Murrumbidgee Irrigation Automation Finalisation

Assessment against Socio-Economic Criteria as part of the Off-Farm Water Efficiency Program

September 2021

Murrumbidgee Irrigation

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Section 1: Overview

1.1. Project Summary

This project will complete the modernisation of the Murrumbidgee Irrigation (MI) Area. The finalisation of these works will achieve improved water delivery efficiencies and increased delivery performance that meets industry demands, enables regional agribusinesses to maximise their potential for sustainable production, invests in regional communities through local opportunities and delivers water for the environment. This will lead to a resilient community that is well-adapted and able to reside, and thrive, in a water-constrained future.

This project is comprised of 5 project categories that include a number of sub-projects. These project categories are:

- Automation of control structures (regulator/offtakes/escapes)
- Metered outlet replacement
- Metered outlet conversion from unmetered outlets
- Roaches surge reservoir
- Open channel refurbishment, piping and reconfiguration

These works will provide 7,390ML of water savings at a total cost of $124M, and will deliver 6,282ML of water entitlement for the environment.

1.2. Finalising the automation of Murrumbidgee Irrigation

Previous automation projects conducted under PIIOP have already led to improved quantity and quality of crop yield per unit of input and improved flexibility of farm systems, enabling greater frequency and reliability of crop yield.

Irrigation practices in the MIA are technically advanced and allow water to be applied more precisely, at higher flow rates and for shorter lengths of time to limit evaporation and seepage losses below the crop root zone and provide optimum growing conditions that increase crop yield. This in turn places higher demand on MI's supply network for greater flow rate and more precise water delivery. The proposed investment complements previous PIIOP funding rounds which has resulted in approximately 70% of MI's delivery network now modernised while also aligning with MI's objective to make every drop of water count.

This program will finalise the modernisation of the Murrumbidgee Irrigation Area through automation of control structures, metered outlet replacement and conversions, open channel refurbishment and piping, and a surge reservoir

Project planning is well advanced, and MI has begun delivering the program of works by self-funding $15M of automation. These works will be completed in September this year with procurement for the 2022 program to commence in November.

MI has also progressed the planning for the surge reservoir which has achieved design completion and MI has acquired lands associated with the proposal. Strategically located surge reservoirs in conjunction with the move to full automation allows MI to further improve its water delivery flexibility for its customers, who are requesting higher flow rates, the ability to start and close at short notice and 24-hour access to

these services. Storages act as a “capacitor” in these scenarios to ensure that these services can be achieved without impacting system performance.

1.3. About Murrumbidgee Irrigation

MI is one of the largest private irrigation companies in Australia, located within the Murray-Darling Basin in southern central NSW and serves over 3,093 landholdings that is owned by over 2,300 shareholder customers within an area of 378,911 hectares (Figure 1). The irrigation water and drainage services MI provide have helped create a diverse and highly productive agricultural region known as the Murrumbidgee Irrigation Area (MIA). The vibrant communities of the MIA offer a range of education, arts, entertainment, sports and recreational activities.

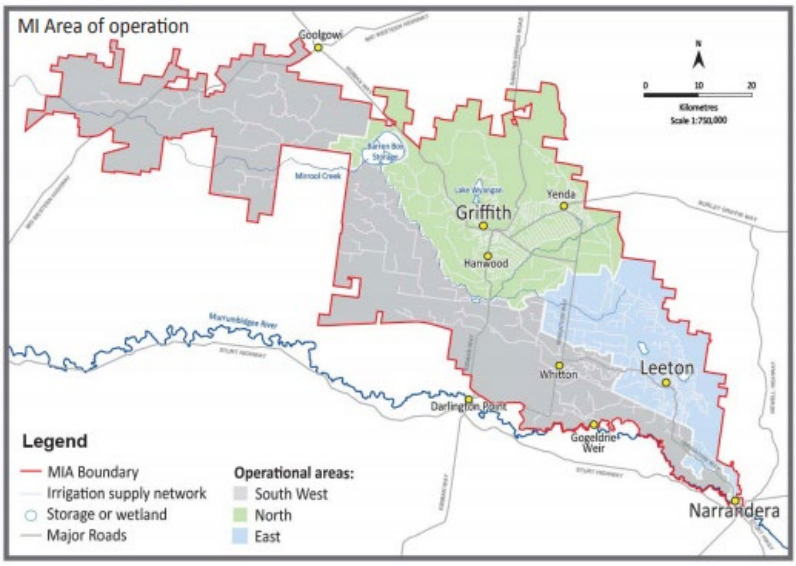


Figure 1: Murrumbidgee Irrigation Area

MI’s core business is delivery of water through an extensive integrated supply and drainage network. The MIA is one of the most diverse and productive regions in Australia, forming part of the Murrumbidgee Valley and covering an area of 378,911 hectares of which an average of 141,000 hectares is irrigated. The MIA is home to over 50,000 people with the majority of jobs tied inextricably to the water that MI supply to farms and industry.

Established in 1912 following the commissioning of Burrinjuck Dam in the Snowy Mountains, the MIA was conceived by the government of the day as a purpose-built scheme, designed to feed and provide employment opportunities for a growing nation. The original vision for the MIA is as important today as it was over 100 years ago. In 1999 the NSW Government relinquished ownership of the MIA (and Districts) and MI now operate as an unlisted public company (limited by shares), owned by the irrigators we supply.

