Hay Private Irrigation District

Final Project Report

Round Three of the Private Irrigation Infrastructure Operators Program in NSW

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1 CHAIRMANS FORWARD

It is with immense pleasure that I submit this Final Project Report for the Hay PID Modernisation Project. The project has been made possible with the generous funding support of the Australian Government under Round Three of the Private Irrigation Infrastructure Operators Program in NSW.

It is hard to overstate the importance of the modernisation of the water delivery infrastructure to the future of the Hay Private Irrigation District. The Hay PID is the oldest government constructed irrigation scheme in NSW, and over its 100-year plus history, the scheme had been maintained and operated along similar lines to the time when it was first constructed.

Whilst the scheme had served its customers well in this time, the increased value and competition for water, and the impact of the Millennium Drought, had resulted in significant volumes of water exiting the scheme over the past decade.

The very future of the scheme depended on implementing a more efficient and effective way of delivering water to PID customers. This meant the replacement of the entire open channel system and its regulating and pumping infrastructure with a piped system, capable of meeting our customer requirements each hour of every day of the year.

The PID Modernisation Project and the associated Australian Government funding has provided for a world's best practice method of water delivery, allowing our customers to grow a greater range of high value crops using less water, irrigate with precision and accurate timing to maximise yields, and importantly sustain the economic and social fabric of the PID and broader Hay community.

The PID Board and its staff have been working for some years to develop a project concept that presented value for money, satisfied the funding and investment requirements of the Australian Government, and met the needs of its customer base. The Hay PID Modernisation Project is the culmination of the efforts of past PID Boards, PID staff and members of the project team, and I congratulate all on their ability to stay focussed on realising this important goal.

Of particular importance to the PID Board, was the ability to engage local contractors wherever possible, to ensure that the economic stimulus provided by the construction of the pipeline could be shared within the Hay community. I am pleased to say that 66% of the total funding has been spent on contracts won by local service providers.

There were many challenges experienced during construction due to the wet winter and spring of 2016, and I would like to acknowledge the patience of our customers during the delays that inevitably occurred.

The PID has enjoyed the support of the Hay Shire Council and the broader Hay community during the construction of the new pipeline, and our thanks go to all the organisations that have contributed to the success of the project.

The staff of the Department of Agriculture and Water Resources have been wonderful to work with, assisting where they could to ensure that the administration of the project and significant government funding was applied with a balance of rigour and practicality.

I look forward to a very bright future for the PID and its customers.

Tom Jarratt

Chairman

2 BACKGROUND

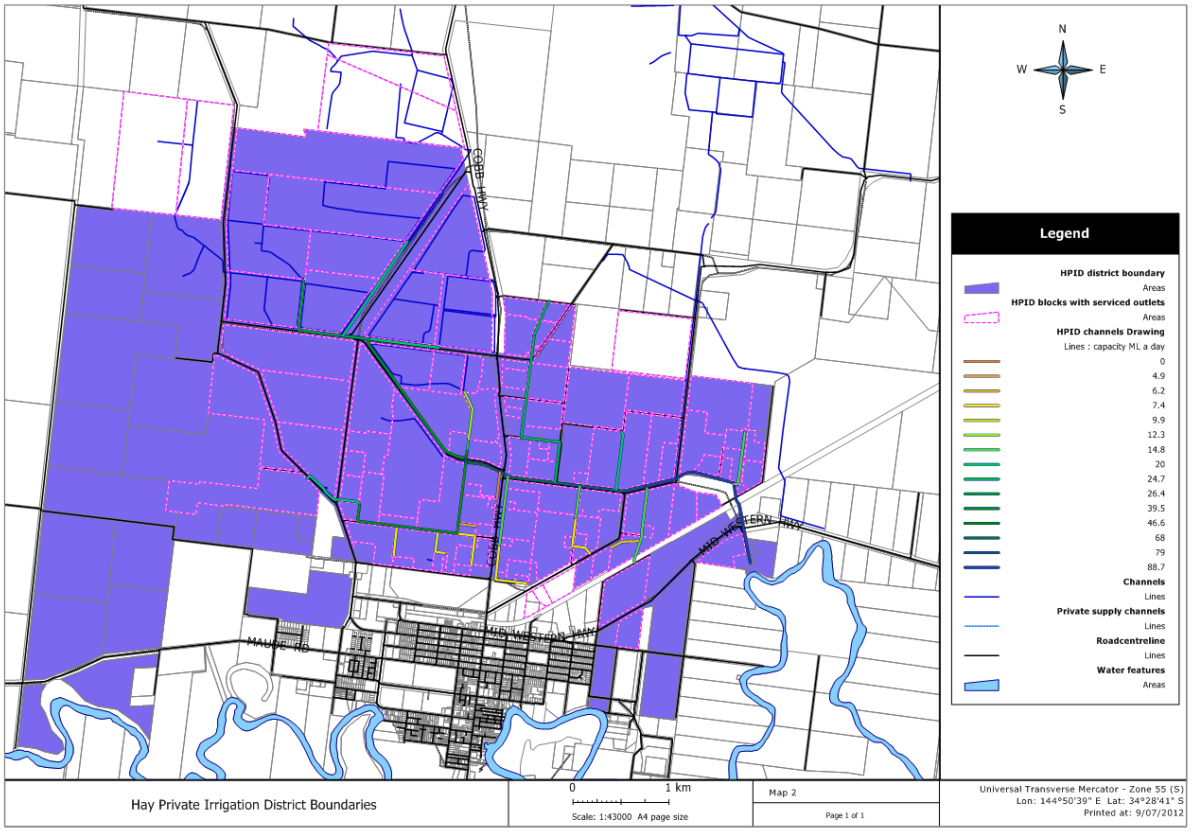
2.1 The Hay Private Irrigation District

2.1.1 Location

The Hay Private Irrigation District (Hay PID) is located on the Murrumbidgee River, to the north of the Hay township. Water is pumped directly from the Murrumbidgee River at the pump station site on the Midwestern Highway.

The Hay PID covers 2,460 hectares of freehold land, of which 1,200 ha has been laid out to flood irrigation. The current extent and the configuration of irrigation blocks have altered very little from the PID's establishment in 1892.

The Hay PID is the oldest irrigation district in NSW and currently has 91 irrigation and over 90 stock and domestic customers.



Map 1 Hay Private Irrigation District Extent

2.1.2 System Operation Pre PIIOP

Prior to modernisation, the PID operated a rotational irrigation delivery through 20.5km of open earthen channels. Channel capacity generally decreased with distance from the main supply channel. At the river off-take the scheme could pump up to 90ML/day. The channel system supplied to 117 irrigation outlets consisting of 46 piped outlets and 71 Dethridge wheels.

