decline and this reduces the need and affordability of new drains.**
- **Economic analysis indicates that overall there would be lower willingness to pay for the provision of new conventional drains in most of the undrained areas of the GMID.**
- **The need for more effective surface drainage in some form still continues for many of the remaining undrained GMID catchments.**
- **A partnership approach with Government would continue to achieve the public and private benefits of drainage.**

The construction of GMW drains has progressed on a catchment-by-catchment basis over many years. The construction order has been based on catchment rankings that used a range of factors including risk. This has meant that GMID drain construction has broadly progressed from higher to lower risk catchments as they were assessed at the time.

Remaining are the relatively lower risk catchments. While water use and irrigated area has reduced and that trend is continuing, the fundamental need for more effective surface drainage still continues for many of the remaining catchments.

There is a current mismatch between the modernised channel system and the drainage network. At this point, not all of the area of the GMID that can be irrigated from the modernised channel system is served by drains.

With the reduced irrigation footprint, the ability to relocate irrigation water within farms away from high-risk areas has increased. As well the ability to relocate farms to currently unirrigated areas of the GMID that are served by existing drains has increased. There are however difficult issues associated with the relocation of irrigation farms and there are no apparent pathways for doing so at this point.

Climate variability, changes to the irrigation footprint and on-farm changes mean when and where drainage will be needed in future is markedly variable across the GMID.

An issue is the difference in value of production at risk between irrigated and non-irrigated land. Due to the lower production value of dryland, it is harder to get landowner agreement on the cost share of new drain construction.

Irrigation customer water use has fallen across the GMID and there is increasing pressure for GMW to reduce infrastructure rather than build additional infrastructure when there is a declining irrigation customer base that can afford to pay.

Economic analysis indicates that overall, the capital cost of constructing conventional drains to serve the remaining undrained areas of the GMID is not justified by the benefits, unless there are specific cases with high value irrigation enterprises or important environmental values.

Because the irrigated area is now a much lower proportion of a drainage catchment, the design of new drains could in theory be at a lower capacity than the current GMW design standard. This is somewhat of a moot point because the capital cost would still not be justified by the economic benefit.

There is interest by landholders in undrained areas for more effective drainage and under the Shepparton Irrigation Region Land and Water Management Plan new lower-cost hybrid DCD-based schemes are now being successfully developed and implemented.

With a hybrid-DCD scheme the emphasis is on reinstating natural drainage lines. Any potential adverse impacts of doing this, such as downstream effects, are addressed at the design stage and a hybrid-DCD scheme will only proceed if it is supported by the landowners and the impacts can be managed as required under section 218 of the *Water Act 1989*.

A management plan is developed for each hybrid-DCD scheme and this includes monitoring of how the scheme performs in the long term.

The benefits of a hybrid-DCD scheme compared with a standard constructed drain are seen as:

- Significantly lower construction and implementation costs
- Less land is removed from production
- No fencing required
- Reduced property impacts
- Ongoing maintenance requirements are simple
- GMW ensures the declared drainage course is not obstructed by future works.

It is proposed that these lower cost hybrid-DCD schemes based on connecting the natural drainage lines will be the general approach to extend drainage into areas currently undrained across the GMID, provided:

- Irrigation is considered to have a long-term future in that area or there are important environmental values.
- The hybrid-DCD drainage approach is supported by the benefiting landowners
- The benefiting landowners agree to pay for the ongoing maintenance and administrative costs
- There is an economically sound business case, including the economic, social and environmental benefits
- The off-site impacts of drainage can be managed.

No new conventional drains will be constructed in future unless there is a compelling case to do so. For example, a GMW primary drain may be extended to provide an outfall for a new hybrid-DCD scheme.

Farm reuse and management, extension and water use efficiency will continue to be part of the drainage solution and these aspects are incorporated in the respective LWMPs.

GMW will work with landowners to connect the drainage system to undrained areas of the GMID where the irrigation system has been modernised. Prioritises will be influenced by the level of landowner support.

The new lower-cost hybrid-DCD approach is well suited to high rainfall events. Excess irrigation water and small-medium rainfall events could be managed on-farm. When on-farm management systems are overwhelmed in a high rainfall event, the off-farm hybrid-DCD would come into play in removing the water.

Hybrid-DCD schemes are adaptive to an uncertain future. They can be upgraded to a conventional drain if the need is there in future, or the formal declaration (DCD) could be revoked and the scheme decommissioned if there is no future need.

Questions are what might be the potential size of a future hybrid-DCD drain program across the GMID, what would its funding needs be and for the remaining 'economic' to drain areas how should it be prioritised?

A DCD-based hybrid scheme is not expected to be adequate to protect intensive horticulture from risks of inundation and waterlogging. An extension of the constructed GMW drain network may be considered in future if there was a compelling case. In the first instance, new horticulture developments will be encouraged to locate where drainage already exists.

The transfer to GMW of existing drains that are under other ownership will be subject to due diligence assessment and the same pre-conditions as a new GMW drain.

Under the Government's irrigation development guidelines approvals are granted on condition that the developers are responsible for managing drainage water. Therefore this Strategy does not need to consider construction of drains for new irrigation developments or re-developments.

There are developed drainage prioritisation and cost sharing frameworks in place for the GMID which consider economic, social and environmental factors. Where drainage may be required in future will be more difficult to predict and the economic benefits of drainage will be more transient. In future a new more adaptive prioritisation framework will be required as water can move within the landscape and the area irrigated can change significantly within individual catchments.

STRATEGY DIRECTIONS

1	**No new conventional drains (e.g. primary drains) will be constructed unless there is a compelling business case to do so.**
2	**GMW, CMAs, Local Government and DELWP will work together to seek funding to extend the GMID drainage network subject to the following conditions:** • **Irrigation in the area is considered to have a long-term future, there is a high level of landowner support and the business case is sound; and** • **Lower cost hybrid DCD-based schemes will be the general approach used in the future for new surface drainage across the GMID.**
3	**The transfer of existing drains to GMW ownership will be subject to the same pre-conditions as a new drain.**

4.2

Bullock Creek System and Other North Central CMA Drainage Networks

KEY POINTS

- **The North Central CMA Bullock Creek network is an important regional drainage system.**
- **North Central CMA does not have a rating base to fund ongoing management and maintenance.**
- **Minimal maintenance has been undertaken for an extended period of time now and that may impact the drainage function. While the North Central CMA has received funding for specific Bullock Creek projects, currently there is not a secure source of funding to undertake ongoing operation and maintenance.**

The Bullock Creek is one of several natural waterways that collect and carry water across the Loddon Valley Irrigation Area.

A Bullock Creek River Improvement Trust was formed in 1970 and it constructed a network of shallow drains from the 1970s to 1990s. This work was done to reduce the inundation and waterlogging of land. During this period Local Government collected rates on behalf of the Trust from the benefiting landowners whose properties drained to the Bullock Creek network. The Bullock Creek drainage network is an important regional drainage system which presently consists of some 347 km of waterways managed by the North Central CMA which in-turn supports over 650 km of community surface drains constructed in the 1990s that are owned and operated by community groups. These CSDs were built to improve the connection between properties and the Bullock Creek drainage network. These CSDs are owned by the landholders of the properties serviced and not the North Central CMA, and many were constructed with a 50% government funding contribution.

The drains were installed to reduce waterlogging and salinity and improve agricultural productivity.

With the creation of Catchment Management Authorities in 1997, River Improvement Trusts were dissolved and the assets and responsibilities were transferred to CMAs.

CMAs cannot levy rates on properties and rates are no longer collected from the benefiting landowners. Consequently, the North Central CMA does not have an on-going source of funds to pay for management and maintenance.

Since North Central CMA took responsibility for the Bullock Creek drainage network little or no maintenance has been undertaken because of the lack of funds. Without regular maintenance there is a risk that the condition of the Bullock Creek drainage network will for drainage purposes degrade over time.

A long-term management plan needs to be developed to enable the sustainable management of the network. As part of the renewal of the Loddon Murray Irrigation Region (LMIR) Surface Water Management Strategy (SWMS) 2022, it is the intention of the North Central CMA to identify future management priorities and responsibilities.

A Bullock Creek River Improvement Trust District Management Planning Pilot Study was initiated in 2019, using funding provided by DELWP under the Victorian Rural Drainage Strategy. As part of that project the North Central CMA surveyed landowners served by the Bullock Creek drainage network regarding drainage issues and possible future management options. The findings from this project are being used to inform the development of the Loddon Murray Irrigation Region Surface Water Management Strategy, which is scheduled to be completed in 2022.

The Bullock Creek drainage network is based on waterways that cross the Tragowel Plains. These are important natural assets that support populations of animals and plants. Refer to Section 3.5 regarding environmental aspects of their management.

STRATEGY DIRECTIONS

4	**The renewal of the North Central CMA Loddon Murray Irrigation Region (LMIR) Surface Water Management Strategy (SWMS) 2022, to provide guidance that supports the ongoing sustainable management and maintenance of the Bullock Creek drainage network in the Loddon Valley Irrigation Area.**

4.3
Differing Levels of GMW Drain Service

KEY POINTS

- **Currently GMW drains are operated and maintained to achieve broadly the same performance intent across the GMID.**
- **The GMID now has a much more variable landscape with variable needs.**
- **A different standard of O&M and level of service for some existing surface drains may better align with future catchment risks and customer willingness to pay.**
- **A low intensity drain maintenance regime could potentially be a lower cost option that is attractive to customers in areas of less intensive land use.**

Concept

Most of the GMW surface drainage network is designed and maintained on a similar basis. The design standard of GMW's surface drains is based on at least a 1 in 2 year summer rainfall event (50 mm in 24 hrs) and currently GMW primary drains and GMW CSDs are operated and maintained to achieve broadly the same performance intent across the GMID.

In the past there were large areas of irrigation dominated by pasture. Now the GMID has a much more variable irrigated landscape with variable needs. The question is what standard of surface drainage will best suit the future catchment risks and be acceptable to stakeholders?

The concept has been raised whether it would be possible to delineate different standards of O&M for existing surface drains across the GMID that could be more aligned with future catchment risks and customer needs. This is turn may support future regional opportunities.

As well as the current surface drainage service level, would it be possible to offer a higher or lower level of service in parts of the GMID by varying the O&M regimes? A higher service level could potentially be attractive to new intensive irrigation developments, such as vegetable growing, where excess water would need to be removed within 24 hours.

In particular, in catchments where there is now more dryland than irrigation and costs may exceed the benefits of drainage at the current standard, a lower level of service at a lower cost may be an option that those customers could consider. Once the future service requirements have been defined, the beneficiaries can be identified and the cost sharing arrangements and pricing structure can then be established.