1.4. Investing in the future

Automation of the MIA is being undertaken as a four-staged approach as detailed in Table 1. Stage 1 was completed in 2014 and Stage 2 was completed in 2020. Stage 3 is currently in progress and expected to be completed in September 2021.

Table 1: Automation Staged Approach

Automation Stage	Funding Program	Period	Manual Control	Partially Automated	Fully Automated
Stage 1	PIIOP 1	2010-2014	53%	40%	7%
Stage 2	PIIOP 2 & 3	2016-2019	18%	11%	71%
Stage 3	MI Funded	2020-2021	12%	8%	80%
Stage 4	Off-farm Efficiency	2021-2024	2%	2%	96%

Through the execution of Stages 1 and 2 of the automation projects, MI have learnt several lessons and developed their knowledge regarding automation. MI's acquired understanding of full automation has allowed revision of its position and adopted full automation as the preferred strategy for the whole of the network. Full Automation includes the automation of all water control infrastructure including regulators, escapes and outlets (meters).

The full automation of our system optimises our water delivery. It enables us to provide higher and more reliable system flow rates, improved system efficiency, reduced operating costs and greater customer flexibility which is now required to meet on farm irrigation modernisation and crop water demands.

Section 2: Project Description

2.1. Project outputs at a glance

360 regulators automated

1500 metered outlets modernised

5000ML surge reservoir constructed

20km open earthern channels and pipelines refurbished/replaced

2.2. Project Scope

The sub-projects are located in various parts of MIA, often in close proximity to PIIOP 1, PIIOP 2 and PIIOP 3 projects (see Appendix 1 & 2). Completion of the sub-projects will result in a fully integrated water delivery network**.**

This project is comprised of 5 project categories that include a number of sub-projects. These project categories are:

- Automation of control structures (regulator/offtakes/escapes)
- Metered outlet replacement
- Metered outlet conversion from unmetered outlets
- Roaches surge reservoir
- Open channel refurbishment, piping and reconfiguration

The outputs and outcomes of these project categories and sub-projects should be considered as a collective – that is, the bundle of works contribute to the automation finalisation – which is more than just the sum of the benefits of the individual sub-projects.

Whilst emphasis will be placed on whole-of-life-cycle costing and the accrued benefits, through a Triple Bottom Line options analysis process, MI maintains an open and consultative approach to identify, analyse, refine and select optimal value for money solutions to modernise water delivery infrastructure and secure improved water delivery efficiency.

Project planning is well advanced, and MI has begun delivering the program of works by self-funding $15M of automation that was included in the original project proposals. These works will be completed in September 2021 with procurement for the 2022 program expected to commence in November.

MI has also progressed the planning for the surge reservoir which has achieved design completion and MI has acquired lands associated with the proposal. Other milestones already achieved or in progress are the completion of the Environmental Impact Statement, Aboriginal Cultural Heritage Assessment Report, as well as the associated Aboriginal Heritage Impact Permit. It is expected that development approval is imminent, following months of consultation with the local community and local councils.

2.3. Project Category 1 – Automation of Control Structures

The remaining districts to be automated include the Leeton and Stoney Point areas, and the Griffith township. Additionally, areas that have lower levels of automation such as Yenda, the Northern Branch Canal (NBC), Hanwood, the Mirrool Creek Branch Canal (MCBC) system and Lake Wyangan require further works to achieve full automation (Table 2).

Table 2: Scope and schedule for regulators/offtakes/escapes

		Asset Quantities			Schedule
Precincts	**Areas covered**	**Regulators/Escapes**	**Offtakes**	**Total**	
1	Leeton & Stoney Point	166	38	204	2022
2	LVBC & Griffith	64	13	77	2023

3	Hanwood & MCBC	32	0	32	2023
4	Yenda & NBC	25	15	40	2022
5	Other	7	0	7	2023
	Total	294	66	360	

2.4. Project Category 2 – Automated Metered Outlets

These sub-projects will upgrade existing metered outlets with the new standard of Pattern Approved meters that meet the requirements of the Australian Standards 4747 for each of the 5 precincts identified below. This will include the automation of metered outlets with the capability to monitor flow remotely, self-adjust and to optimise channel flows and operations (Table 3).

As part of the process, customers will continually be consulted and provided the opportunity to reset their farming practices with the availability of higher flow outlets that cater for flow ranges from 2ML/d to 100ML/d. This allows customers to reduce the number of access points (metered outlets) and hence reduce ongoing fixed charges associated with each metered outlet. This also provides an ongoing benefit to all customers as the reduction in the number of outlets reduces the ongoing capital and maintenance costs for the network.

Table 3: Scope and schedule for automated metered outlets

		Asset Quantities	**Schedule**
Precincts	**Areas covered**	**Metered Outlets**	
1	Leeton & Stoney Point	225	2022
2	LVBC & Griffith	113	2023
3	Hanwood & MCBC	142	2023
4	Yenda & NBC	243	2022
5	Meter Only	60	2023
5	Other	1	2023
	Total	713	

2.5. Project Category 3 – Conversion of Unmetered Outlets to Metered Outlets

MI currently has approximately 1,000 unmetered outlets. These connections generally provide low flow water supply for stock, domestic and garden purposes. MI recently approved a policy to convert all unmetered outlets to be either low flow metered outlets with average flows of 2 ML/day, or garden licences that are unmetered connections restricted to a maximum connection pipe size of 50mm and

limited to 2-acre land sizes. This project category requires the upgrade and metering of all low flow outlets with a cost-effective metering solution (Table 4).