Prior to the Millennium Drought, irrigation deliveries usually occurred every 3 to 4 weeks over the summer period, with longer periods between deliveries over the cooler and wetter months. In most years 12 rotations were completed. In more recent years the number of irrigation rotations has declined due to lower water allocations and more recently because of water entitlement and allocations transferring out of the system. As a result of less frequent rotations, the period between rotations increased to between 4 and 5 weeks.

Prior to 2010, stock and domestic supply to customers within the PID was delivered via the irrigation channels. In 2008 and 2009, a pressurised and filtered stock and domestic pipeline was constructed to supply all PID customers as well as some customers outside of the scheme. Funding for the pipeline was provided by Water for Rivers in exchange for 1,000ML of the PID conveyance entitlement.

The stock and domestic pipeline will continue to be operated separately to the new irrigation pipeline constructed as part of the PIIOP 3 funded works.

2.1.3 Past Land use, Production and Irrigation Practices

The Hay Private Irrigation District is located in one of Australia's leading wool growing and sheep meat producing areas, with the surrounding area home to important merino studs. Cattle are also produced for slaughter and, in recent years, for sale to feedlots for fattening. Along the river, irrigated land supports crops such as rice and cotton, and horticultural produce such as lettuce, pumpkins, tomatoes, garlic, corn, rockmelons, watermelons and broccoli. Most of the fruit and vegetable crops are picked and packaged in the area for Melbourne and Sydney markets.

Many of these valuable irrigated crops have not been able to be grown in the Hay PID due to the rotational delivery of irrigation supply and the extended time between deliveries. Instead, from the time of PID establishment, the main irrigated land use has been pasture and fodder production.

Around 1,000ha were reportedly irrigated in the PID during the late 1970s and 1980s. In the two years that records are available (1976 and 1987), 87% of the irrigated area supported pasture (DLWC 1998 – see Table 1).

Table 1 Hay PID Area Irrigated (ha) in 1976 and 1987

Crop Type	Median Area Irrigated (ha) (1976 & 1987)	% total area irrigated
Pastures (total)	834	87
Cereals (grain)	53	6
Fodder crops	24	2
Lucerne	21	2
Total (sum)	**961**	**97**

Source DLWC (1998)

In 1996/97, 97% of the water used in an average rotation was applied to irrigated pastures including paspalum, sub-clover and lucerne – see Table 2.

Table 2 Hay PID Water Use per Rotation (ML) in 1996/97

Crop Type	Average water used per rotation (ML) (1996-97)	%Total water used
Paspalum	716.7	81
Sub-clover & ryegrass	104.6	12
Lucerne	37.6	4
Wheat	14.4	2
Oats	6.6	1
Total	**879.8**	**100**

Source J Bisset (pers comm)

Since privatisation in 1996, the PID has retained, for most years, a record of irrigated crop areas and a summary of this data is provided in Table 3. This data shows that pastures have remained the dominant irrigated crop accounting for an average of 84% of the irrigated area each year.

Table 3 Irrigated Crop Statistics (Source: Hay PID data)

Hay PID Irrigated Crop Statistics (1997 to 2014)					
	Area of Crop Type (Ha)				
Year	**Paspalum**	**Sub and Rye**	**Lucerne**	**Cereals**	**Total Area Irrigated (ha)**
1997-98	605	76	56	24	761
1999-00	287	106	21	44	458
2000-01	279	139	51	42	511
2001-02	286	129	80	90	585
2002-03	295	116	97	108	616
2003-04	278	111	53	79	521
2004-05	317	114	23	261	715
2005-06	278	120	19	123	540
2006-07	62	37	5	58	162
2007-08	54	31	2	0	87
2008-09	93	65	0	30	188
2009-10	68	97	2	94	261
2010-11	171	180	3	80	434
2011-12	224	62	13	44	343
2012-13	217	93	11	69	390
2013-14	176	84	17	38	315
Total	**3690**	**1560**	**452**	**1184**	**6886**
% of Total Area	54%	23%	7%	17%	100%
Average area grown/year (ha)	231	98	28	74	430

Hay PID customers have indicated that the selection of pasture species over time is influenced by economic conditions, water availability and developments in technology in relation to plant improvement. A significant proportion of perennial pasture species were lost during the recent 10 - year drought period as irrigation water became scarce or unavailable and many of these areas have reverted to a mixture of native pasture and introduced species. Landholders have indicated that many plan to re-establish pastures as water availability and finances allow.

Prior to the construction of the irrigation pipeline, flood irrigation has been the primary form of irrigation practised across the district. Various methods have been employed utilising laser levelled bays for open flooding, both large and small scale. There is limited capacity for recycling and end of bay watering, and run of waste watering is predominately utilised.

The predominant use of irrigation is for seasonal pasture production, or establishment and finishing of winter cereals, utilising low level technology to control and/or determine irrigation requirements.

Figure 1 Image of a standard irrigation bay within the HPID

The rotational delivery program means that irrigation water has only been available to customers every 3 to 5 weeks, depending on the allocation and seasonal conditions at the time. This has resulted in irrigation customers needing to take all the water that is available to them at the time of delivery. This practice supports inefficient flood irrigation practices resulting in significant losses at the time of irrigation application, followed by a period of moisture deficit for the crop once the soil moisture profile is exhausted. Crop and pasture yields that result are generally sub-optimal for the volume of water applied.

2.2 Modernisation Planning

The PID completed a Modernisation Plan funded through the Irrigation Modernisation Planning Assistance Program in 2012. This plan identified a range of options to upgrade the open channel system to improve the irrigation delivery service to its customers, reduce water losses and contain operating costs.

The option that was evaluated as the most appropriate was a gravity pipeline to replace all the open channels, together with a new and more efficient pumping station, system automation and a new meter fleet that meets the National Standards.

The PID pursued several options for funding the works identified in the Modernisation Plan, including two unsuccessful applications under the Commonwealth Government's Strategic Sub-System Reconfiguration Program. Whilst the rejection of these applications for funding was disappointing for the PID, the process resulted in valuable and ongoing consultation with PID customers. This built an understanding and acceptance that a "do-nothing" approach would see a slow demise of the system, and that a fully piped option to deliver a smaller volume of irrigation supply was the most effective option for the PID to implement.

During the consultation, PID customers made it clear that they wanted:

- Irrigation in the PID to continue;
- Access to irrigation supply more often so that they could grow more productive crops and pastures; and
- A scheme that they could afford to run.