With the exception of a number of pump stations, the GMID surface drainage network is made up of passive assets that are not operated, unlike the channel supply system. This means that once the design standard is set, the level of maintenance is the next biggest factor that influences surface drain performance.

The concept put forward is for potentially high, standard and low intensity maintenance of surface drains across the GMID.

High Maintenance Regime

The concept of a high intensity maintenance surface drain is not considered practical as it would not provide a consistently higher level of service year round. A range of factors on-farm and within the surface drainage network and the variability of rainfall, catchment and seasonal conditions will make it difficult to meaningfully differentiate the higher level of service that customers would be paying for. The characteristics of the long surface drains on the flat grades in the GMID mean that once a drain is running full the backwater effect becomes the limiting service performance factor and the underlying surface drain design standard would predominate.

Based on customer feedback and very few service issues being raised, the current GMW surface drain service standard has proven satisfactory to date for a wide range of horticultural plantings. There are existing opportunities in the GMID for high value vegetable developments where there is either good natural drainage, existing GMW surface drains or lighter soil types and plantings can be located higher in the landscape to minimise inundation and the risk of waterlogging.

Low Maintenance Regime

Drainage is fundamentally about risk management, with the form of drainage service tailored to the risks.

The general reduction in area irrigated means the intensity of irrigation across the landscape is lower than in the past and as a consequence the need for high service levels has reduced in some areas of the GMID.

In situations where drains now serve large areas of non-irrigated land, they have in theory become under-utilised and there is the question as to what an appropriate level of O&M is.

The thinking around low intensity maintenance of surface drains has been evaluated and it is considered that this approach could be a feasible option and may have merit in some circumstances, depending on the attractiveness to customers of the service-cost-risk trade-off.

While there are seasonal variations, under average conditions, most GMW surface drains now require two weed spray passes per year to maintain the current service standard. With the low intensity maintenance surface drain option, it is proposed that there would be minimal maintenance of the drainage waterway. Structures at road and channel crossings would continue to be maintained. GMW surface drains are generally constructed along the natural drainage lines and the resulting surface drainage performance could be aligned with that of a hybrid-DCD scheme.

The level of surface drainage service would be a step change, markedly different to the current standard. Properties served by a low intensity maintenance drain could be rated on the same basis as properties in a hybrid-DCD catchment.

It is projected that the total length of hybrid-DCD schemes across the GMID in future could potentially be in the order of 200-400 km.

The process around changing a standard service drain to low intensity maintenance drain would need to be worked through with customers and stakeholders. This would include consideration of the legal liability issues that could arise specific to individual drains.

A change to drainage service would have to be at a whole of surface drain catchment level and would not be an individual landowner choice. It would be a catchment decision made by all landholders and stakeholders, taking into consideration the broader benefits of the surface drain. To be a viable business option for GMW there would have to be sufficient GMID scale of demand for the lower level of service. Most GMID surface drain catchments currently include a mix of irrigated, inactive and non-irrigated properties and this would add a further layer to the decision making required on this option.

A change to a low intensity maintenance surface drain is a decision that could potentially be reversed in future if required. The lower intensity maintenance option for existing surface drains is consistent with resilience principles and aligns with the future approach of using hybrid-DCD schemes to extend surface drainage into undrained catchments of the GMID.

The question is, do customers across the GMID consider the current level of surface drainage service to be still relevant to their needs? Is there sufficient customer demand for a lesser level of drainage service at a lower cost? Would the overall customer value of introducing a different service level justify the added management and pricing complexities that could be involved for GMW and customers?

STRATEGY DIRECTIONS

5	**A low intensity drain maintenance regime could potentially be an option that some GMW customers would consider depending on the attractiveness of the service-cost-risk trade-off.**
6	**If there is customer interest in a lesser level of drainage service at a lower cost, the details around this option is proposed to be worked through with customer groups as part of GMW's Drainage Service Plan development process.**

4.4
Value Proposition of GMW Drainage Services

KEY POINTS

- **Customer expectations of drainage services and perceptions of value are changing.**
- **The value proposition for future GMW drainage services needs to be clear.**
- **Perceptions of value should exceed the annual charges.**

Some GMW drainage customers feel that they are not getting the same value for money they were in the past. Their drainage service expectations and perceptions of value are changing. They now discharge little or no irrigation runoff to the surface drain and only really need the drain 'sometimes' when there has been a large rainfall event. The thinking of some landholders is they don't need drainage now, so they don't want to pay for it now, but they want surface drainage when it is needed.

Understandably, GMW customers wanted to pay less and during the millennium drought (1996-2009) many landholders questioned the value of drainage. The challenge for the future is that the changing climate is bringing more extreme events with longer drier periods and more intense rainfall events.

The practical reality of this means that GMW drains have to be 'service ready' all year round and able to perform in high rainfall events at any time. This was very evident in the high rainfall years of 2010 and 2012 at the end of the Millennium drought.

Potential approaches to improve the value for money for drainage customers across the GMID include reducing O&M costs, changing levels of service and resetting current cost shares.

Changed O&M regimes could reduce costs if there is a higher risk appetite. A different level of service could be offered that better matches specific catchment needs and risks. The existing rating base could be broadened to include beneficiaries that are not contributing to costs through the current tariffs. There is a need to understand more about the value Local Government places on drainage and what level of drainage do they think they will need in future to protect road infrastructure.

Key questions might include, what are Local Government's perceptions across the GMID of the value of roadside drainage compared with recent economic analysis? Is there a common understanding across stakeholders of the role Local Government roadside table drains play in drainage?

There needs to be clear and concise statements of the value proposition for future drainage services under variable climate behaviour, so that serviced landholders recognise the value of the service provided by their drainage rates. These statements should identify that the benefits that drainage offers to the respective beneficiaries exceed the costs. The benefits need to be demonstrable and the costs include economic risks.

This should recognise that the future GMID climate may be more variable and that in a wet period the benefits of drainage will become more positive and in a dry period less positive.

If the value of drainage services is not clear then a review and analysis of future service needs, costs, risks and pricing structures may be required.

In all of this, there is a need to be mindful of the significant variations and differences across the GMID. The questions are what level of drainage service do customers want in future, what is their willingness to pay and what is their preparedness to accept more risk?

STRATEGY DIRECTIONS

7	**There needs to be clear statements of the value proposition for future GMW drainage services relevant to each identified beneficiary group, including the environment.**
8	**That drainage service value propositions need to be included as part of GMW's Drainage Service Plan development process.**

4.5

Public Groundwater Pump Adaptive Management

KEY POINTS

- **Changes in land use and climate have reduced but not eliminated salinity threats.**
- **Threats are more variable in terms of when and where they may arise in future.**
- **In response to changing watertable behaviour and salinity threat, an adaptive risk-based approach to the management of the SIR public groundwater pump network is being implemented by GMW.**
- **GMW adaptive management of the public groundwater pump network is well advanced and the number of operational public pumps is being progressively reduced in a way that allows them to be reactivated in the future if salinity and watertable threats return.**

Between 2000 and 2010 the GMID was impacted by a succession of very low rainfall years – the Millennium Drought. Over this period, the watertable across the region declined due the rainfall deficit and the reduced area of irrigation. With the decline of the watertable, the threat posed from shallow watertable salinity also declined.

2010 and 2011 were high rainfall years and groundwater levels rapidly rose. This provided valuable data into how the SIR groundwater behaved in response to changes in irrigation and rainfall. It altered the pre-drought understanding of the nature of the regional salinity threat from one of 'fixed and unchanging' to one of 'variable and driven by climate'.

Changes in land use, irrigation and climate have reduced, but not eliminated, the salinity and groundwater threats in the SIR. Whilst there is now an improved understanding of the ongoing nature of these threats, it is difficult to predict when and where the future groundwater and salinity risks will arise because of climate variability and the increasingly dynamic land use.

The future threat will be variable in terms of time of occurrence, duration of occurrence and the areas where the threat is realised.

Future salinity threat management has to adapt between conditions of low intensity management during periods when it is dry and groundwater levels are at depth, and high intensity management when levels rise and approach ground surface following high rainfall years.

In the mid-2010s, in response to significant climatic and land use changes, GMW began an adaptive risk-based management approach of its public groundwater pumps in the SIR, replacing the former more rigid approach which had been prescriptive and management intensive.

This adaptive management approach involves optimising GMW's public groundwater pump network across the SIR to foreseeable future risks scenarios. With the much more variable irrigated landscape now being encountered, GMW is rationalising the pump network by matching services to future needs.

Public groundwater pumps in areas of ongoing salinity threat will remain operational.

In areas where the watertable and salinity risks over the next decade have reduced sufficiently, GMW is de-activating (mothballing) the public groundwater pumps. This is being done in a way that the pumps can be reactivated in the future if wet conditions return and the salinity and watertable threats increase in protected areas. GMW is consulting with customers before pumps are deactivated.

Public groundwater pumps in areas where the salinity threat has been reduced by significant changes in land use (urban development) are to be decommissioned.

Table 6: Indicative SIR ground water pump costs

Description	Indicative Cost per pump site
Annual cost of active pump	$6,000
Pump deactivation	$5,000
Annual cost of deactivated pump	$800
Reactivation of pump if deactivated	$50,000
Pump decommissioning	$50,000
Reinstatement of pump if decommissioned	$200,000

This means there will be fewer operational pumps and GMW's public groundwater pump network will be less costly to manage. This is enabling the annual O&M costs to be reduced whilst maintaining future capacity to respond where and when required. The emphasis has always been to maximise private groundwater pumping where it is feasible.

GMW has reviewed over 30 years of groundwater level data to determine the likely future salinity and watertable threat in the area around each public groundwater pump. With the changed conditions in the SIR, technical analysis indicates that in the order of 30-35 of the 115 public groundwater pumps will be required to operate in the short to medium term unless sustained wet conditions occur.

Deactivating pumps rather than decommissioning (removal) has been adopted by GMW because it is the lowest cost approach, allows the pumps to be brought back into operation if conditions change in future and it preserves the public investment that has been made in the pumps.

Indicative SIR public groundwater pump costs are set out in the Table 6.

GMW is undertaking a number of adaptive management tasks in the SIR including:

- Assessing the future requirements for public groundwater pumps in protected areas.
- Deactivating pumps identified as having a low probability of being required to operate.
- Developing a decision support process for deactivating pumps.
- Updating of public pump operating rules based on the changed conditions and salinity risks.
- Rationalising the observation bore network.
- Monitoring watertables to identify trends and guide reinstatement of deactivated pumps in the future.
- Salinity risk reporting through a web-based portal to inform landholders about salinity threat changes.

The planning around the adaptive risk-based operation of GMW's public groundwater pump network and updating of the pump operating rules is being funded by the Goulburn Broken CMA sustainable irrigation program.

This adaptive approach to subsurface drainage aligns with GMW's business directions as well as MDB, State and regional catchment strategies.