The impetus for moving this asset class to either the Garden Licence or a low flow metered and monitored outlet is as follows:

- A number of unmetered outlets have large offtake capacities (up to 3 - 5 ML/d). Water savings can be achieved by removing these, and it also allows connection charges and usage fees to be accurately calculated for billing purposes.
- Compliance levels and the performance of an automated channel system will be greatly improved with the removal of larger capacity and undocumented unmetered outlets from MI's area of operations.

Table 4: Scope and schedule for unmetered outlets

	Asset Quantities	Schedule
Areas covered	**Unmetered Outlets**	
All MIA	700	2021-2023

2.6. Project Category 4 – Roaches Surge Reservoir

Located within the MIA footprint, Roaches Reservoir is a strategically located 5,000ML surge reservoir that will provide greater flexibility to efficiently manage resource surplus and shortages to minimise excess being released from the storages and not utilised.

The Project has already achieved 80% design status and the Environmental Impact Statement (EIS) is complete and has been submitted for approval. Storage design parameters are detailed in Appendix 3. The scope includes the construction of a 5,000 ML surge reservoir that will:

- Further enhance internal operational efficiencies through the automation of the network;
- Enhance river operational efficiencies;
- Increase system capacity (surge) to meet customer needs during peak usage periods;
- Enable critical environmental watering objectives in the Murrumbidgee including restoring natural flow variability and sustain key watering events that will support other initiatives such as the Reconnecting River Country Program;
- Assist with flood mitigation;
- Provide greater water security particularly during maintenance periods; and
- Provide towns with greater water security.

The site of the proposed surge reservoir is located adjacent to MI's Main Canal and near a major regulating structure known as Roaches Regulator and is owned by MI (Appendix 2). This site is considered highly suitable for a surge reservoir as it:

- Allows command over much of the MI supply network due to its location near the start of MI's network;
- Creates the opportunity to leverage head difference at Roaches regulator for gravity inflow/outflow operation;
- Has flood mitigation potential;
- Is in close proximity to road access and electricity supply;

- Has clay soils which are suitable for bank construction and reduced seepage rates; and
- Has the land area available for the structure.
- Comprehensive detail for the design parameters is included in Appendix 3.

2.7. Project Category 5 – Open Channel Refurbishment, Piping and Reconfiguration

Open channel Refurbishment, Piping and Reconfiguration was identified as an opportunity for MI to achieve water savings as well as asset rehabilitation. General erosion, repeated desilting and removal of weeds over the past 80 years has widened the waterway, thereby creating additional water loss, water control, access and maintenance challenges. Table 5 details the proposed works.

Channels that have been identified for refurbishment and piping have typically widened by up to 50% and this leads to:

- Increase seepage due to a reduction in the bank width;
- Access difficulties due to loss of a traffic-way along the crest of the adjacent bank;
- Increased weed growth due to low flow velocities;
- Overbank losses due to a diminishing quantities of bank material; and
- Additional losses of water due to increased evaporation.

Reconstruction of the channels will allow for better water control, a reduction in seepage, evaporation, escape water and maintenance due to refurbishment of open channel and a reduction in WHS hazards. Channel refurbishment includes relining using both HDPE and clay lining methods.

Several channels have been identified for piping. Piping eliminates seepage and evaporation whilst also reducing maintenance and WHS issues associated with an open channel system which has contributed to a steady decrease in safety incidents and resulted in MI being Lost Time Injury (LTI) free for over 12 months. Several of the pipelines will replace existing failing pipelines. These laterals are old concrete pipelines that are reaching the end of their useful life and are continuing to develop leaks after major repairs. The water lost through these leaks, combined with the water losses associated with dewatering to undertake repairs, can be saved via pipeline replacement.

Channel reconfiguration is made achievable through the increase in outlet sizes that allows customers to reduce the number of assets required to service their landholdings and the reconfiguration of parts of the network. This can be achieved with zero reduction in serviceable land. Additionally, as smaller land parcels are amalgamated into larger farming enterprises, more tail end channel systems are servicing and dissecting these larger properties. These landholders are taking the opportunity to have larger outlets installed at the boundary of these properties which allows MI to hand over the existing infrastructure to the landholder. The landholders are then reconfiguring and utilising the existing channel system to divert water through their farms at higher flow rates with less fixed infrastructure.

Table 5: Scope and schedule for open channel refurbishment, piping and reconfiguration

		Asset Quantities	Schedule
Precincts	**Activity**	**(km's)**	
1	Channel Lining/Refurbishment	13	2022-23

2	Pipeline	9	2022-23
3	Reconfiguration	13	2022-23
4	Seepage Interception	10	2022-23
	Total	45	

Section 3: Socio-Economic Criteria

3.1. Preparing for the future

As part of MI's Automation Strategy, $348M has been invested over the past 5 years in upgrading and automating the irrigation infrastructure both off farm and on farm under the Private Irrigation Infrastructure Operators Program (PIIOP) Rounds 1, 2 & 3. The successful completion of these programs of work are continuing to support agricultural production, regional economies, and the environment by forming a fully integrated water supply network.