In the years following 2007/08, 34% of the PID water entitlement was transformed out of the system and 33% of delivery entitlements were terminated. This trend was expected to continue if more responsive irrigation delivery was not implemented. The annual volume of water delivered to customers through the open channel system had declined to around 2,400ML/year, compared to between 6,000ML/year and 10,000ML/year in the 1990s and early 2000s.

The loss of water entitlement and subsequent termination of delivery entitlements was the most significant threat to the sustainability of the Hay PID. A diminishing number of paying customers would be left with the burden of an increasingly costly irrigation system. In addition, their farming production capacity would continue to be eroded through the delivery of irrigation supply in fewer and less frequent rotations.

2.3 PIIOP Round Three Application

An application to fund the Hay PID Modernisation Project under the PIIOP Round Three was submitted by the PID in March 2015.

The project's main objectives were:

1. To plan and manage a transition to a future with reduced irrigation water availability and utilisation within the PID;
2. To rationalise the scale and increase the efficiency of the irrigation delivery system that is cost effective to operate, maintain and replace;
3. To assist Hay PID irrigation customers to reduce water and delivery entitlements in an orderly and planned way to support the operation of a reduced capacity piped system; and
4. To improve the level of service to irrigation customers within the PID to optimise farm production of existing cropping systems and support the establishment of high value irrigation crops.

Project Description:

The project design included the installation of a new gravity pipeline to replace the existing open channel system, together with new river pumps, a meter fleet compliant with the national standards and system automation. The gravity pipeline has the capacity to deliver irrigation supply continually and customers will be able to access irrigation supply through an ordering system that supports optimum crop and pasture production.

It has been estimated that production levels are expected to double, and in some cases, triple under a pipeline option (Hay PID, 2015).

The proposed pipeline has been designed to efficiently deliver 30ML/day at the river offtake under normal operating conditions. However, the design parameters used for the system will allow the potential for 55ML/day to be delivered to meet peak summer demand and future demands, and additional pumping systems will be established to allow the increase in delivery. The PID channel system had a delivery capacity of 90ML/day at the river off-take. The pipeline design has considered the trade-off between initial capital cost and ongoing operating costs and presents an optimum scale for the PID into the future.

As the pipeline option represents a reduction in daily delivery capacity compared to the open channel system, some of the PID customers elected to transfer water entitlement to government as part of the project. This will leave an optimum volume of water entitlements and delivery entitlements behind to support the operation of the newly constructed pipeline. Due to the increase in agricultural production that the pipeline can support across the scheme, the transfer of water entitlement from individual customers does not represent a loss in either production or earning capacity for PID farmers.

The Funding Agreement between the Commonwealth and Hay PID for funding of $10,204,564 was executed on 1 April 2016. In total, the Hay PID Modernisation Project is estimated to cost $10,554,564 (ex-GST). The PID Board has contributed $350,000 from its cash reserves to the project and will transfer to the Commonwealth Government 1,968 shares of Hay PID Conveyance Entitlement, 1,760 shares of Murrumbidgee General Security Entitlement and 1,166 shares of Murrumbidgee Supplementary Entitlement, in return for $10,204,564 (ex-GST) funding for construction of the pipeline option.

Cost – Benefit:

A cost benefit analysis of the project showed that for every dollar spent on the project $1.06 of benefits are derived. The key benefits of the project are:

* The value of the water savings;
* Avoided capital expenditure on a new meter fleet and WH&S upgrades;
* Increased value of farm production; and
* Reduced operation and maintenance costs.

Risk Assessment:

The PID Board undertook a detailed risk assessment as part of the project application process and identified the key risks to the project to be:

- Delays in project approval for funding preventing construction of the project in the 2016 winter shutdown period and rendering the water transfer options secured by the PID expired (the options contracts have an expiry date of 30 April 2016);
- Cost escalation leading to budget blowouts because of poor cost estimates and price rises;
- Work place health and safety risks;
- Project governance risks and financial controls; and
- Delays due to wet weather or unavailability of materials or contractors.

A key risk in securing customer participation in a transfer of water entitlement to government as part of the project was mitigated through the execution of an options contract linked to a contract of sale between the Hay PID Board and their customers electing to transfer water entitlement to government.

As the pipeline was positioned in the footprint of the open channels the entire channel system had to be shut down to allow construction to proceed. Delivery of stock and domestic water supply to all PID customers was maintained through the existing stock and domestic pipeline system.

Due to the very wet conditions in the winter and spring of 2016, construction was delayed, with the final commissioning taking place in September 2017.

The Hay PID Modernisation Project had overwhelming customer support, which was shared by key stakeholders in the local community, including the Hay Shire Council. The project has generated significant economic stimulus to the Hay community during the construction phase, and is expected to generate ongoing financial stimulus through increased farm production.

2.4 Water Savings

A requirement of PIIOP Round Three is an analysis of the water losses incurred through the operation of the current irrigation delivery system, consistent with the Government's "Hotspots" assessment. As the Hay PID was seeking to replace its entire channel system with a pipelined system, a "Hotspots" analysis was not considered a suitable process to determine total system losses.

A report on total system losses was compiled as part of the Stage 1 PIIOP application. This report provided analysis of the historical water losses within the Hay PID to serve as a baseline from which the proposed modernisation project could be compared and assessed (see Hay PID, 2015).

The report identified two key areas of water loss within the Hay PID:

1. System based losses; and
2. Farm based losses.

Water delivery through the Hay PID open channel system was undertaken through a series of rotations every 3 to 5 weeks across the year. The system was run as efficiently as possible to utilise all water through farm outlets with no outfalls, and full drainage to the most distant customers every rotation.

Water was lost from the system through evaporation, seepage, leakage and meter error.

The volume of losses varied greatly from season to season and was strongly related to the total volume of water diverted and delivered through the system and the number of rotations completed.

It has been estimated that over the history of system operation, the Hay PID channel system lost between 200 and 2,400ML/year. By comparison, the new piped system is expected to lose less than 200ML per year, from cleaning and scouring the system, maintenance and potential damage and breakage.

At a farm level, the rotational nature of irrigation delivery in the PID meant that customers were forced to take water when it was made available, regardless of the condition and requirements of their crops. Most significantly, the extended periods between irrigations (up to 40 days and averaging 28 days) over the summer period meant that crops and pastures were often water stressed, and produced well below the yields that could be expected under an irrigation system where irrigation water is available to meet plant water requirements.

It has been estimated that water "losses" (or ineffective water use) at a farm level ranged in the order of 46% to 70% of the water applied, and that production levels could be expected to double or even triple under a more responsive irrigation supply system.