STRATEGY DIRECTIONS

9 **Maximise private groundwater pumping and continue the implementation of the adaptive management of GMW public groundwater pumps in the Shepparton Irrigation Region in response to changes in groundwater levels.**

4.6

Approaches to Drainage Cost Sharing and Pricing

KEY POINTS

- **The GMID faces a more variable and less predictable future.**
- **Drainage services needs to be underpinned by appropriate pricing structures that are simple and robust.**
- **The current GMW drainage pricing structures were developed at different times in the past and are not all based on consistent principles.**
- **There are opportunities to achieve better application of the beneficiary pays principle for drainage services.**
- **Drainage across the GMID has changed significantly since GMW pricing structures were developed.**

The continuing provision of drainage services across the GMID needs to be underpinned by appropriate pricing structures. Pricing structures determine how service costs are recovered and how those costs are shared between customers.

There are a range of different pricing structures that GMW currently applies to GMID surface and subsurface drainage services. The development of these have occurred at different times in the past, often independent of each other and based on the policies and thinking of the time.

There is at present a mix of 'contributor' and 'beneficiary' pays approaches that are a legacy of the past. Consequently, current GMID pricing structures are not all based on consistent principles.

Drainage across the GMID has changed significantly since the pricing structures were developed and it is considered timely for GMW to review its current suite of pricing approaches for drainage services. There would appear to be potential opportunities for the amalgamation of GMID drainage financial entities and the simplification of tariff structures.

GMW's Drainage Service Plan development process will be the vehicle that sets GMID pricing structures for surface and subsurface drainage and the basis of future charges. GMW will work through the details with customers and stakeholders before proposed future pricing structures for the GMID are submitted to the ESC in 2023.

A wider application of the beneficiary pays principle is proposed for the GMID surface and subsurface drainage services, with costs spread where that can sensibly be done on the basis of benefit. A 'pure' beneficiary pays approach can be difficult to achieve in practice due to the challenge in balancing transaction costs, the variability of clearly defining beneficiaries and applying it to existing infrastructure that has legacy issues.

As part of Service Plan development, GMW will set out a strategic picture of the future GMID. The pricing structures needed for drainage can then be considered and how they may need to support and align with other corporate directions.

GMW customers have communicated their desire for drainage pricing to be simpler, easier to understand and broadly equitable. To achieve this may require fundamental change to some of the attributes of the current pricing structures.

The following are some of the issues that will need to be considered in achieving the balance of efficiency, simplicity and equity:

The GMID is first and foremost an irrigation scheme and significant infrastructure investment has been made to support irrigated agricultural production. GMID has a mix of intensive, opportunistic and inactive irrigation as well as non-irrigated land that moves around over time based on water availability, costs, markets and seasonal conditions. The GMID has an increasing proportion of smaller non-commercial properties.

Current surface drainage pricing structures do not consider the land use or potential land use at any particular time because it is considered to be an individual landholder decision on the types of crops they grow and whether they choose to irrigate or not in any year. It could be argued that the use/level of benefit of the drainage service is up to the customer, given the equal access to the infrastructure.

The more variable conditions mean that for periods of years the only service being provided by some GMW public groundwater pumps is insurance that pumping can be done when and if high watertables return.

In a drainage context, the GMID has very flat grades with prevailing gradients of 1 in 2,000-3,000. This means that where a property has a connection to a surface drain, then the total area of the property is generally capable of being drained, with relatively minor internal works using equipment that is now available compared with the past.

A case could be put that the current surface drainage tariffs do not adequately reflect the change in the distribution of benefits between irrigated and non-irrigated land within the GMID. The changed property and catchment conditions across the GMID means that there is now little difference in runoff per hectare between irrigated and non-irrigated lands. In 1990 there were 900 reuse schemes in the SIR. In 2020 there are now over 4,500 reuse schemes in the SIR. The irrigation induced component of runoff is now relatively small and drain flows are driven by excess rainfall runoff rather than irrigation as in the past. This suggests that all hectares are more or less equal and could possibly be treated uniformly regardless of irrigation status at any single point in time.

Current pricing structures may no longer add sufficient value to justify the business complexity involved. Simplifying the administrative structures of drainage could make GMID drainage services more adaptable and resilient. Consolidation and the sharing of risks could create more robust revenue bases, greater resilience to future shocks and simpler customer accounts. On the other hand, consolidation and simplification can potentially increase cross subsidisation and reduce equity. There are challenges in applying cost sharing principles and change will require balance in what is fair and reasonable.

Hybrid-DCD schemes are expected to be the predominate approach in future to extend surface drainage in the GMID. The service performance of a DCD is appreciably lower than a constructed GMW drain and will have higher levels of locational and seasonal variability. How the new lower cost hybrid- DCD schemes are going to be financially administered and how properties within DCD catchments are going to be rated needs to be worked through. The O&M cost of DCD schemes is comparatively low and with a projected GMID length of 200-400 km in total, the revenue base may be too small to be a financially viable stand-along service.

There is a legacy issue of different landowner capital contributions to GMW surface drain construction and how to equitably deal with this could arise when considering pricing structures. The construction of primary surface drains has been funded 100% by Government while CSD construction has been funded 50% by Government and 50% by landowners.

How salt disposal costs are funded may need to be reviewed to assess the most appropriate approach for the future.

Changes to the way costs are shared can have implications for different GMID customers. The more significant the changes the greater the potential impacts on customers. The result may be reduced charges for some customers and increases for others. In the Drainage Service Plan development phase, GMW will financially model what the impact of potential changes would look like. For some customers a transition path may have to be offered as part of the implementation of a change.

The *Water Act* provides GMW with the authority to construct and maintain drainage works and recover annual O&M costs. In some cases, properties outside the boundaries of the GMID may receive a degree of benefit from GMW drainage works, but as these properties are not within the District they cannot be rated.

STRATEGY DIRECTIONS

10	**No change is proposed to the current cost share basis between GMW customers and State and Local Governments.**
11	**A review of the pricing approaches GMW applies to its drainage services is required to reflect future needs.**
12	**The details around GMW's future pricing structures for the suite of GMID surface and subsurface drainage services is to be worked through with customers and stakeholders as part of GMW's Drainage Service Plan development process.**

4.7 Agency Coordination Group

KEY POINTS

- **Drainage management across the GMID involves multiple agencies and has multiple objectives.**
- **High level coordination of drainage management activities is needed to achieve alignment.**

Engagement with regional stakeholders will be important to the Strategy's success, ensuring that the Strategy reflects the demands for drainage services and the value placed on drainage across the GMID. Because of the diverse nature of drainage management across the GMID and the need for greater alignment, the Agency Partners have identified the benefit of having a single body to coordinate overall implementation and provide ongoing high-level oversight of the Strategy.

An Agency Coordination Group with membership from Goulburn Broken CMA, North Central CMA, GMW, AgVic and DELWP is to be established. The Agency Coordination Group will meet regularly during the initial Strategy implementation phase and then an annual 'check-in' to provide high level oversight of the Strategy.

The Agency Coordination Group will focus on implementing the priority and foundational Strategy proposals first than then build out to pick up the other proposals.

STRATEGY DIRECTIONS

13 **An Agency Coordination Group with representatives from Goulburn Broken CMA, North Central CMA, GMW, AgVic and DELWP is established to coordinate overall implementation and provide ongoing high-level oversight of the Strategy.**

4.8 Cyclic Review and Adaptation

KEY POINTS

- **Unanticipated changes that impact GMID drainage are highly likely to occur and adaptive management responses will be needed in future.**
- **Catchment partners need to work together to monitor and review the Strategy.**
- **The Strategy has taken a medium term outlook and will use a rolling 4-5 year review cycle to pick up and respond to changes.**
- **Cyclic review process will be a key adaptation mechanism that will also strength collaboration between GMW, CMAs and Local Government on drainage issues.**

In the increasingly dynamic world facing the GMID, the conditions, environment and assumptions on which this Strategy is based on will not remain forever constant or stable.

Many of the challenges that surface and subsurface drainage will face across the GMID in future are seen as being gradual and cumulative. It is also recognised that the real world will intervene and not everything in this Strategy will work as envisaged. Set and forget for an extended period is not seen as being an effective approach going forward. Unanticipated changes will occur, and the application of resilience principles requires adaptation when necessary.

Reviews of this Strategy will be undertaken on a regular basis to be sure that changes are picked up and responded to when needed and the Strategy will not be subject to major unsettling resets in the future.

A structured two-step 'review and adapt' process undertaken on a 4-5 year cycle is considered to strike the right balance in terms of monitoring the Strategy to take stock of changes.

Many of the changes that the GMID is undergoing that are impacting on drainage are incremental and it is considered that it will take a number of years to pick up underlying trends and separate them from the year to year variability. The two-step process would involve an initial 'light' review at a very practical level. This would decide whether a more extensive review of the Strategy was needed.

The 4-5 year review cycle would allow outcomes to be aligned with GMW pricing submission cycles where service or cost changes were proposed.

The current knowledge of climate-based watertable responses in the SIR would indicate that the rate of change to threat levels and consequential changes required to GMW public groundwater pump operations could be picked up and acted on if necessary with a 4-5 year review cycle.

The detail around the review process will be developed in collaboration with catchment partners. This will be done at the start of the Strategy implementation phase and include the identification of key indicators to monitor the catchment management and drainage business outcomes being sought from drainage. Reporting to the community on review outcomes will be through the established avenues within the CMAs and GMW.

These shared outcome focused indicators and the data needed to support the cyclic review process may be very different to what is currently being monitored. This will assist in maintaining agency knowledge of the risks and drainage networks across the GMID.

It is considered important that the collective partnership has evaluation capacity so data can be analysed and informed decisions can be made on changes where needed. As part of the cyclic review process updated information will be shared about areas seen to be at risk so landowners can make informed decisions about the future surface and subsurface risks and responses.

This may also mean that the 2010 Irrigation and Drainage Memorandum of Understanding (IDMoU) for the Goulburn Murray Water Irrigation Areas needs to be updated and better aligned with this Strategy.

With less emphasis in future on construction of new drainage systems, the focus is on the efficient and effective operation and management of existing drainage services.