The Automation Strategy delivers improved customer service and improves the efficiency of the water delivery network. The strategy aims to:

- Accurately measure flow throughout the system, including water delivery to individual farm outlets,
- Increase the peak flow capacity of the network thereby providing additional opportunity to meet customer demand, improve on-farm irrigation efficiency and potentially expand the irrigation footprint,
- Reduce water losses from the system via escapes and meet program water savings targets,
- Reduce operational costs,
- Provide a safer workplace,
- Implement system redundancy,
- Build relationships with preferred suppliers to deliver enhanced service levels, competitive pricing and consistency across the asset portfolio, and
- Deliver cost-effective investment that maximises the lifespan of existing civil infrastructure wherever possible.

This investment has driven significant regional growth in the planting of citrus and nuts, development of new aquaculture industry and the development of large scale down stream processing. The benefits associated with these projects are incorporated in the final project reports and associated post project benefit studies commissioned by the Department of Agriculture, Water and the Environment.

This project will assist MI to deliver against the Basin Plan's key goal of balancing environmental goals with continuing to support farming and other industries for the benefit of the Australian community and to prepare local communities to thrive in a water-constrained future.

3.2. Benefits to industry

3.2.1. Building a sustainable irrigation future

Improved water delivery efficiency and increased delivery performance will enable MI to meet industry demands and enable regional agribusinesses to maximise their potential for sustainable production. A direct result of increased water use efficiency for irrigators is productivity gains and a cleaner and greener operation as growers are able to better target water use to the requirements of the plants, and to respond to climatic conditions. It has been shown that previous automation projects conducted under PIIOP have already led to improved quantity and quality of crop yield per unit of input and improved flexibility of farm systems enabling greater frequency and reliability of crop yield (Marsden Jacobs). This in turn supports regional and national goals, such as the Commonwealth goal for agriculture to be a $100 billion industry by 2030.

Better security of water supply for irrigated production and downstream processing also underpins greater domestic food security. As seen in 2020, low water allocations combined with strong consumer demand as a result of the pandemic, led to a perfect storm of low rice supplies and excess demand for a staple product. Many crops, such as rice, require water security in order for growers to invest in planting and this project will help to offer such security.

Irrigation in the Murray Darling Basin already makes a very considerable contribution, supporting 9,200 irrigated agriculture businesses producing $22 billion worth of food and fibre annually. The MIA supports a significant portion of this activity and has the potential to increase it through increased water efficiency and increased crop yields per ML of water. Greater confidence in the delivery of water as and when it is required to meet crop demands will underpin additional agricultural development which leads to increased economic activity and income in the region, better supporting regional communities.

Enhanced agricultural activity will also support downstream processing such as food manufacturing, rice milling, animal feed production, cotton ginning and nut processing. This is particularly important in the context of the Basin Plan where improved regional outcomes can mitigate some of the negative impacts of the Plan on irrigation reliant communities. The employment delivered through value adding, downstream processing and food and water related tourism are very important in building resilience through a diverse economic base. This diversity becomes even more evident in periods of drought.

Investments that result in increases in farm value added without altering intermediate inputs generate productivity improvements and result in net economic gains for the local economy, as demonstrated by a 4% p.a. ($22M) increase to MIA GDP and 75 extra jobs annually as a result of the modernisation of MI's delivery network through the PIIOP Rounds 1, 2 & 3. Annual long term average net increases in on-farm productivity are estimated to be in the order of $3.8 million per annum based on present day prices and yields. This includes gains to the rice, cereals and cotton industries of $2.8 million; and the citrus industry of $1.0 million (Marsden Jacobs).

A large proportion of these gains have been achieved by improved quality and quantity of crop yield per unit input resulting from greater access to higher flowrates and precise irrigation methods. It has been shown that under average climate conditions (based on the 2000-01 to 2017-18 period), there has been a marginal decrease in the application rate and an increase in the yield for rice and cotton in the Southern Connected Basin (ABARES).

Projects such as MI Automation Finalisation will support ongoing efforts of farmers to make every drop count and increase water productivity. The Project will leverage this investment to provide a further substantial increase to farm productivity of up to 4% by:

- Continuing the rollout of automation across the delivery network allowing more farmers to benefit from the investment;
- Further reducing ordering times to ensure that crops receive watering precisely when required; and
- Decreasing shut off notification by pushing excess water into the reservoir resulting in a reduction in crop water logging and significant increase in yield, and minimal in system water loss.

The project will create value for MI customers through:

- Significantly increasing customer service levels and system capacity through precise water control/delivery throughout the supply network;
- Improved river operations efficiency, internal irrigation network efficiency and on farm irrigation efficiency through Roaches Reservoir;
- Linking to on-farm efficiencies for higher overall irrigation efficiency from river to paddock;
- Providing accurate metering to ensure fair accounting of water extractions from the network;

- Increasing regional productivity through water use efficiency and supporting further agriculture development;
- Further enhancing delivery efficiency from the PIIOP funded automated network; and
- Increase grower confidence through meeting customer demand.