Whilst the PIIOP would not normally consider water losses and potential savings generated at a farm level, the rotational nature of the Hay PID delivery system has dictated the timing of irrigation on farm and has been largely responsible for the ineffective application of irrigation water, resulting in poor yields and limiting the types of crops that could be grown within the PID.

The replacement of the open channel system and rotational delivery with a gravity pipeline operating continually will result in significantly higher crop yields, without the requirement for any efficiency works at a farm level, simply by providing water more frequently when crops require it. If the rate of water loss and/or ineffective water use (46% to 70% of the irrigation water applied on farm), was extended to the 5,730ML of General Security entitlement held within the PID pre-PIIOP and the actual water usage of 2,400ML per year on average over the past 4 years, it would equate to a potential loss of a minimum of 1,104ML and a maximum of 3,881ML per year in a year of 100% allocation when all available water is applied (see Table 4).

Table 4 Hay PID Summary of Water Losses

Source of Losses	Minimum (Fixed) Losses	Variable	Explanation
System Based	200*	2,200*	Minimum system losses in low allocation years and maximum in years of high allocation and water delivery.
Farm Based	1,104*		Minimum level based on 46% losses at average water use of 2,400ML from last 4 years of data.
		2,636*	Variable level based on 46% losses at maximum potential farm water use of 5,730ML
		1,680	Variable level based on 70% losses at average water use of 2,400ML from last 4 years of data.
		4,011	Variable level based on 70% losses at maximum potential farm water use of 5,730ML

* These scenarios were chosen as part of the cost benefit analysis.

For the Cost Benefit Analysis (CBA), a conservative approach to farm based savings was taken and the 46% of average use (2,400ML/year) was established as a fixed rate (1,104ML) and 46% of the maximum use (5,730ML) or 2,636ML as an upper limit, giving a variable farm based loss of 1,532ML.

In addition, the rotational delivery of the open channel system meant that there was little opportunity to make use of the supplementary events that flow past the PID offtake, and this is also considered a loss to the system. As supplementary flows are not able to be effectively pumped or stored in the pipeline option, the PID elected to transfer 100% of its supplementary entitlement to Government as part of the Modernisation Project.

2.5 Project Works

The Hay PID Modernisation Project involved the replacement of the entire open channel water supply system (20.45km) with a gravity pipeline, including new pumps and pump station, automation and a new meter fleet that meets the national standards.

The key features of the project included:

- The installation of pipelines to deliver 30ML/day under normal operating conditions (55ML/day peak flow) at the river off-take to 91 irrigation customers within the Hay PID area of operation;
- Decommissioning of regulating structures, culverts, bridges and crossings associated with the open channel system;
- The optimisation of customer outlets creating an efficiency from an existing 117 to 112 in total;
- The installation of new meters and automated outlet control valves. A voluntary transfer of 1,400ML of water entitlement from PID customers to Government at market value. This will leave the PID with 3,582ML of General Security entitlements and 4,455 Delivery entitlements, which the new pipeline can deliver at normal operating levels;
- The PID will retain 200ML of General Security entitlement to cover conveyance losses in the pipeline;
- The installation of new variable speed pumps and pump station fittings;
- Automation and remote-control technology;
- Fencing of outlets and key pipeline above ground structures;
- Signage of pipeline route and outlets;
- Reconfiguration of farm connections to facilitate outlet rationalisation;
- Geotech survey and detailed design work;
- Project management, procurement, site supervision and statutory approvals.

The new pipeline has a nominal capacity to efficiently deliver 30ML/day during normal operating conditions. However, the system has the capacity deliver up to 55ML/day to meet peak summer demand, or accommodate higher irrigation demands in a high water-use season.

Originally the pipeline design included a dual mainline from the river off-take, however this was not included in the final design due to cost, and a single mainline resulted in as good if not better hydraulic efficiencies. A ring main was also included in a key area of the pipeline to create further delivery efficiencies.

Because the pipeline is nominally one third the daily capacity of the existing open channel system, an essential element of the project was a reduction in the volume of delivery entitlement within the system to a sustainable level, capable of being delivered within normal operating conditions. To facilitate the orderly reduction in delivery entitlements and corresponding water entitlements, Hay PID customers have participated, on a voluntary basis, in the transfer a proportion of their water entitlements to government as part of the modernisation package. The PID has terminated a corresponding number of delivery entitlements to bring the scheme back to a scale that can be delivered sustainably.

The PID secured through an options agreement (backed onto a contract of sale) 1,400ML of General Security entitlement from PID customers for transfer to the Commonwealth Government in one individual transaction at a cost to government of $1,100/ML. This transfer of water was completed in July 2016.

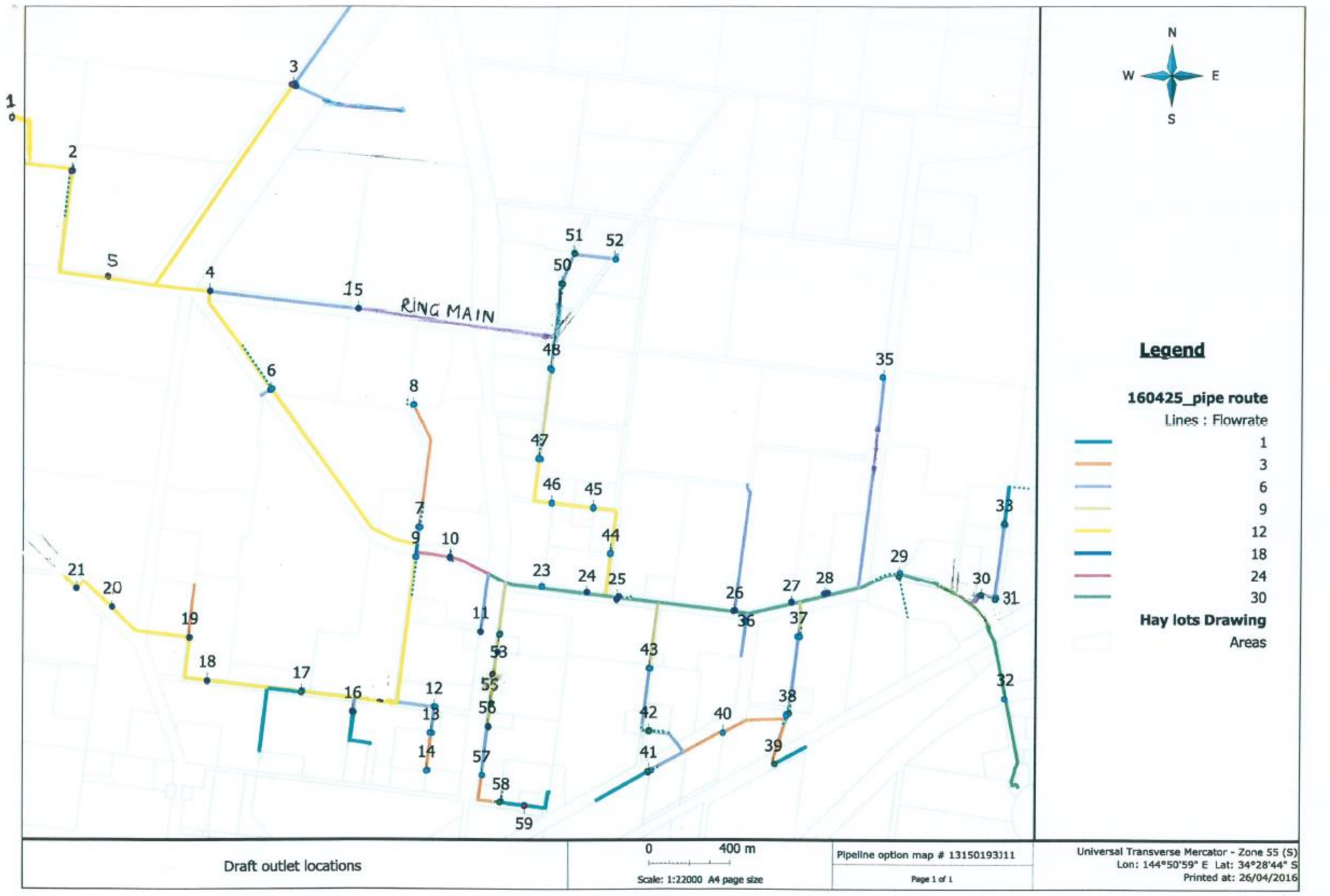
The PID has contributed $350,000 in cash to pipeline construction from its existing cash reserves set aside for asset replacement.