STRATEGY DIRECTIONS

14	**The Agency Coordination Group is to respond to issues that require adjustments to strategy directions as they arise.**
15	**A two-step 'review and adapt' process to be undertaken on a 4-5 year cycle to monitor the Strategy and take stock of changes.**
16	**The detail around the Agency Coordination Group oversight and the cyclic review process is to be developed in collaboration with catchment partners as part of the Strategy implementation phase and include identifying shared outcome-focused indicators and reporting arrangements.**

4.9

GMW Drainage Service Standards

KEY POINTS

- **Existing service standard for GMW surface drains is no longer considered to be meaningful.**
- **New service standards are needed that can be adequately defined and measured in future.**
- **The service standards feed into the value proposition, consideration of cost-risk trade-offs and the development of performance targets.**
- **Performance monitoring and assessment are fundamental to resilience.**
- **Changes in climate, land use and groundwater levels have made the past standards of service and performance measures of GMW public groundwater pumps no longer relevant.**

Surface Drainage

It can at times be difficult for GMW customers to understand what the level of service provided by GMW surface drains actually is now, particularly for larger rainfall events (>100 mm). This is understandable given the changing catchment conditions and it goes to the heart of what is the value proposition of drainage and the willingness to pay for a service that is not well defined.

GMW's Customer Service Charter sets out the standard of services and performance measures that customers can reasonably expect to receive. The service standard in GMW's 2020 Customer Charter is 98% availability of surface drainage. Because of the issues around how this service standard is expressed in practice, no systematic monitoring is being performed to determine if it is being met across the whole of the GMW drainage network.

During the consultation on GMW's 2020 water price review, customers said that they wanted surface drains available all of the time, other than during scheduled replacement and maintenance activities. They also said that they use the water removal period as their main measure of surface drain performance, particularly after larger rainfall events.

The design capacity of the majority of GMW surface drains is based on assumptions around removing the runoff from a property produced by a specific summer rainfall event on an irrigated catchment within a five day period. Property, farm layout and catchment changes have meant that this surface drain design rainfall event (50 mm in 24 hours) now produces little or no drain inflows during the summer period when the catchments are dry. Drain flows are now dominated by larger rainfall events.

It is considered that the current service standard is really no longer meaningful given the catchment conditions on which it is based have greatly changed. Rainfall on its own is less of a predictor given the changed conditions. A new service standard is needed that can be adequately defined and measured to determine if standards are being met. This would identify service issues and the need for corrective action. Monitoring, assessment and adaptation are fundamental to resilience.

In the past the service intent of the GMW's surface drainage network was to remove the irrigation induced rainfall runoff. In future the service intent may be the removal of excess water in the landscape.

The intended service performance of a surface drain can be defined around a number of variables. This may be based on a specific rainfall event, time of year and removal period. GMW surface drains will provide a lesser level of service for increasingly larger rainfall events with water taking longer periods to be drained. The challenge is dealing with real world ambiguities around how it is defined, catchment variabilities and the level of control GMW has.

What water removal period will give reasonable protection against damage from inundation and waterlogging in future? Is five days still the right target removal period? Should the future focus be on larger less frequent rainfall events?

Within the physical constraints of the existing drainage systems the aim would be to define a more meaningful rainfall event and catchment conditions and then derive a new target removal period. With the exemption of horticulture, the risk of losses from summer rainfall may not be as great now as the catchments are drier, the crops are different and the area of summer active irrigation is much lower. Spring conditions with wetter catchments may be the higher risk period in future, particularly with more long-season annual crops, and an applicable basis to define service performance for both irrigated and non-irrigated land.

Subsurface Drainage

The level of service for GMW public pumps was based on analysis of changes in groundwater pressure levels in the vicinity of pumps or a cluster of pumps. There were different service standards based on land use, amount of groundwater level drawdown and duration. Determining if service standards were met could be a lengthy technical process.

The levels of service for GMW public groundwater pumps were established in the context of ongoing high watertables and changes in climate, land use and groundwater levels have resulted in GMW public pumps not needing to operate for prolonged periods of time.

It is considered that the adaptive management approach for GMW public groundwater pumps now being implemented and the integrated nature of the private and public pump network in the SIR means that past standards of service and performance measures specific to GMW public groundwater pumps that differentiate on the basis of horticulture and pasture protection are no longer relevant. Consequently, GMW's 2020 Customer Charter does not explicitly state the standard of service that applies to public groundwater pumps.

It is considered that the performance of salinity control measures and how effectively they are integrated together is more meaningfully assessed at the level of the SIR Land and Water Management Plan (SIRLWMP). This is being done comprehensively through established Goulburn Broken CMA review and reporting processes.

STRATEGY DIRECTIONS

17	**The development of more definitive measures of the level of service that customers can reasonable expect to receieve from GMW surface drains in future are needed.**
18	**Separately identified service standards for GMW public groundwater pumps are not meaningful. Regional salinity control performance needs to be assessed at the overall Shepparton Irrigation Region Land and Water Management Plan level.**
19	**Deriving a new standard of services and performance measures is to be undertaken by GMW in consultation with its customers as part of GMW's Drainage Service Plan development process.**

4.10
Local Government Role

KEY POINTS

- **There is an extensive drainage network across the GMID and it has a diverse mix of ownership.**
- **More integrated management of the drainage network would achieve the greatest benefit.**
- **There are areas of the GMID served by Local Government drains.**
- **Drainage issues vary across the six Local Government areas that cover the GMID.**
- **Need to start conversations with Local Government on irrigation drainage management.**

The GMID covers six Local Government areas; Campaspe, Gannawarra, Greater Shepparton, Loddon, Moira and Swan Hill. There are areas of the GMID served by Local Government drains that outfall to GMW drains or natural waterways. There is however, not a clear overall picture of these Local Government drains because of their formal and informal nature.

Indicatively, the length of Local Government drains across the GMID is estimated to be less than 50 km in total. The total area drained is not known. Some Local Government drains are CSDs constructed under the Local Government Act and are community managed.

Other drains have been constructed informally in the past and they have no formal management arrangements.

Local Government in the SIR contribute to the operation and maintenance costs of public drainage works installed after 1990 under the Shepparton Irrigation Region Land and Water Salinity Management Plan.

There are locations across the GMID where landowners discharge excess surface water to roadside table drains. This may have been accepted by some Councils in the past, but it is increasingly becoming an unacceptable practice because of the potential road damage, safety risks and public liability issues.

There is an extensive surface drainage network across the GMID which includes GMW, CMA, Local Government and privately constructed drains, as well as natural drainage courses. Given this diverse mix of GMID drain ownership, the challenge is how to bring the overall drainage network together in an integrated manner to achieve the highest economic, environmental and social benefit.

It is considered that this needs to start with drain owners gaining a greater appreciation of each other's positions and the issues they are facing. Budget constraints are a fact of life for all GMID drain owners.

The GMID covers a large region and the drainage issues vary across Local Government areas. Each Council has its own urban discharge, peri-urban and rural drainage issues.

A range of questions need to be addressed with Councils. What is happening on the ground with Council drains? How do Councils view their roadside table drains? What value do Councils places on GMW drainage services? What level of drainage do Council's think they will need in future to protect their road infrastructure? What asset and catchment data do Councils have on their respective drains? What capabilities do Councils have to manage drainage?

STRATEGY DIRECTIONS

20 **Engage with individual Councils across the GMID to better understand their respective positions on irrigation drainage management, their future roles in drainage and how that may be brought together in a more integrated manner to achieve the greatest benefit.**

4.11
Environmental Management

KEY POINTS

- **The management of GMID drainage systems needs to protect and enhance the environment.**
- **Surface drains offer opportunities to add ecological value based on their ability to move water across the landscape.**
- **Value adding environmental benefits will be decisions that drain owners will have to make based on the situation at the time.**
- **Opportunities will vary from catchment to catchment and year to year.**
- **Working with partners will make embedding multiple benefits more effective.**

Management of drainage systems needs to encompass the economic, the social and the environmental.

One of the guiding principles for development of the Strategy is sustainability, which incorporates the need for drainage systems to protect and enhance the environment. This involves two distinct aspects:

- Mitigating the negative impacts of irrigation on the environment.
- Enhancing the health of natural environmental assets and wetlands by managing water in landscape.

More recently constructed drains have been designed with a strong emphasis on protecting and enhancing environmental values. Hybrid-DCD schemes have approved management plans that incorporate an environment protection and enhancement component.

GMID drain owners are encouraged, as part of their ongoing drainage management, to consider and develop opportunities for existing drains to perform a wider range of functions based on their ability to move water across the landscape and to actively enhance the environmental benefits delivered from existing drainage systems (e.g. reinstating and rehabilitating wetlands).

Ecological opportunities such as corridors/connectivity through the landscape need to be explored by drain owners. This may involve removing water at some times and retaining water at other times.

Keeping drains dry as much as possible can minimise weed growth, lessen the spread of invasive weeds and reduce the need for weed spraying. Where drains have water in them for extended periods this can increase the need for weed spraying from 2 passes to 3-4 passes a year. Unlike channels, drains are located in the lowest point of the landscape and there are practical issues with getting water out. This will generally entail pumping or operational structures.

Drain owners should look at the opportunities to retro-fit or re-purpose existing drains to better protect the environment and cultural values. This could include enhancing waterways, wetland environments and wildlife habitats where possible.

This would need to be managed appropriately so not to overly compromise the main purpose and benefits of a drainage system.

It is expected that the opportunities available and environmental benefits that might be achieved will vary widely across the system and will require individual, site specific consideration. This would involve surveying drains to identify potential re-purposing opportunities and the development of programs and funding proposals.

Building in environmental benefits are decisions that drain owners need to consider based on individual situations, the lifecycle of drain planning, construction and management and the objectives at the time, such as the presence of specific environmental needs, requirement to have the drain ‘service ready’, legal liability risks, the necessity to undertake drain maintenance and renewal works, what is financially sustainable and the water quality impacts on the downstream environment and users.

Implementing contemporary arrangements for drainage involves actively looking for opportunities to improve the natural environment and cultural heritage values.

Before decommissioning or rationalising a drain that has been deemed as no longer required from an irrigated agriculture perspective, drain owners, in consultation with the CMA, should look at what opportunities exist to re-purpose the drain for environmental and ecological benefit. This could involve retaining water or moving water across an otherwise dry landscape.

STRATEGY DIRECTIONS

21 **Drain owners should identify opportunities for existing drains to perform environmental-ecological functions based on their ability at times to hold or move water across the landscape.**

4.12
Traditional Owner Engagement

KEY POINTS

- **Indigenous water values and interests need to be recognised and protected.**
- **Traditional Owner groups want to and should be partners in NRM matters.**
- **Drainage service providers should listen to and act in the interests of Traditional Owners.**
- **Engagement processes with Traditional Owners need to be flexible and adaptive.**

Drainage systems across the GMID need to be managed in environmentally and culturally sensitive ways.

Traditional Owners place a high value on their traditional lands and waters. The value of wetlands in supporting Aboriginal values that previously existed need to be recognised.

Victoria's Aboriginal cultural heritage is protected by the *Aboriginal Heritage Act 2006* and Drainage Service providers need to be aware of their statutory responsibilities under the Act and how to meet their obligations in a drainage context. For example, a cultural heritage management plan may be required for a specific location.