Increasingly, agribusinesses are realising the substantial benefits of on-demand water availability that provides moisture to crops precisely when its required. On-demand water is extremely difficult to support due to conveyance timeframes and MI is required to forecast usage in advance of receiving final orders. Any sudden spikes in customer demand often cause restrictions within MI's customer base due to insufficient water available from the river to meet this demand, resulting in lost yield, poor water efficiency on farm and a reduction in grower confidence. The benefits of an automated system and surge reservoir is that spikes in demand can be met with minimal delay with water held in the system.

Equally important to on-farm water efficiency and yield maximisation is the ability to cease irrigating precisely when the soil has optimum moisture content. To achieve this, customers require the capacity to shut down irrigation instantaneously. This becomes problematic and difficult to manage off-farm, particularly at high flows. Surge reservoirs provide a "buffer" for rejected flows that would otherwise spill within the delivery network, and a fully automated and integrated network allows the control to ensure that this level of service is achievable.

3.2.2. Secure Supply for Industry

Griffith's Gross Regional Product is estimated at $1.72 billion[1]. It is home to the Riverina's largest employer, the Baiada Group (poultry), over a dozen wineries including De Bortoli Wines, McWilliams Wines and Casella Family Brands (makers of Yellow Tail wine). It is said that one in four glasses of Australian wine is made in the Murrumbidgee Irrigation Area (MIA).

Leeton's Gross Regional Product is worth $527million[2] and is renowned as Australia's Rice Capital and The Heart of SunRice Country, as it is home to the SunRice headquarters. Other industries include food and beverage manufacturing such as Freedom Foods, the Daily Drinks Co., JBS Australia, Webster Limited (walnuts and cotton), as well as research and development centres of Tocal Agricultural Centre (DPI) and Yanco Agricultural College.

The following industries use large volumes of water throughout the year and are directly supplied by MI's canals.

- Feedlots/Abattoir – JBS at Yanco and Tabbita
- Wineries – 10 in Griffith and two in Leeton, the majority of which use town water supply.
- Baiada Chicken – Chicken Processing Plant, Hanwood.
- Associated hatcheries (eight) around the Griffith and Carrathool regions.
- Inland Fisheries – Murray Cod Hatcheries around Leeton (one) and Griffith (four).
- Local Juice Factories – Real Juice and Australian Juice
- Rice Mill at Leeton
- Cotton Gins
- Nut processing

[1] Source: Griffith City Council – Economic Profile

[2] Source: Leeton Shire Council – Economic Development Strategic Plan

The surge reservoir will improve security of the supply of water to these industries and protect employment within MIA during times of drought.

3.2.3. Matching Water Releases with Water Usage

Water for the MIA is supplied by Burrinjuck and Blowering Dams in the upper Murrumbidgee catchment and is conveyed to the area by the Murrumbidgee River. MI faces major constraints with the current supply system primarily due to excessive travel time (7 days) along the river from the storages to the Main Canal offtake. MI has limited ability to respond to short term irrigation demand fluctuations during peak usage months and to sudden cancellation of orders following rain events. This results in a frequent mismatch between the volume of water released and that taken at MI's offtake. Where a portion of the ordered water is not diverted by MI, it is lost from the resource pool and contributing to river operational loses. On average every year 70GL of releases intended for MI are not taken at the offtake.

3.2.4. River Flow Demand

Demand for flow capacity within the river system is also increasing and an internal reservoir will enable MI to supply "off the grid" in high demand periods such as for targeted high flow environmental events along the Murrumbidgee (currently constrained by physical impediments).

3.3. Benefits to community

MIA will support local communities by adopting a self-managed delivery model to deliver this program of works. This provides significant benefits in terms of value for money and flexibility of delivery. Importantly, it provides MI with the flexibility to target greater participation of local contractors in delivering the works. Around 75% of capital expenditure is projected to flow to regional contractors and suppliers. In adopting the delivery model MI has considered several factors:

- MI has accumulated considerable experience in the delivery of storage and modernisation projects
- The works will primarily involve bulk earthworks and civil infrastructure including pump stations of which MI and local contractors are skilled at delivering
- Locally based contractors offer value for money due to local knowledge and the avoided costs of mobilisation/demobilisation
- The project will generate of up to 100 jobs during construction.

The project will target 75% of capital expenditure ($93M) directed towards local contractors. This approach will increase local employment and provide upskilling opportunities with significant flow on benefits to the wider community.

MI will leverage established relationships with suppliers in the MIA and across the wider Riverina area. These relationships extend from procurement of services and products for civil works, including earth moving, gravel supply, concrete, formwork, wet hire of heavy machinery, to the supply of automation hardware and software.

The project also aligns with the regional strategies as shown in Table 6.

Table 6: Alignment with regional and local strategies

Strategy	Element	Project fit
Griffith City Council – Guiding Griffith 2040	AIM 6: Encourage our local economy to grow.	The project will support economic growth through efficient water delivery and greater confidence in water security
	AIM 10: Use and manage our resources wisely	The plan states to - Manage Griffith's water resources and water quality responsibly. The project increases water efficiency, effectiveness and contributes to better quality water.
Leeton Shire Council – Envisage 2044	Challenges - Rise to the challenge of living with less water - Murray Darling Basin Plan	This project offsets the reduction in water availability and supports increased economic output

3.4. Secure Water Supply to Towns

During the winter months, MI and WaterNSW conduct major maintenance activities when the demand for irrigation water is at its lowest. This requires the draining of systems to conduct maintenance works on water delivery infrastructure. However, MI supplies raw water to towns once every two weeks due to insufficient urban water storages to meet demand, which creates several water efficiency and asset cost issues for MI and WaterNSW.