Where possible the new pipeline was installed in the footprint of the existing channel system, to reduce site impacts, maintain existing outlet locations and reduce costs. Earthworks associated with the new pipeline involved reestablishment of access crossings for customer properties, site leveling and grading. Opportunities to rationalise or reposition farm outlets were realised where this provided a benefit to the farm business and the PID business overall.

A map showing the layout of the new pipeline is provided in Figure 2.

Figure 2 Map Showing Location of Pipeline and Farm Outlets

Figure 3 Map showing Pipeline Location and Pipe Diameters



3 ADMINISTRATION

3.1 Project Management and Governance

The Hay PID established a governance structure to oversee the key elements of project delivery. A summary of these arrangements is provided below:

3.1.1 Specific Roles and Responsibilities

Hay PID Board

The overall responsibility for project implementation resided with the Board of the Hay PID. The Board had specific accountabilities which included:

- Appointment of the Project Manager, Project Control Group, Site Supervisor and any other key project staff;
- Approval of the Project Work Plan;

- Approval of the Project Procurement Strategy;
- Approval of the Work Health and Safety Plan;
- Approval of the Risk Management Plan;
- Appointment of contractors for each component of project delivery;
- Approval of Project Delivery Contracts;
- Policy decisions on key areas of implementation, for example decommissioning of assets;
- Ensuring compliance with the Funding Agreement; and
- Completion of the water entitlement transfers to Government.

The Hay PID Board also held reporting responsibilities including provision of timely and detailed information that allowed the tracking of project progress and Commonwealth Government investment, and early identification of risks and issues impacting on project delivery. The Board responsibilities also included compliance with the progress, milestone and completion reporting required under the Funding Agreement as well as project audit requirements.

Project Control Group

The Project Control Group was established at the outset of project delivery, and was tasked with responsibility for the delivery of the project and to ensure that the most effective and efficient delivery arrangements are put in place.

The Project Control Group reported to the Hay PID Board, and included the following members:

- An Independent Chair – Paul Geurtsen (later Austin Goodfellow in Paul's leave of absence)
- Project Manager – James Bisset
- Hay PID Board member – Tom Jarret

The Project Control Board met each fortnight. Technical and legal support and advice was co-opted as required to provide advice to the Group.

The Project Control Group had the following specific responsibilities:

- Recommend the appointment of the Technical Works Superintendent to the PID Board;
- Recommend the appointment of the Site Supervisor to the PID Board;
- Prepare a Project Work Plan;
- Prepare the Procurement Strategy;
- Prepare, coordinate and oversee the tender process and tender review process;
- Prepare Project Delivery Contracts;
- Manage Project Delivery Contracts;
- Management of expenditure and budget;
- Ensure system design and construction methods meet the PID's short and long-term needs;
- Administer any planning approvals as required;
- Prepare Reports for the Hay PID Board;
- Oversee risk management;
- Oversee management of Work Health and Safety systems; and
- Prepare PID customer and stakeholder communication updates.

Whilst the Project Control Group maintained a prominent level of oversight over all aspects of project implementation, both the Chair and Project Manager also assumed a more hands-on role with many aspects of the implementation program.

A key area of responsibility for the Project Control Group was procurement. The Project Control Group developed a project procurement strategy that focused on:

- Utilising the experience of the Project Control Group members and project delivery team to review and finalise the material requirements;
- Identifying a list of suitable material suppliers, earthwork providers and construction businesses;
- Establishing a request for tender for each material and works aspect;
- A cost-plus approach, which can be implemented with additional items that may be required during construction; and
- A process that allows Hay PID to check prices during the supply period and ensure that the supplier will match the minimum confirmed competitive price or allow for supply by an alternative provider; and
- An opportunity for local businesses to compete for supply of materials and services;

The Project Control Group closely monitored procurement costs, and accounting against budget targets.

Project Delivery

The day to day delivery of the project was managed by the Project Manager, James Bisset who was supported by a team of contractors including:

- Technical Works Superintendent – Dave Busnello
- Site Supervisor - Mark Robertson
- WHS Officer / Advisor – Mark Robertson
- Administration assistance - Perrott's Solicitors, Hay
- Accounting Services – Paul Pless, Brian Jennings Accountants, Hay
- Auditor – Brian McCleary and Co
- Legal Services – Paula Johns, Capello Rowe Lawyers, Griffith
- Reporting and Communications - Kaye Dalton, The Risorsa Group Pty Ltd, Griffith
- Tender Preparation and Oversight – Paul Geurtsen, Prohort Management, Wagga Wagga
- System Design – Austin Goodfellow, Water Consultants Australia, Gundaroo, NSW

Many of these service providers have long standing contracting and consulting relationships with the Hay PID and were invited to provide proposals to the PID Board at the outset of project delivery to extend these roles to the implementation of the PIIOP Round Three Modernisation Project.