GMW guidelines for the design and construction of drainage works covers the environmental and cultural heritage requirements in some detail for new projects.

Greater engagement with Traditional Owner groups on the ongoing management of drainage systems has been identified as a gap that needs to be addressed.

Drainage service providers should actively seek opportunities early to work in partnership with Traditional Owners on drainage management activities and projects.

Particular attention needs to be paid to understanding the cultural values associated with waterways that could be impacted by drain works.

DELWP have produced a Traditional Owner and Aboriginal Community Engagement Framework that is designed to enable meaningful engagement with Traditional Owners by creating the necessary mechanisms, opportunities and protocols for participation and collaboration.

At the core of the Framework are eight principles of engagement, which drainage service providers should follow when engaging with Traditional Owners.

An example of engagement on the Guilfus Congupna DCD project is described in Box 6 (next page).

Drain owners should meet with Traditional Owner representatives to find out where their areas of interest are, what input they would like to have and how they want to be involved.

To support engagement with Traditional Owners in Victorian water resource management, DELWP have put together a publication titled *Traditional Owner Objectives and Outcomes: Compilation of Contributions to Victoria's Water Resource Plans*. Drain owners should refer to this document for guidance.

STRATEGY DIRECTIONS

22 **Drainage service providers will work in partnership with Traditional Owners in the planning and delivery of drainage management activities and projects.**

Box 6: Traditional Owners engagement in Guilfus Congupna DCD project

Traditional owner engagement in implementing a drainage project

- In early 2020, Goulburn Broken CMA, GMW and Yorta Yorta Nation Aboriginal Corporation (YYNAC) worked in partnership to ensure cultural values were identified in a declared drainage course (DCD) project in the Guilfus Congupna catchment, north of Shepparton
- Early and direct engagement with YYNAC enabled meaningful input and involvement in the development of this DCD project, long before any obstruction works occurred on the ground
- The project team and YYNAC undertook shared place-based site visits, which prioritised the importance of being present on Country
- These on Country visits were vital in aligning DCD project objectives with YYNAC priorities, in addition to identifying the presence of culturally significant sites
- A scar tree was identified during the visits and through the development of a voluntary Cultural Heritage Management Plan (CHMP), it was appropriately recognised and registered as an Aboriginal Place
- Ongoing engagement with YYNAC continued through the DCD obstruction removal works program, with a YYNAC site induction completed with all key project leads prior to the commencement of on-site works
- YYNAC and GMW actively worked together to ensure the scar tree site was protected during DCD works in accordance with the CHMP and followed a process that aligned with, and respected, YYNAC's role as a decision maker
- Ongoing engagement with YYNAC is continuing to occur to identify cultural values and opportunities in other upcoming drainage projects, such as the proposed Murray Valley West DCD.

4.13

GMW Drainage Asset Management Approach

KEY POINTS

- **The nature of GMW surface drainage networks allows scope for trade-offs between cost, service and risk.**
- **The ongoing rate of GMID change and the future uncertainties means that there are higher confidence levels around medium-term asset plans and lesser so for the longer term service and asset needs of drainage.**
- **Longer term asset management needs of drainage will ultimately track the future changes in irrigated land use across the GMID.**

Surface Drainage

GMW operates and maintains a network of surface drains across the GMID of differing standards, age and condition.

From the 1910s up until the present time, a total of 3,240 km of GMW surface drains (GMW primary and GMW CSD) have been built across the GMID. The current construction cost of the GMW drains is estimated to be in the order of $700 million. The O&M cost of the GMW drains is at this time $4 million per year. The metric of O&M as a percentage of construction cost is 0.6%.

The GMW surface drainage infrastructure primarily consists of below ground excavation, long-life concrete structures and a number of pump stations. With robust long life assets of this nature, trade-offs can be made within certain limits between cost, service and risk. Such assets can never-the-less fall into disrepair if neglected for an extended time.

Given the ongoing rate of change in irrigation and the future uncertainties, it is proposed that GMW adopt an asset management 'holding pattern' for its drainage infrastructure. This essentially involves reducing and deferring expenditure as long as possible while the physical, economic and policy changes play out across the GMID and the future catchment drainage needs and risks become clearer.

During this holding period, GMW would broadly not be looking to withdraw surface drainage from the modernised irrigation parts of the GMID and not looking at extending drainage into those parts of the GMID that have not been modernised.

GMID drain capital and operating expenditure is now at low levels. There is little new drain construction being undertaken and part from weed spraying, drain maintenance is now largely reactive.

Ultimately specific actions may be needed to deal with under-utilised drainage assets, but it is considered that these can reasonably wait until the end of the 'holding pattern' period.

Where there is strong customer support and it is economically viable to do so, it is proposed that the drainage network would generally be extended by using the new lower-cost hybrid-DCD based schemes.

The drainage focus will be where the modernisation investment has been made and irrigation has a future. Reinvestment decisions will be delayed as long as possible where it is doubtful if replacement of the existing drainage infrastructure will be necessary or justified in future. This will mean that in these areas, assets may only receive essential maintenance and renewals required for safety and continuity of service, based on asset condition and land use, until future drainage needs are clarified and agreed with the community.

It is expected that longer term drainage needs will track what is happening around irrigation. The thinking on drainage needs to be aligned with the strategic directions of the channel-by-channel approach. Future drainage expenditure can be more effectively targeted based on assessments of future demand for irrigation and the location and extent of intensive irrigation.

It is considered that this asset management 'holding pattern' approach can be applied within manageable service, risk and renewal backlog limits for the next decade, provided there is not a return to extended wet conditions. Wetter conditions and higher drain flows can accelerate deterioration rates and increase maintenance and repair needs. If there is an extended wet cycle, then the 'holding pattern' approach will have to be reassessed.

Repair and replacement of ageing fencing along GMW drains is a growing issue and it has sizable cost implications for the future. In the past the benefits of longitudinal fencing of drains were clear and fencing has been standard practice in the GMID for many years.

GMW should undertake detailed analysis to determine if the benefits of longitudinal fencing of drains still stack up given the widespread GMID land use changes, with reduction in dairy, destocking, change to dryland, unutilised lands and farm inactivity. GMW is exploring lower cost and no-fence options for the future. It may be more cost-effective to deal reactively to individual fencing issues when they arise and addressing them on a risk basis.

Subsurface Drainage

GMW subsurface drainage assets are concentrated in the SIR and primarily consist of a network of public groundwater pumps.

From the 1960s to the 2000s a total of 115 public groundwater pumps have been installed in the SIR. The current construction cost of these pumps is estimated to be in the order of $60 million.

In response to changing watertable behaviour and salinity threat, an adaptive risk-based approach to the management of the SIR public groundwater pumps is being implemented by GMW.

Details of this management approach are set out in Section 3.1.4 Public Groundwater Pump Adaptive Management.

STRATEGY DIRECTIONS

23	**Outside the modernised channel backbone, GMW should consider an asset management 'holding pattern' approach for the next decade. With this approach assets will only receive essential maintenance and renewals required for safety and continuity of service, based on asset condition and land use, until future drainage needs are clarified and agreed with the community.**
24	**Other drain owners should put in place asset management approaches appropriate to their future asset and service needs.**

4.14

GMW Surface Drain Rationalisation and Decommissioning

KEY POINTS

- **The GMID surface drainage network will continue to change and evolve over time.**
- **There are no large scale opportunities seen in the medium term to shutdown parts of the GMID surface drainage network.**
- **There are areas in the GMID that are served by drains but are either outside of the modernised irrigation footprint or the irrigation system has been decommissioned.**

Because the irrigation footprint continues to change it is not envisioned that there will be a final fixed GMID drainage network as such. Rather it will continue to change and evolve over time. Land use changes have left some drainage infrastructure currently under-utilised and it may or may not be required in future.

However, decision making processes are needed so that the drainage footprint better matches future needs, recognising both the private and public benefits of drainage.

GMW drain rationalisation is now being considered more closely during channel rationalisation planning. While opportunities continue to arise to rationalise drain inlets and farm crossings, no large scale opportunities are seen in the medium term to shutdown significant parts of the GMID surface drainage network. An exception of this could be the surface and subsurface drainage infrastructure in the Campaspe Irrigation District.

In the longer term, the retirement of irrigation land and the trend to larger farm sizes is expected to increase drain rationalisation potential.

GMW should look at placing stronger emphasis in future on a program approach to drain rationalisation and decommissioning aligned with its Channel-by-Channel project thinking.

Some under-utilised drains could be run to fail and then converted to a hybrid-DCD scheme in future.

There are areas in the GMID that are served by drains but are either outside of the modernised irrigation footprint or the irrigation system has been decommissioned. These areas are now largely non-irrigated and questions have been raised whether or not GMW should continue to provide a drainage service and if so at what level?

GMW should explore the potential to maintain in varied forms of readiness, mothball or decommission the drains in these areas. The costs of the drains are already sunk and there would be a decommissioning cost to backfill the excavated waterways and remove the structures and fencing. How this could be funded will need to be looked at.

The benefits of drainage are wider than individual properties and a decision-making process for customer groups and other stakeholders to work through the issues involved would need to be developed. In most cases this will not be an individual landowner decision, given Government funding of the drain construction was based on achieving both public and private benefits.

An option to consider may be re-purposing a decommissioned drain for environmental purposes by offering the land to a community group for revegetation with trees or native grasses. This would involve individual site specific considerations and GMW, or other drain owners, would need to talk to the CMA, Landcare or community groups to see if this could be a workable option.

Drain rationalisation and decommissioning proposals need to ensure that:

- Natural flow paths are reinstated and not impeded
- There is no increase in local or downstream flood risk
- Natural environmental benefits continue
- The land does not lead to the spread of weeds or vermin, or become a fire hazard
- Direct engagement occurs with affected landowners to confirm support of proposals

STRATEGY DIRECTIONS

25	**GMW to explore the potential to maintain surface drains in varied forms of readiness, mothball or decommission.**
26	**The details around rationalisation and decommissioning approaches need to be worked through with catchment partners and GMW customer groups as part of the Strategy implementation phase.**

4.15

Reduction of GMW Drainage Operating & Maintenance (O&M) Costs

KEY POINTS

- **GMID surface drains are increasingly dynamic systems with high locational and seasonal variability of O&M needs.**
- **Drainage risks and the value of farm production at risk are declining.**
- **Adopting an increased risk-based management approach and focusing on seasonal and catchment variability has the potential to reduce current surface drainage O&M costs.**
- **Potential surface drainage cost savings are considered to be moderate in magnitude without appreciably increasing service and customer dissatisfaction risks.**
- **With surface drainage systems the benefits and risks of cost reductions are not always shared equally.**

Surface Drainage

The maintenance of drainage systems is seen as an important issue by landowners across the GMID. A recurring message is that, on some drains, the level of maintenance is not seen as being adequate. This highlights maintenance levels being an issue that all drain owners need to look at.