Towns and farm dwellings have small high security water entitlements, however, the conveyance losses associated with town water supply has been borne by WaterNSW and MI. These losses can be significant when there is no other demand for supply. Therefore, supplying town water from dams will save these large water losses and provide significant water savings benefit to WaterNSW and MI. A reservoir also provides certainty to towns that water can be made available quickly if required.

Roaches Reservoir could be filled and have adequate capacity to meet town demands for up six months which provides significant benefits to the towns as well as to MI and WaterNSW through drought proofing (towns and farm dwellings) – with a secure water source that can meet six-month demands during prolonged drought periods.

3.5. Environmental benefits:

The project also supports the environmental objectives identified in the Basin Plan (particularly watering of the Mid-Murrumbidgee wetlands under the Reconnecting River Country Program) by providing an option to bypass known river constraints. It supports the catchment's water resource plan by supporting water sharing plan compliance through assisting in the efficient management of end of system flow connectivity. Demand for flow capacity within the river system is also increasing and internal storage will enable MI to supply "off the grid" in high demand periods such as targeted high flow environmental events along the Murrumbidgee (currently constrained by physical impediments).

3.6. Supporting the Murray Darlin Basin Plan

The project supports the healthy working basin objectives of the Murray-Darling Basin Plan and the aligns with the Murrumbidgee Water Resource Plan. Specifically, the investment in infrastructure for Roaches Reservoir will improve river operations efficiency, internal irrigation network efficiency and on farm irrigation efficiency. The investment in water dependent regional communities also mitigates some of the impacts of reduced water availability resulting from the Basin Plan.

3.7. Cultural impacts and benefits

The project acknowledges the prior use of the land by First Nations People. An EIS has been undertaken for the Roaches Surge Reservoir site that has identified areas of high cultural significance and scattered artefacts. Subsequently, an Aboriginal Cultural Heritage Assessment Report was commissioned to fully understand the history of the lands use.

Throughout the process, consultation with Aboriginal stakeholders was undertaken in accordance with Section 60 of the *National Parks and Wildlife Regulation 2019* (NSW) and following the consultation steps outlined in the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCRP) guide. As a result, these artifacts will now be preserved in accordance with the Aboriginal Heritage Impact Permit (AHIP) and will provide further knowledge of the use of the land by Indigenous people.

During construction, the local Indigenous community will be engaged to explore opportunities for further involvement in the project and to meet any AHIP conditions. MI seek to continue the good relationship with local First Nations People created during previous projects.

3.8. Community support and engagement

The program has been scoped following extensive consultation with customers, the local community, Regional and State representatives. Stakeholders engaged include Murrumbidgee Irrigation customers, local Councils, State Government Departments, Australian Government Departments, Local Aboriginal Land Council, regional contractors and supplier businesses.

The local community is generally supportive of the project given that conveyance losses are provided for in MI's bulk entitlement and there will be no reduction in the amount of water available for consumptive use.

3.9. Positive Economic Outcomes

3.9.1. Management of future lifecycle costs

Just as managing current costs is important, so is managing the future costs of MI's asset base. As MI has been implementing its Automation Strategy, it has been able to reduce the forward capital needs of the business whilst reducing its operating costs, increasing the network utilisation and improving our service delivery. This has been achieved whilst ensuring our asset reserve meets the needs of the business.

The continuation of the program through the implementation of Roaches Surge Reservoir and the full roll-out of automation, will provide a unique opportunity to continue to work with our customers, that will enable MI to further refine the network and provide them with an opportunity to reset their businesses. As with previous automation projects, MI will be able to rationalise a substantial number of

assets as part of the modernisation process. This rationalisation of assets reduces the forward capital cost commitment which in turn requires less recovery from our customers.

This is achieved by utilising the increased controls and flow capacities provided by the automated infrastructure to manage larger sections of channels, as well as collaborating with our customers to hand over or decommission infrastructure for the benefit of both parties. MI has also clarified policies regarding what infrastructure should be provided by the business that is fair and reasonable and also ensures that the future liability for these assets are sustainable.

MI is a cost recovery business that utilises an Asset Reserve to fund its future capital needs. The revenue that MI derives from financial and water investment funds the ongoing asset renewal program of the business. Robust forward 20-year and 5-year capital planning is utilised to test the adequacy of the Asset Reserve, which is reviewed by Management and the Board on an annual basis.

MI is experienced in not only the assessment of future replacement needs of its infrastructure but also the operational and maintenance costs. MI has approximately 70% of its area automated and is managing three active surge reservoirs as part of its normal operations. These assets are managed through the implementation of detailed asset management plans and associated maintenance and inspection schedules.

3.9.2. No impacts to the water market

The Projects water savings are generated by reducing conveyance losses across the MI channel network. The conveyance losses include escape flows as a result of channel control, evaporation, seepage and leakage in open channels and meter error in legacy metered outlets. Conveyance losses are provided for in MI's bulk entitlement. There will be no reduction in the amount of water available for consumptive use and MI's net water balance will be increased by water savings exceeding the volume of water provided to the Environment. This ensures there are no negative impacts on current water allocation enhancements traditionally provided to MI Irrigators.