The delivery team were responsible for all project tasks as directed by the Project Control Group, including but not limited to:

- System Design;
- Preparation of background and technical information required to prepare tenders;
- Tender preparation and conduct of tender process;

Ensuring all work health and safety protocols are in place and effectively implemented; Ensuring all documentation relating to project progress, project staff and contactors was provisioned, stored and reported;

- Day to day site operation;
- Provision of local site knowledge;
- Review and compliance with technical standards;
- Coordination of logistics;
- Progress and Milestone reporting to the Project Control Group and PID Board;
- Preparation of accounts to be paid, accounting and reporting against budget;
- Auditing of Milestone financial reports and final report; and
- Customer and stakeholder communication and liaison.

3.2 Specific Roles and Responsibilities

Project Manager

The Project Manager, James Bisset, was tasked with customer liaison and consultation, ensuring that the timing and sequencing of works was undertaken to minimise operational shut down of irrigation supply and complete construction and commissioning of the new pipeline as efficiently as possible. James has filled the role of PID Manager for the past 17 years and has a high level of expertise and experience together with local knowledge of the project site and customer base to take on this role.

The specific tasks for the Project Manager included:

- Preparation of a project work plan;
- Monitoring and reporting against project time lines on a weekly basis;
- Provision of information for milestone and final reports;
- Ensuring site notes are properly maintained;
- Ensuring the WHS plans are developed and implemented;
- Ensuring WHS protocols are followed on site;
- Provision of local site knowledge;
- Coordinating logistics;
- Reporting on works progress for the Control Group and Board on a fortnightly basis;
- Ensuring accounts are up to date and provided to the Control Group and Board on a fortnightly basis to review;
- Working with the Project Control Group to ensure all responsibilities are meet;
- Managing project contracts;
- Coordinating with Hay Shire Council and ensure all planning requirements are prepared and permits obtained;
- Assisting in preparing any required planning permits; and
- Ensuring all contractors have submitted necessary documentation to satisfy compliance with workers compensation insurance, work plans and WHS plans.

Site Supervisor

The Site Supervisor, Mark Robertson, worked closely with the Project Manager, to oversee contractors on a day to day basis during the construction phase. The Site supervisor's tasks included:

- Providing photographic evidence of all work progress daily;
- Maintaining a daily diary of all activities and any incidences that may arise;
- Ensuring all advised WHS protocols are followed and implemented by contractors;
- Maintaining a daily register of contractors, their employees and equipment on site;
- Collecting all delivery dockets and present them daily to the Project Manager; and
- All other activities as directed by the Project Manager.

Technical Works Superintendent

The Technical Works Superintendent's main role was to provide advice and expertise to ensure that the agreed technical standards of construction of the pipeline and pump station were achieved. The supervisor was on site as required during the construction phase of the project. Specifically, the supervisor:

- Provided technical input to the tender process;
- Provided advice on the technical aspects of the pipeline and pump station works;
- Produced a proforma that the site supervisor used to monitor and report on works;
- Inspected works on a weekly basis or at critical stages, as agreed with the Project Control Group, to ensure that works were completed to a suitable technical standard as agreed with the Control Group; and
- Reported on inspected works including photographic evidence for each site visit.

Procurement Advisor:

As well as Chairing the Project Control Group, Paul Geurtsen was engaged to oversee the procurement and tender process and assist the Project Manager with completion of the project work plan and preparation of any documentation required to progress planning or environmental approvals and permits.

Specifically, Paul's role included:

- Preparation of a Procurement Strategy;
- In conjunction with the Project Manager, preparation of a Work Plan;
- In conjunction with the Project Manager, preparation of required planning permits;
- Oversight of the final design process;
- Cost and audit of the final design to ensure it meets budgets and the Hay PID Board requirements;
- Provision of technical plans and long sections for the tender documents;
- Preparation of design information and data, including the technical specification of the final design requirements;
- Preparation of material lists with the System Designer and Technical Works Superintendent;
- Preparation of supply and construction tender documentation;
- Establishment of tender assessment criteria;

- Organisation of distribution of tender documentation and receipt of tenders on behalf of the PID;
- Set up and maintenance of a system of communication to all tenders during the tender process;
- Assessment of tenders received against criteria and preparation of documentation for the Hay PID Board;
- Maintaining appropriate records relating to the tender process; and
- Communication of tender outcomes to tenderers.

The tender process was supported by:

- The appointment of an independent reviewer who provided advice to the PID Board on the tender process and assessment reports;
- Paula Johns, Cappello Rowe Lawyers who assisted with checking of tender documentation to ensure consistency with the Funding Agreement, preparation of supply contracts and provision of dispute resolution if required.

System Designer

Austin Goodfellow of Water Consultants Australia was engaged to undertake the system final design. Austin has working knowledge of the Hay PID system and was able to utilise existing available preliminary design data to provide the necessary services. In addition, Austin provided advice on the technical specifications and requirements for the pump station tender documentation and stood in as the Chairman of the Project Control Group, when Paul Geurtsen was unavailable due to ill health.

3.3 Work Health and Safety

WHS was an important part of the project and as the works were outside of the HPID usual activities policies and procedures were developed and put in place to meet the requirements of the project. A more detailed explanation of the WH&S system is provided in Chapter 4.

3.4 Project Communication

Communication was important across all aspects of the project. Communication was assisted by regular meetings of the Project Control Group, regular meetings between the Project Manager and contractors, the HPID Board and the Board and its members. Communication was undertaken in many forms including face to face meetings, written correspondence, teleconferences, newsletters and written and radio advertisements.

A sample of the project newsletters and media releases is provided in

Appendix 1

4 KEY PERFORMANCE INDICATORS AND OBJECTIVES

Key Performance Indicators	Outcomes
Project delivers the contracted share of the water savings in the form of water entitlements transferred to the Australian Government.	Water entitlement transfer to the Australian Government completed in July 2016, including: • 1,968 ML Conveyance Entitlements; • 1,760 ML General Security Entitlements; and • 1,166 ML Supplementary Entitlements.
Project achieves water and energy efficiency at all flow levels, including a reduction in water losses to the farm gate, improved measurement, monitoring and control over water delivery and water take.	System design has maximised energy efficiency through selection of pump sizes and location of pipelines within existing channel easements to take advantage of grades. The delivery of constant flow rates at all flow levels has resulted in reduced irrigation delivery times and allowed faster on and off irrigation practices on farm. System losses are now limited to scouring and initial testing practices. Water lost through scouring is used to supply Local Land Services stock dams on adjacent stock routes. This also has benefits to local wildlife and recent sightings of water birds has confirmed the value of these permanent watering points. Conveyance losses are now in the order of less than 3%, and this is expected to be maintained in the long term. The accuracy of the meter fleet, which is compliant with National Standards, and the remote monitoring and control has minimised labour and operational costs, resulted in a fair and equitable distribution of water supply and resulted in water savings.
Project achieves irrigation water delivery 24/7 at any time of the year, creating new opportunities for growing higher value crops and increased yields.	The pipeline is now operating 24/7 all year round. The automated delivery is allowing customers to allocate water to crops when they need it, any time of the day. Remote monitoring and control is undertaken 24/7, eliminating operational downtime associated with a manual operated system.