Reducing O&M costs can be one way to improve value for money for surface drainage customers.

A review of GMW surface drainage expenditure has identified the potential to reduce costs by:

i. Adopting an increased risk-based management approach.
ii. Placing more focus and effort on driving out cost savings around seasonal and catchment variability.

Surface drains are dynamic systems with considerable locational and seasonal variability of O&M needs. Maintenance expenditure on surface drains largely follows an annual cycle. The largest O&M expenditure for both GMW primary and community surface drains is weed spraying followed by access track maintenance for spray vehicles. Then structure and fencing maintenance and drain flow, salinity and nutrient monitoring.

Variations in GMW's O&M expenditure are driven by external factors, primarily seasonal conditions which impact on weed growth, access maintenance, flow blockages and erosion repairs. Budgets are based on average conditions and under and over expenditures are to be expected depending on conditions. Surface drainage system pump stations increase O&M costs when they have to be operated.

The reduced base drain flows and the greater frequency of summer rainfall events has changed the prevalent weed species in drains from the more traditional water-based weeds such as umbrella sedge, cumbungi, nutgrass and in the east arrowhead to more soil based weeds in drains such as wild oats and wild millet. There are sections of surface drains where water-based weeds still dominate.

This change in weed species has made it necessary to carry out broadly two weed spray passes in most seasons. Some higher risk peri-urban and horticulture areas may have to be sprayed 3-4 times a year. The wild millet and oats stand tall and had the ability to reduce a surface drain's capacity in a subsequent rain event if left untreated.

Landholders are questioning weed control practices as drains dry up and the prevalent weed species in drains changes from water based to more soil based. Weed growth in drains is now much more variable across drainage systems and weed control measures have to be more targeted. This requires more active surveillance and assessment of the areas being irrigated and the weed growth in drains.

With the drying climate and the reducing GMID water use and irrigated area, the drainage risks and the value of farm production at risk are also declining.

It is considered that GMW adopting an increased risk-based management approach to the O&M of surface drains can reduce costs. Expenditure would be targeted more to the higher risk areas with the focus on known locations in the surface drainage network that are prone to having problems. This would involve the acceptance of more risk exposure to potential service disruptions, structure blockages and fencing deficiencies.

In making cost-risk trade-offs, there is a need to consider the magnitude of the risk, who bears the risk and the appetite for risk across all stakeholders, covering agriculture, infrastructure, environment and regulatory compliance risks.

In summer, only high intensity widespread rainfall events are now likely to cause major surface drainage issues. With the significant reduction in summer active irrigation area that has occurred, the risk of losses from summer storms may not be as great as in the past and the O&M regime could be adjusted. After a summer storm, if conditions turn hot and dry the weed growth can die back in a couple of weeks and the risk decision could be made not to re-spray. In spring and autumn when the catchments can be wetter, lower rainfall intensity events can cause issues at any time and this could be the high risk period to focus on. Risks to horticultural areas if drains do not perform effectively can be high all year round.

With drainage catchments, the benefits and risks of cost reductions are not always shared equally. It is proposed that the risks, different cost-risk balances and how far trade-offs can be moved without having an unacceptable service impact will be explored with all stakeholders to gauge the level of support for change. The benefits of surface drainage to high value public assets such as road infrastructure and environmental features need to be appropriately recognised.

There are seasonal and individual drain variations. Surface drain maintenance needs can be lower during dry conditions. Weed growth is very seasonal and can be at random isolated locations across the network. Some dry seasons may allow one weed spray of the whole system with the need for only follow up spot spraying.

From a review of the expenditure data, it is considered that the current GMW surface drain O&M spend across the GMID is more or less adequate for the current dry cycle conditions, but it is at the lower end of the range. The review did not identify any future issues that would necessitate a significant change to the current levels of drain maintenance.

No major emerging issues or new weed problems were identified and the expectation is that drain maintenance expenditure could remain at about current levels for an extended number of years. The extent of arrowhead in the Murray Valley area is a continuing problem and GMW's control costs are not coming down. There is no evidence that drains are being over-maintained.

Cost saving opportunities remain, but reductions have been made in recent years with decreases in maintenance budgets, cost-risk trade-off decisions and increasingly reactive maintenance approaches. In theory, cost-risk trade-offs sound clear-cut but in practice it is not always straightforward to clearly communicate the implications and risks to customers of the potential trade-offs involved.

Experience has also shown that GMW customers can discount the benefits of having surface drainage, particularly during drier periods, up until it rains. In areas with long established drainage it can also be difficult to change expectations around traditional drain maintenance and performance.

Poor maintenance can reduce the functionality of a surface drainage system over time. Uncorrected minor maintenance needs can grow into larger and more costly problems. Landholders can help reduce surface drain O&M costs by reporting issues. Localised drain inputs can produce small nuisance flows that lead to randomly located weed banks across drains that have to be found and treated.

There are no Australian standards, codes or guides for surface drain maintenance. The basic test of a surface drain is how well it is actually performing both in terms of removing water from properties and conveying water through the surface drainage network to the point of outfall.

An appraisal of surface drain performance indicates that most drains in the GMID could be categorised as providing a level of service somewhat less than optimum but still acceptable to most customers. Broadly, the potential to make year to year cost savings in the future is likely to be moderate in magnitude without appreciably increasing service and customer dissatisfaction risks.

An alternative cost reduction approach for surface drainage was considered that involved undertaking the minimum needed to meet regulatory responsibilities and self-correcting management that is reactive to short-medium term customer sentiment. This approach would mean that when customer priorities are towards reducing costs, then drainage expenditure is reduced. Conversely in wet years and when implications of reduced access to drainage materialises, drainage expenditure is increased.

However significant rainfall events can occur at any time of year and surface drains need to be service ready at all times. This type of cost reduction approach is not considered to be consistent with achieving the maximum benefits for customers and the broader community from the significant infrastructure investment that has been made.

'On' then 'off' again management of surface drains is difficult to apply in practice.

Subsurface Drainage

'On' then 'off' subsurface drainage through adaptive management is possible with the deactivating and reactivating of groundwater pumps.

The annual O&M cost of the GMW public groundwater pump network in the SIR was in the order of $1 million prior to the Millennium Drought of 2000 to 2010. The current annual O&M cost is $0.6 million.

With the public pump rationalisation and adaptive management approach being implemented by GMW, the cost of operating and managing the SIR public groundwater pumps is projected to further reduce to less than $0.4 million/year.

The main cost drivers in future are projected to be the active pumps, groundwater monitoring, risk analysis, adaptive management and salt disposal.

STRATEGY DIRECTIONS

27	**To reduce surface drainage O&M costs GMW to continue to develop risk-based management approaches and place more focus on driving costs down in response to seasonal and catchment variability across the GMID.**
28	**Different cost-risk balances and how far trade-offs can occur without having an unacceptable service impact will be explored with GMW customers and key stakeholders to gauge the level of support for change.**
29	**The inter-related drain service, cost and risk issues to be worked through with GMID customers and stakeholders as part of GMW's Drainage Service Plan development process.**

4.16

GMW Drainage Rating Exemptions

KEY POINTS

- **Some GMW drainage customers receive fee exemptions that were granted in the past that may no longer have merit as the drainage conditions and settings are now very different.**

Surface Drainage

In certain circumstances some GMW surface drainage customers currently receive exemptions from payment of the annual fees or from some component of the current tariffs. These exemptions were originally applied to encourage certain behaviours or installation of works to achieve catchment strategies of the time.

In other cases, exemptions have been applied due to difficulties in defining the level of service received or as a result of legal rulings made in the past. Some dryland customers do not pay drainage fees but receive a drainage benefit.

There are also some issues around fee approaches for the outfalling of urban stormwater and industry and wastewater plant discharges to GMW drains that may be in need of review and updating at this time.

Records indicate that the basis of some of the current GMW fee exemptions go back to the 1950s and 1960s. The current drainage conditions and settings across the GMID are now very different to what they were in the past and some of the fee exemptions that have been granted over time may no longer have merit.

It is proposed that GMW review all of the historical drainage fee exemptions and assess from first principles all GMID properties on the basis of whatever the adopted tariff structures are in future. Fee exemptions could continue where there is a compelling case while others may not. Where a property exemption is discontinued, transitional billing arrangements may need to be considered.

Subsurface Drainage

Due to the technical constraints in defining the area of benefit and the conservative approach taken to rating, many landholders in the vicinity of GMW public groundwater pumps receive benefits but are not charged. It has been projected that the landowners identified as directly benefiting from GMW public groundwater pumps could be underestimated by 30-50%. Some tile drainage customers receive a collector service but are not charged.

Although there is the provision for GMW to apply a municipal local benefit area annual fee on Local Government entities, GMW has not done so. Local Government does contribute to the operation and maintenance costs for works installed under the 1990 Shepparton Irrigation Region Land and Water Salinity Management Plan.

STRATEGY DIRECTIONS

30	**GMW to review the historic drainage fee exemptions and assess from first principles GMID properties against the future tariff structures to decide whether or not the exemptions should continue.**
31	**A review of the fee exemptions and the issues arising to be worked through with drainage customers as part of GMW's Drainage Service Plan development process.**

4.17

Pumping Excess Water into GMW Channels

KEY POINTS

- **Landholders pumping excess drainage water into GMW supply channels has been a long-standing practice in some areas of the GMID.**
- **The GMW channel network is now different to the past and pumping into channels brings with it costs and risks for GMW.**
- **It is considered an appropriate time to review the pumping of drainage water into GMW channels in light of the substantial changes that are occurring across the GMID.**

Landholders pumping excess drainage water into GMW supply channels has been a long standing practice in some areas of the GMID and it brings with it costs and risks for GMW. This practice goes back decades to when it was thought that most of the GMID would in time be served by constructed surface drains and pumping into GMW supply channels was seen as an interim measure for undrained areas pending construction of a surface drain.

Pumping excess drainage water into channels is subject to the landholder entering into an agreement with GMW and abiding by the agreement conditions. Customers must not discharge drainage water into a channel without prior consent on each occasion and can only pump during daylight hours. Water discharged into GMW channels must not be polluted with effluent, or other unauthorised chemical or fuel residues.

Under GMW's surface drainage rating structure, properties that receive a drainage service by pumping surplus stormwater into GMW channels can be rated and charged an annual fee.

Pumping into supply channels is a very different type of drainage service to a property serviced by a constructed GMW drain. Supply channels are not designed to be drains and their downstream capacity reduces, which is the opposite to surface drains. Pumping into channels requires GMW to actively manage pumpers to avoid overtopping the channel and flooding downstream landholders.