3.10. Water savings shared between the environment and water users

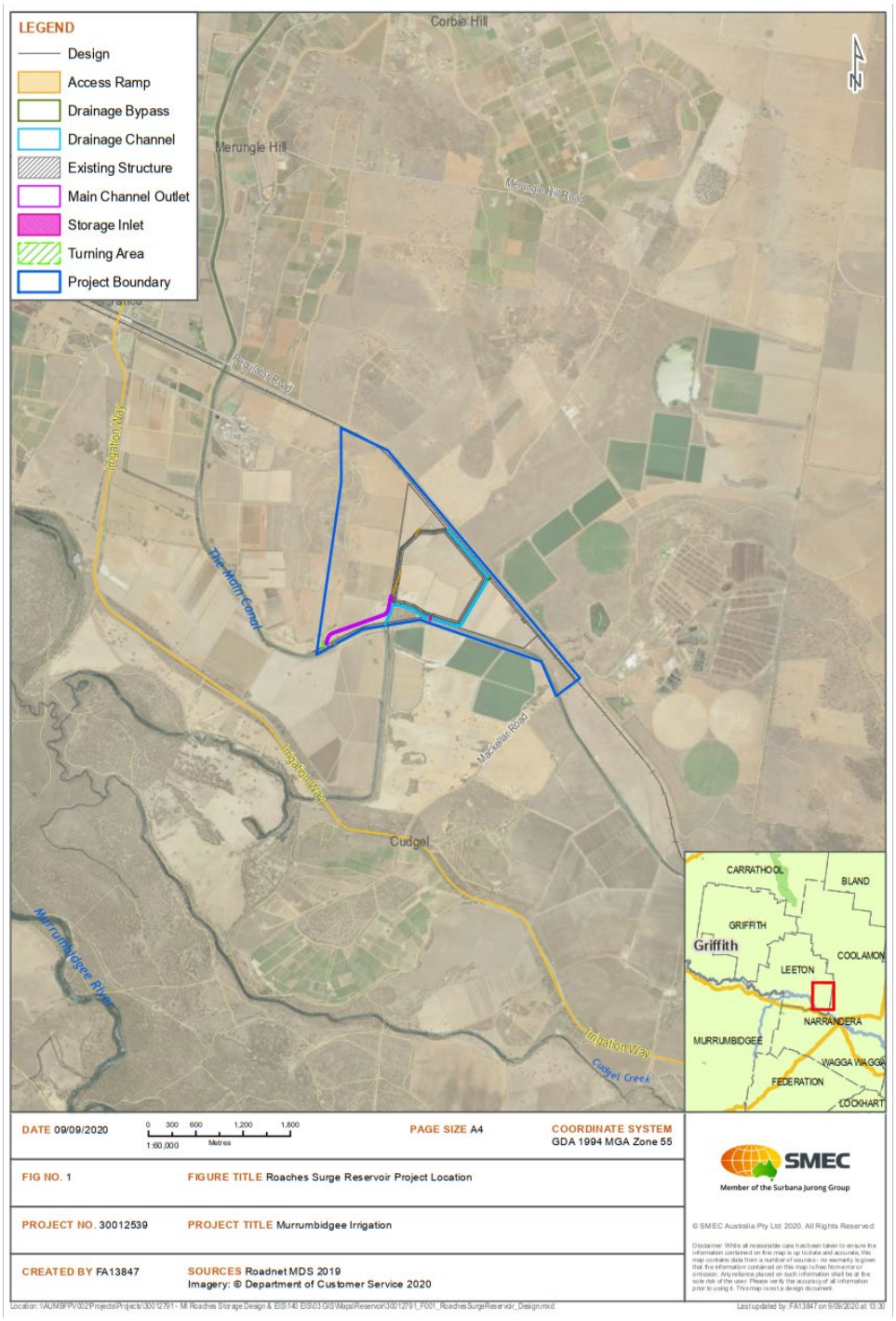
These works will provide 7,390ML of water savings and will deliver 6,282ML of water entitlement for the environment (Table 7). The water savings are shared in alignment with the principle that the region is in a "net" better position in regard to socioeconomical outcomes as a result of completing the project. The current shared arrangement results in MI retaining 15% of the water savings.