	Anecdotally, PID customers have reported an ability to establish new areas of lucerne pastures, and superior growth rates due to more frequent water availability. Some landholders are planning the establishment of cotton crops in the summer of 2018.
Project delivers higher levels of service to PID customers including increased control over irrigation scheduling and monitoring of water availability, water availability to match crop water requirements, greater availability of water information generated through connectivity of information technology, real time metering and monitoring of efficiency of water take.	Whilst there is a proposed minimum 72-hour lead time for water ordering, to date this has not been needed and all customers have been able to access supply as and when they need it. It is expected that as demand increases, there will be times when delivery constraint will occur, and customers will need to seek alternative available order timeslots. If the proposed watering window is fully allocated, members can electronically schedule an alternative watering time and place an order at the next available opportunity. Cancelled orders can be viewed in real time allowing other members to take up the opportunity vacated by the cancellation. Real time metering and system automation provides an immediate snapshot of water demand and delivery, and allows customers to monitor their own water use and access an historical record of water use, since system commissioning. This will allow customers to build up a history of usage and better match irrigation practices to crop requirements in the future. The automated system allows a more immediate response to rainfall events and means that water already in the pipeline is not lost, but available for delivery once demand increases again. **See Appendix 2 – Testimonials from PID customers.**
Majority spend of project funds on procurement of goods and services from local providers, within agreed procurement principles and procedures, generating significant economic stimulus and employment opportunities within the Hay community.	66% of project funds were awarded to local providers.

5 CONSTRUCTION AND WORKS

5.1 Guiding Principles

The program of pipeline and pump station construction focussed on achieving excellence in the following principle areas:

- Environmental Protection
- Safety
- Fit for Purpose Design
- Quality Assurance
- Value for Money
- Stakeholder Engagement

5.2 Environmental Protection

Central to achieving excellence in environmental protection was the development of an Environmental Management Plan prior to the commencement of construction. The Plan outlined processes and procedures for the following areas of environmental management:

- Waste management – including disposal of decommissioned structures, asbestos management and general site clean-up following construction activities.
- Native vegetation protection – survey of the site to identify any significant areas of native vegetation.
- Cultural heritage protection – preparation of a cultural heritage management plan, including consultation with local Indigenous stakeholders.
- Erosion and sediment control – identification of control measures relating to earthworks and their impact on roadsides and river environs.
- Weed management – including identification and disposal of weed species, containment of spread of weed species.
- Hazardous substance management – including controls relating to handling of oils and lubricants, asbestos and chemicals.

Waste management was organised through the Hay Shire with a cooperative arrangement to use the local tip site for disposal of decommissioned structures and other non-hazardous materials. There was no incidence of asbestos reported during the construction phase.

As the pipeline installation followed closely in the footprint of the existing channel system, there were no significant areas of native vegetation impacted by construction activities. Similarly, there was no reported incidence of Aboriginal or historical artefacts or sites identified, disturbed, or impacted by construction.

Erosion and sediment movement was successfully controlled and managed as was the movement, spread and containment of weed species.

There were effective controls and management procedures in place for the management of hazardous materials with no spills or contamination reported.

5.3 Work Health and Safety

Work Health and Safety (WH&S) was an important consideration in every aspect of the decommissioning, construction and commissioning program. Prior to the commencement of construction, a WH&S Policy and Management Plan was produced by the Project Manager and Site Supervisor and submitted to the Hay PID Board for approval. The WH&S Management Plan included consideration of:

- Policies and procedures for hazard and risk identification, assessment, and mitigation in the areas of traffic control, emergency response, working alone, sun safety, operation of heavy machinery, Safe Work Method Statements, issue and use of Personal Protective Equipment, staff and contractor training and supervision, daily start up procedures, bullying in the workplace.
- Measurement and Evaluation;
- Consultation;
- Reporting;
- Hazard and Risk assessment and control;
- Contractor accountability and responsibility.

The WH&S Management Plan identified safety objectives and targets, which were closely monitored during construction.

The Plan was audited twice, in December 2016 and May 2017, by the Project Management Group. An independent WH&S audit conducted by the Department of Agriculture and Water Resources' consultant was undertaken in August 2016. This audit found several opportunities for improvement, but no breaches or significant issues with the ways in which WH&S was being managed.

During the construction period of the project there were no WH&S incidents reported and no near misses identified.

5.4 Fit for Purpose Design/Value for Money

The scope provided by the Project Control Group included the design of an efficient, simple pipeline and pump station system that would be relatively easy to maintain. The Project Control Group requested some comparative analysis be carried out to look at multiple mainlines running in parallel with a single mainline. The scope also included costing options for supply and installation of both in PE and PVC product and/or a mixture of the two.

This resulted in a single mainline in PE, replacement of two pumps and removal of one in the existing pump shed and the addition of five flow specific submersible pumps installed in the river.

The Hay PID Board and Project Control group opted not to install any primary filtration and agreed to include extra flushing/scour points and filters on the small 80mm farm meters only. This was a considerable saving in cost.

Due to the vast range of flow requirements, minimum velocities have been modelled throughout the design process to minimise flushing activities during times of low demand. This has been a key aspect of the design.

The final design incorporated a pump, pipeline and control system that can cater for 1, 3, 6, 15, and 30 ML/day delivery and up to a combined 55ML/day at peak periods. Pumps have been specifically selected for this range of flows to maintain high efficiencies to minimise energy costs. This has also allowed the operators to provide much more flexibility in the delivery of water volumes to their

customers, along with major improvements in scheduling efficiencies. This feature, along with the design of the outlet configuration and delivery/control solution have been the key innovative features of new Hay PID pipeline system.

Early signs during the commissioning stage are indicating slightly higher system operating efficiencies than expected due to the conservative nature of the design.

5.5 Quality Assurance

5.5.1 General

A Quality Assurance Plan was developed prior to construction to ensure that there were adequate Inspection and Testing Procedures (ITP) in place. The PID produced plans and procedures for each different type of works, for example poly welding, connection and meter installation, and decommissioning of regulating structures, to guide the activities of contractors. It was expected that these ITPs would be followed by all contractors.