The channel network is now different to the past. Channel regulator gates are automated and during the winter period they are shut down. Following modernisation, there are less channel outfall points on the backbone network, water is left in channels over the non-operational period and there are significantly less staff present in the field to oversee pump discharges. GMW has to manage the downstream water quality impacts of the drainage water on domestic and stock supplies and the tighter regulatory requirements around town water supplies that offtake from the channel system. Pumping drainage water into channels may conflict with the requirements of the *Safe Drinking Water Act*. While landowners are able to pump water into channels in certain circumstances there may be other potentially better future drainage options such as implementing a hybrid-DCD based scheme.

It is considered that this is an appropriate time to review the pumping of drainage water into GMW channels in light of the substantial changes that are occurring across the GMID. The questions are, what level of future risk and cost is acceptable? Can it be managed differently? Are risks at some locations more manageable? What operating rules need to be in place and what is the level of summer/winter drainage service that these customers can reasonably expect to receive in future?

That service level will help define the degree of property benefit received and the appropriate fee for a property that pumps storm water into a GMW channel compared to a property directly served by a GMW constructed surface drain.

What drainage alternatives could be offered landholders in undrained areas to manage the risks themselves if pumping into GMW channels is not considered in some locations to be an acceptable long-term practice? Would farm reuse incentivised by extension and whole farm planning be a viable alternative?

STRATEGY DIRECTIONS

32	**GMW to review the future operating rules, costs, risks and opportunities of pumping drainage water into GMW channels across the GMID.**
33	**The review be undertaken as part of GMW's Drainage Service Plan development process.**

4.18

GMW Drainage Diversion

KEY POINTS

- **In the past drainage water diversion from GMW drains provided valuable environmental and water resource benefits.**
- **The benefits of drainage diversion have greatly diminished across the GMID.**
- **Base flows in many GMW drains are now nearly non-existent and flows are dominated by larger more irregular rainfall events.**
- **Large numbers of drainage diversion customers across the GMID have cancelled their diversion licences and it is an open question how many customers in future will want to access drain flows.**
- **Would a light-handed management regime for drainage diversion have merit in future?**

Drainage diversion, the pumping of water from GMW surface drains for irrigation, has been in place across the GMID for decades. It serves two purposes, to reduce the impacts of drainage water on downstream receiving waters and to allow customers to access drainage water for productive use.

Pumping from surface drains occurs via customer-funded works under certain conditions and the two main types are pumping during low flow conditions and pumping during high flow conditions following rain induced flows.

Drainage diversion customers must have an agreement with GMW and conditions are applied that include pump installation, volume of water available annually, GMW operational requirements if water sharing is required and the need to pay annual fees. The current drainage diversion tariff was reset in 2010.

For drainage diversion customers there are no defined levels of service as such and customers acknowledge that access, reliability of supply and water quality is not assured as water availability is dependent on unreliable water sources.

Drainage diversion was an important part of regional nutrient and salinity management strategies of the 1990s and was successful in reducing irrigation runoff induced nutrients discharging to rivers and streams. Drainage diversion now plays a much diminished part in catchment water quality strategies. Base flows in many GMW drains are now nearly non-existent and drain flows are dominated by larger irregular rainfall events.

Large numbers of customers have cancelled their drain diversion licences and the total number of diverters across the GMID has reduced significantly. This trend is continuing as water availability in the drains diminishes. There are still a number of active drain diverters and at times there can be issues after rain around sharing the small flows available in some drains.

Drain diversion is now a far more opportunistic resource driven by rainfall events rather that irrigation runoff and channel outfalls as in the past.

Recognising the reducing availability of water in drains and the increasingly opportunistic nature of the service, GMW is considering the merits of a light-handed management regime in future.

The questions are would this be a uniform approach across all GMID drain diverters or not? How would it apply to high and low flow diverters and GMW primary drains and GMW CSDs? Should there be a volumetric fee in future and on what basis should a site fee be set?

There are different types of drainage diversion agreements and different wordings of agreements developed in the past. Diversions from GMW primary drains and GMW CSDs are treated differently. Would a new simplified diversion agreement have merit?

Apart from short spikes in 2011 and 2016, surface drain flows across the GMID continue to decline. If this trend continues it is questionable how many customers would want to rely on drain flows as a source of water in future. Is drainage diversion seen by customers as an issue that needs to be addressed at this time? How much change effort is warranted given the reducing number of diverters?

STRATEGY DIRECTIONS

34	**If there is customer support GMW will assess the merits of alternative management approaches for GMID drainage diversion in future.**
35	**The details around alternative drain diversion regimes to be worked through in consultation with customers as part of GMW's Drainage Service Plan development process.**

4.19

Management of Private Groundwater Pumps in the Shepparton Irrigation Region

KEY POINTS

- **The past management of private groundwater pumps in the SIR was rigid, complicated and costly.**
- **A simpler, adaptive and lower cost management approach for private groundwater pumps is now in place that has been developed for a more variable and less predictable future.**

Shallow groundwater in the SIR is both a threat and a resource. Shallow private groundwater pumping for irrigation in the SIR provides important salinity control benefits and its management needs to strike the right balance between the enabling groundwater use and providing protection against high water tables.

A review identified that the management approach at the time to groundwater in the SIR was not a good fit for the future and was seen as overly rigid, complicated and costly. A more relevant, adaptive, and lower cost management approach for private groundwater pumps was needed.

In response, the 2015 SIR GMA local management plan was developed by GMW after two years of work with community representatives, customers and stakeholders, including DELWP, the Goulburn Broken CMA, the Murray-Darling Basin Authority (MDBA), the Murray Groundwater Group and the former National Water Commission.

The plan provides simpler groundwater licensing rules and more flexible management arrangements for shallow groundwater in the SIR GMA. Importantly the plan encourages shallow groundwater users to retain and use their groundwater licences, to help counter the threats of shallow saline groundwater in future.

Annually GMW considers the need for any amendments to the plan. If amendments are proposed that directly affect groundwater licences, GMW consults with users and key stakeholders on proposed changes.

STRATEGY DIRECTIONS

36 **Continue the current low intensity management of private groundwater pumps in the Shepparton Irrigation Region.**

4.20

Legacy Community Surface Drains (CSDs)

KEY POINTS

- **There are areas of the GMID served by CSDs managed by Local Government and Landowner groups.**
- **At present there is not a complete picture of what is actually happening on the ground with each of these CSDs.**
- **Given that 50% of CSD construction costs were funded by Government, a better understand of the status of these drains is needed.**

The community surface drain concept (CSD) was an outcome of Land and Water Management Plans developed in the early 1990s. During the 1990s CSDs in the GMID were constructed by either Local Government or Landowner groups (private). After 2000, most CSDs progressively came under GMW management as irrigation drainage was seen as its core function.

For a number of reasons, not all CSDs constructed in the 1990s were transferred to GMW management and there are still some areas of the GMID served by CSDs managed by Local Government and Landowner groups.

It is understood that there are some 8-10 Local Government CSDs across the GMID that fall into this category, with a total drain length of less than 50 km.

The Bullock Creek drainage network in the Loddon Valley Irrigation Area includes in total some 650 km of community surface drains that are owned and operated by community groups. It is understood that this total length is made up of between 50-60 individual community drains.

At present there is not a complete picture of what is actually happening on the ground with these Local Government and Landowner CSDs.

Is drain ownership clear? Are they all functioning as intended? What is their physical condition? Are there active community management arrangements in place? What is their long term outlook? Do they need assistance?

Given that 50% of CSD construction costs were funded by Government, it is considered appropriate as part of the Strategy to better understand what the current status of all Local Government and Landowner CSDs across the GMID is and what if any their operational issues are.

A scoping audit of the formal CSDs constructed under the Local Government Act or Water Act by Councils and Landowner groups is proposed to establish their current status. The Coordination Group will address the implementation priority and resourcing of the audit.

It is not proposed at this initial stage to include the informal Local Government and Landowner drains that have been constructed across the GMID over many years. The Co-ordination Group will consider the future need for this information and how it could be best obtained. Many of these informal drains serve individual properties, are not mapped and there is little or no information held on them.

STRATEGY DIRECTIONS

37 **Undertake a scoping audit of all formal CSDs across the GMID that are managed by Local Government or Landowner groups in order to better understand their current status and future direction.**

4.21

Drainage and Salinity Information

KEY POINTS

- **The GMID is undergoing significant landuse and catchment changes.**
- **Extensive information is available on the region's drainage and salinity issues.**
- **Access to the most current and relevant information on irrigation drainage is important.**

The Strategy is strongly linked to the Victorian Government's Sustainable Irrigation Program (SIP) and the Victorian Irrigation Drainage Program (VIDP). Under these programs extensive information has been available over many years about GMID drainage and salinity issues and how they are managed. The Goulburn Broken CMA, North Central CMA, GMW and AgVic provide information and extension services and undertake direct engagement on irrigation drainage and salinity risks.

The GMID is going through a period of significant change and some landowner and community members have expressed that they are unsure how to access the most current and relevant information so they can understand current risks and changes to irrigation drainage, as well as better understanding environmental and Aboriginal cultural issues relevant to irrigation drainage management.

This information is needed so landowners, community members and other stakeholders can continue to build knowledge about drainage and salinity issues and changes, and in a position to make more informed decisions.

The importance of providing information in a way that meets the needs of all interested parties is recognised and the Agency Coordination Group is to have a 'watching brief' over irrigation drainage information needs and to identify and respond to information gaps that emerge.

STRATEGY DIRECTIONS

38 **The Agency Coordination Group will assess the need for targeted landowner and community information on irrigation drainage and work together on ways to share the most current and relevant information through its catchment partner networks.**

SECTION 5

STRATEGY DIRECTIONS IN SUMMARY

The GMID Drainage Management Strategy is seen as an important step forward in the contemporary management of drainage and how that could be implemented across the GMID in future by all of the regional partners working together.

Views on drainage in the GMID have been observed to change with seasonal conditions. In drier conditions drainage can be seen as less important and with the onset of wetter conditions drainage is given greater priority. How the value of surface drainage is seen will also depend to some degree on where a property is located in the irrigated landscape.

There is a diversity of views on irrigation drainage. This is not surprising as the GMID is diverse and so the drainage risks and needs across the GMID are also diverse. There are multiple objectives of drainage and having a single approach is no longer enough. In response to this, the Strategy has put forward a suite of different approaches to managing drainage and salinity in the future.

It is important to note that, given GMW is a significant drainage service provider in the GMID, much of the Strategy and the strategy directions developed relate directly to the future of GMW's drainage services to its customers. GMW aims to build on key Strategy outcomes and in consultation with its customers, develop a Drainage Service Plan. This process is to occur during 2021 and 2022.

Strategy Directions

NEW SURFACE DRAINS

For details see Section 4.1

1. No new conventional drains (e.g. primary drains) will be constructed unless there is a compelling business case to do so.