Table 7: Total water savings on completion the project

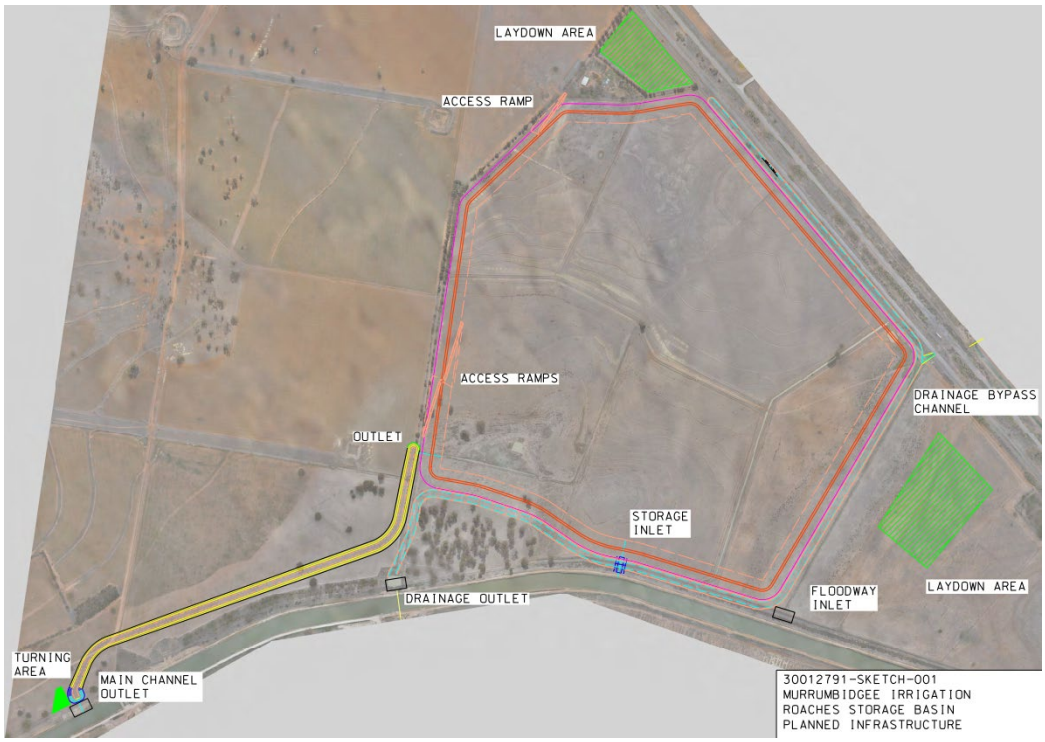
Asset Type	Total Water Savings ML	ML Returned to CEWH
Regulators/Offtakes/Escapes	2,896	2,462
MO Replacements	2,025	1,721
MO Conversions from UMO	700	595
Roaches Surge Reservoir	256	218

Channels, Piping & Reconfiguration	1,514	1287
Total	7,390	6,282

Appendix 1 – Project Location



Appendix 2 – Storage design layout



Appendix 3 – Storage Design Parameters

Design Parameter	Detail
Storage Design	• Undertaken using 12D Modelling Software • Avoid significant vegetation areas • Balanced earthworks • Source adequate suitable materials locally for embankment construction • Storage of internal area = 90ha • Storage bank = 148.30 m AHD • Total volume = 5,000 ML
Storage Embankment	• Crest width of 5.0 m • Batter slope Internal – 3H:1V • Batter slope External – 3H:1V • External batter to be topsoiled • Internal batter to be lined with rock riprap to protect from wind/wave action
Storage Bed	• Built on clay layer • Existing clay material to be excavated and recompacted to ensure water tightness • Storage bed to be graded appropriately towards the pump station • Storage bed = 140.5m AHD
Storage Inlet	• 5 No. 1500 mm diameter (115 m long) • 5 No. AWMA TLF penstock gates to suit 1500 mm diameter pipes with bidirectional seal

	• 5 No 200 ML/D submersible propeller pump (Sulzer VUPX 1002 50 HZ or equivalent) • Pump sump – 12.3 m wide x 18.0 m long x 6.5 m high • End structures – to suit 5 No. 1500 mm diameter pipes • Gravity Inflow = 1,280 ML
Storage Outlet	• 5 No. 1500 mm diameter (70 m long) • 5 No. AWMA TLF penstock gates to suit 1500 mm diameter pipes with bidirectional seal • End structures – to suit 5 No. 1500 mm diameter pipes • Gravity Outflow = 630 ML
Outlet channel	• Crest width of 4.0 m • Batter slope Internal – 2H:1V • Batter slope External – 3H:1V • External batter to be topsoiled • Channel velocity at design flow rate – 0.5 – 0.6 m/s
Outlet Channel @ Main Canal	• 5 No. 1500 mm diameter (40 m long) • Provision of bulkheads and also sized to fit 5 No. AWMA TLF penstock gates in future • End structures – to suit 5 No. 1500 mm diameter pipes
Storage Spillway	• TBC
Drainage bypass	• 2500 m long • Bed width – 6 m • Batter slope – 2H:1V
Subway	• 2 No. 1200 mm diameter (60 m long) • End structures – to suit 2 No. 1200 mm diameter pipes
Floodway Inlet	• Capacity - 1,000 ML/d (to be confirmed following discussion with Leeton Shire Council) • Gates – Either Rubicon Flume Gates or AWMA Decant Gates.
Drainage to Department of Ag land	• 600 mm diameter drainage pipes under the outlet channel
Pipe material	• Reinforce Concrete Pipes
Pipe Class	• To be designed to comply with relevant Australia Standard
Design Temperatures	• Design temperature to be ambient water temperature. Min 10°C, max 30°C.
Flow measurement	• Inlet and outlet structures shall be fitted with flow meters • Flow meters shall meet NMI Standards with better than 3% laboratory accuracy and 5% field accuracy over the full range of expected flows.
Site Geotechnical Conditions	• Based on recent geotechnical report undertaken by SMEC
Vehicle Loads	• As per Austroads standard
Earth loads	• AS 4678 Table 1.1
Pits	• All pits shall have removable lid or grating cover to allow maintenance access
Earthworks Volume (m^3)	• Stripping - 200,000 m^3 • Excavation - 750,000 m^3 • Bank - 850,000 m^3 • Topsoil - 20,000 m^3 • Rock lining - 12,000 m^3