2. GMW, CMAs, Local Government and DELWP will work together to seek funding to extend the GMID drainage network subject to the following conditions:
   - Irrigation in the area is considered to have a long-term future, there is a high level of landowner support and the business case is sound; and
   - Lower cost hybrid DCD-based schemes will be the general approach used in the future for new surface drainage across the GMID.

3. The transfer of existing drains to GMW ownership will be subject to the same pre-conditions as a new drain.

NORTH CENTRAL CMA BULLOCK CREEK DRAINAGE NETWORK

For details see Section 4.2

4. The renewal of the North Central CMA Loddon Murray Irrigation Region (LMIR) Surface Water Management Strategy (SWMS) 2022, to provide guidance that supports the ongoing sustainable management and maintenance of the Bullock Creek drainage network in the Loddon Valley Irrigation Area.

DIFFERING LEVELS OF GMW DRAIN SERVICE

For details see Section 4.3

5. A low intensity drain maintenance regime could potentially be an option that some GMW customers would consider depending on the attractiveness of the service-cost-risk trade-off.

6. If there is sufficient customer interest in a lesser level of drainage service at a lower cost, the details around this option is proposed to be worked through with customer groups as part of GMW's Drainage Service Plan development process.

VALUE PROPOSITION OF GMW DRAINAGE SERVICES

For details see Section 4.4

7 There needs to be clear statements of the value proposition for future GMW drainage services relevant to each identified beneficiary group, including the environment.

8 That drainage service value propositions need to be included as part of GMW's Drainage Service Plan development process.

PUBLIC GROUNDWATER PUMP ADAPTIVE MANAGEMENT

For details see Section 4.5

9 Maximise private groundwater pumping and continue the implementation of the adaptive management of GMW public groundwater pumps in the Shepparton Irrigation Region in response to changes in groundwater levels.

GMW PRICING STRUCTURES

For details see Section 4.6

10 No change is proposed to the current cost share basis between GMW customers and State and Local Governments.

11 A review of the pricing approaches GMW applies to its drainage services is required to reflect future needs.

12 The details around GMW's future pricing structures for the suite of GMID surface and subsurface drainage services is to be worked through with customers and stakeholders as part of GMW's Drainage Service Plan development process.

STRATEGY COORDINATION GROUP

For details see Section 4.7

13 An Agency Coordination Group with representatives from Goulburn Broken CMA, North Central CMA, GMW, AgVic and DELWP is established to coordinate overall implementation and provide ongoing high-level oversight of the Strategy.

CYCLIC REVIEW AND ADAPTATION

For details see Section 4.8

14 The Agency Coordination Group is to respond to issues that require adjustments to strategy directions as they arise.

15 A two-step 'review and adapt' process to be undertaken on a 4-5 year cycle to monitor the Strategy and take stock of changes.

16 The detail around the Agency Coordination Group oversight and the cyclic review process is to be developed in collaboration with catchment partners as part of the Strategy implementation phase and include identifying shared outcome-focused indicators and reporting arrangements.

GMW DRAINAGE SERVICE STANDARDS

For details see Section 4.9

17 The development of more definitive measures of the level of service that customers can reasonably expect to receive from GMW surface drains in the future are needed.

18 Separately identified service standards for GMW public groundwater pumps are not meaningful. Regional salinity control performance needs to be assessed at the overall Shepparton Irrigation Region Land and Water Management Plan level.

19 Deriving a new standard of services and performance measures is to be undertaken by GMW in consultation with its customers as part of GMW's Drainage Service Plan development process.

LOCAL GOVERNMENT ROLE

For details see Section 4.10

20 Engage with individual Councils across the GMID to better understand their respective positions on irrigation drainage management, their future roles in drainage and how that may be brought together in a more integrated manner to achieve the greatest benefit.

ENVIRONMENTAL MANAGEMENT

For details see Section 4.11

21 Drain owners should identify opportunities for existing drains to perform environmental-ecological functions based on their ability at times to hold or move water across the landscape.

TRADITIONAL OWNER COLLABORATION

For details see Section 4.12

22 Drainage service providers will work in partnership with Traditional Owners in the planning and delivery of drainage management activities and projects.

GMW DRAINAGE ASSET MANAGEMENT APPROACH

For details see Section 4.13

23 Outside the modernised channel backbone, GMW should consider an asset management 'holding pattern' approach for the next decade. With this approach assets will only receive essential maintenance and renewals required for safety and continuity of service, based on asset condition and land use, until future drainage needs are clarified and agreed with the community.

24 Other drain owners should put in place asset management approaches appropriate to their future asset and service needs.

GMW SURFACE DRAIN RATIONALISATION AND DECOMMISSIONING

For details see Section 4.14

25 GMW to explore the potential to maintain surface drains in varied forms of readiness, mothball or decommission.

26 The details around drain rationalisation and decommissioning approaches need to be worked through with catchment partners and GMW cutomer groups as part of the Strategy implementation phase.

REDUCTION OF GMW DRAINAGE OPERATING & MAINTENANCE (O&M) COSTS

For details see Section 4.15

27 To reduce surface drainage O&M costs GMW continue to develop risk-based management approaches and place more focus on driving costs down in response to seasonal and catchment variability across the GMID.

28 Different cost-risk balances and how far trade-offs can occur without having an unacceptable service impact will be explored with GMW customers and key stakeholders to gauge the level of support for change.

29 The inter-related drain service, cost and risk issues to be worked through with GMID customers and stakeholders as part of GMW's Drainage Service Plan development process.

GMW DRAINAGE RATING EXEMPTIONS

For details see Section 4.16

30 GMW to review the historic drainage fee exemptions and assess from first principles GMID properties against the future tariff structures to decide whether or not the exemptions should continue.

31 A review of the fee exemptions and the issues arising to be worked through with drainage customers as part of GMW's Drainage Service Plan development process.

PUMPING EXCESS WATER INTO GMW CHANNELS

For details see Section 4.17

32 GMW to review the future operating rules, costs, risks and opportunities of pumping drainage water into GMW channels across the GMID.

33 The review to be undertaken as part of GMW's Drainage Service Plan development process.

GMW DRAINAGE DIVERSION

For details see Section 4.18

34 If there is customer support GMW will assess the merits of alternative management approaches for GMID drainage diversion in future.

35 The details around alternative drain diversion regimes to be worked through in consultation with customers as part of GMW's Drainage Service Plan development process.

MANAGEMENT OF PRIVATE GROUNDWATER PUMPS IN THE SHEPPARTON IRRIGATION REGION

For details see Section 4.19

36 Continue the low intensity management of private groundwater pumps in the Shepparton Irrigation Region.

LEGACY COMMUNITY SURFACE DRAINS (CSDs)

For details see Section 4.20

37 Undertake a scoping audit of all formal CSDs across the GMID that are managed by Local Government or Landowner groups in order to better understand their current status and future direction.

DRAINAGE AND SALINITY INFORMATION

For details see Section 4.21

38 The Agency Coordination Group will assess the need for targeted landowner and community information on irrigation drainage and work together on ways to share the most current and relevant information through its catchment partner networks.

Set out in Appendix 1 is a list of proposed drainage projects that are examples of the type of works that align with new strategy directions. These are all regionally supported projects that could proceed with funding.

APPENDIX

APPENDIX 1

Proposed GMID drainage projects that align with strategy directions

Project type	Status (as at mid-2021)	Next steps	Estimated investment
North Central CMA and community drains			
Collaboration with Traditional Owners to identify drainage management opportunities including restoring water connectivity across the landscape	Aligned with State-wide strategies, Regional Catchment Strategies and LCIR Land and Water Management Plan	1. Use existing knowledge of drain network, engage with Traditional Owners to determine priority areas/assets/ e.g. Song lines (if willing to share), environmental assets, e.g. Water bird habitat, culturally important plants, etc. 2. Prioritise systems and look to identify improvements in drainage system to achieve outcomes.	$300k
North Central CMA and community drains			
Investigation and community engagement to develop options for sustainable management	Preliminary work done for Bullock Creek drainage scheme	1. Scope and prioritise drainage improvement work for issues such as blockages, slopes, and cultural heritage to improve drainage practices in the Loddon Valley and Torrumbarry Irrigation Areas. 2. Work closely with Goulburn-Murray Water to follow process and procedures to execute documentation required for improved management arrangements of community surface drains.	$800k ($350k EC5 funded)
Muckatah Drain 3 catchment			
DCD-based 'hybrid' drainage	Prioritised, scoped and initial survey completed. Flagged for future funding.	1. Review existing LiDAR to define on ground survey and progress initial model from LiDAR inundation plans. 2. Initial landowner engagement to gauge support and requirements. 3. Form landowner focus group to discuss project concept.	$800k
Cornella (northern extent) and Wanalta Creek catchments			
DCD-based 'hybrid' drainage	Prioritised and flagged for future funding, with opportunities to achieve broader environmental and cultural objectives across the Corop Lakes region	1. Review available LiDAR and undertake additional Lidar and ground survey. 2. Compile landowner focus group to review concept and catchment complexity. 3. Engage Traditional Owners, undertake cultural and environmental assessment and enhancement opportunities.	$2M

Project type	Status (as at mid-2021)	Next steps	Estimated investment
Mosquito catchment			
DCD-based 'hybrid' drainage	Assessed and prioritised for future funding	1. Early landowner engagement, focus group formation to seek catchment support and needs. 2. On-ground review of existing private community drains and key catchment focus areas. 3. LiDAR for undrained areas.	$1.5M
Wharparilla catchment			
DCD-based 'hybrid' drainage	Assessed and prioritised for future funding	1. Early landowner engagement, Focus Group formation to seek catchment support and needs. 2. On-ground review. 3. LiDAR for undrained areas.	$1.5M
Deakin Drain 5 catchment			
DCD-based 'hybrid' drainage – integration with existing primary drain system	Community need and support identified. Flagged for further investigation into feasibility	1. Early landowner engagement, Focus Group formation to seek catchment support and needs. 2. On-ground review. 3. LiDAR for undrained areas.	$1.5M
Muckatah catchment (previously identified CSDs never constructed)			
DCD-based 'hybrid' drainage	Community need and support identified. Flagged for further investigation into feasibility	1. Early landowner engagement, focus group formation to seek catchment support and needs. 2. On-ground review. 3. LiDAR for undrained areas.	$3M
Toolamba 4P CSD catchment			
DCD-based 'hybrid' drainage – integration with existing private CSD system	Community need and support identified. Flagged for further investigation into feasibility	1. Early landowner engagement, focus group formation to seek catchment support and needs as a pilot project for conversion of private CSD to DCD. 2. On-ground review and inspection with key landowners. 3. Engagement with Traditional Owners and environmental review of DCD proposal and opportunities.	$900k