In addition, all tender documentation included specifications and quality standards that suppliers were expected to meet and demonstrate. Together with the ITPs, these formed the basis for quality inspections and assessments during construction.

It was mandatory that all suppliers and contractors provided twelve-month warranties on materials and services. Hay PID continues to hold a bank guarantee from all contractors to ensure that warranties are honoured.

The PID will maintain regular inspection of all areas of pipeline performance for the first 12 months of operation.

5.5.2 Regular Inspections and Testing

During construction, the Site Supervisor made several inspections of contractors each day to review progress and standard of works, WH&S implementation and adherence and the effectiveness of environmental management controls.

The Site Supervisor undertook daily compliance inspections of all works sites and contractors. Technical assessment and compliance was done at key stages in construction by the Technical Supervisor.

Comprehensive testing of the pipeline system could only be completed once all the pipeline was installed and the pump station was operational. Unfortunately, the scheduling of the pump station works meant that testing couldn't be undertaken as the pipeline and fittings were progressively installed, which was not ideal. With hindsight, this is one area that could have been improved with the scheduling of pump station works earlier in the construction program.

A Certificate of Practical Completion was issued to each contractor by the Project Manager (under approval of the PID Board) at the time of completion of the contract (in relation to the decommissioning and earthworks components) and at completion of commissioning (in relation to pipeline and pump station works).

5.5.3 Work as Constructed/Executed Drawings

The pipeline installer has provided Construction Drawings so that future location of the pipeline and associated fittings, for example scour valves, air valves and outlets, is possible by the PID.

These drawings will be electronically stored and backed up with hard copies also produced.

The PID also made use of drone technology to maintain a record of construction activity as well as a visual record of the location of the pipeline and associated farm connections and fittings.

5.5.4 Correspondence and Filing

All correspondence and documentation relating to the project has been filed and stored electronically in the Project Management Office. Electronic backups are regularly completed and electronic copy held off site.

5.5.5 Archiving of Records

Archiving of all project documents will be included as part of the Hay PID management and administration systems and held securely for 7 years, in keeping with the Commonwealth Funding Deed.

5.5.6 Photographic Evidence

The Old Open Channel System

Dethridge Wheel prior to decommissioning

Open channel with Dethridge Wheel outlet prior to decommissioning

Pipe outlet and regulating structure prior to decommissioning

Commencement of PIIOP Funding

Hay PID Board Chairman Sam Barnes signing the PIIOP 3 Funding Agreement March 2016

Decommissioning


DONOHOE
EARTHMOVING
320D L
CAT

Decommissioning the main channel

Pipeline Installation

Pipeline welding

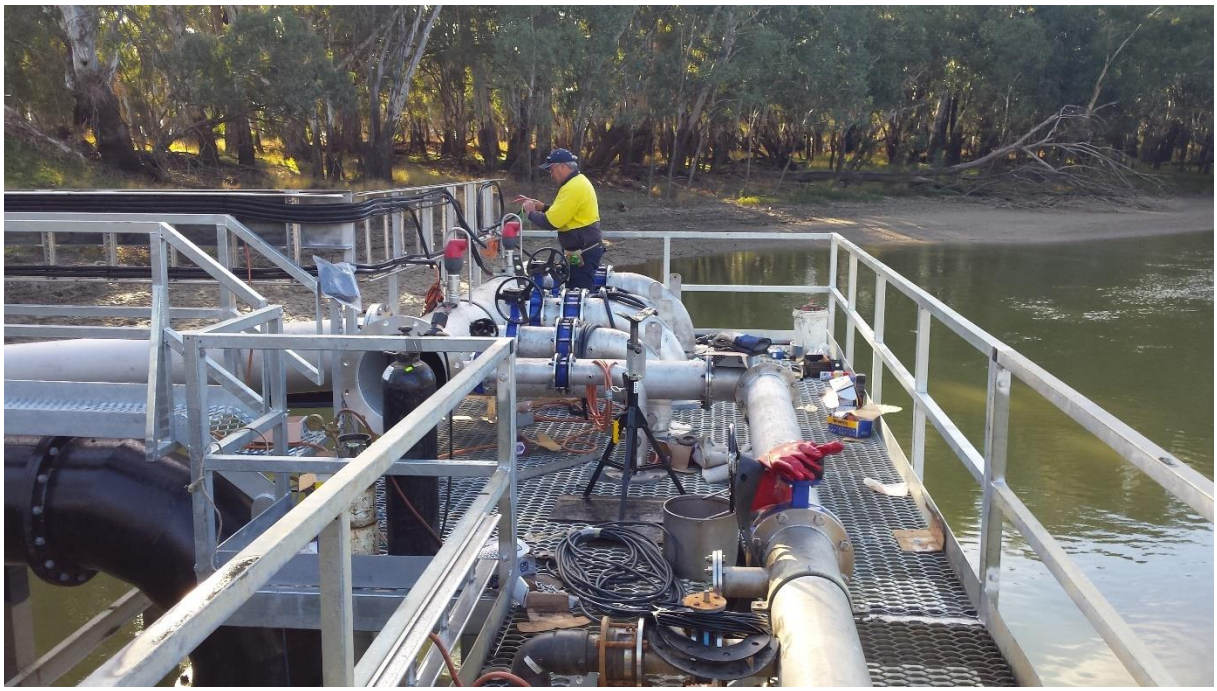
Pipeline installation

Rebuilding Pump Stage

Removal of Old Pumps

Meter Assembly

Pump Installation



Installing Outlets

Replacement of the Main Suction Line


HITACHI


HITACHI

Finishing Off

New Outlets and Hay PID Customers

Completion

5.6 Construction Outcomes

In total, the following decommissioning and construction activities were completed:

Decommissioning:

- 20.5km of open channel decommissioned with the original ground surface reinstated;
- 117 irrigation outlets removed including 71 Dethridge wheels and 46 piped outlets;
- 68 channel regulating structures removed.

Pipeline Installation:

- 22.2km of mainline installed;
- 11km of on-farm pipeline connections completed.

Refer to Figure 3 showing different pipe diameters and location of outlets.

Pump Station:

- 3 existing pumps decommissioned and removed;
- 2 new axial flow pumps installed (1x 30ML/day, 1 x 15ML/day); submersible pumps installed (2 x 6ML/day, 1x3 ML/day, 1 x 1 ML/day, 1 x Jacking pump – 0.7ML/day);
- Installation of new electrical control system to sequence the pumps.
- Suction lines renewed;
- River pump stage refurbished to accommodate the submersible pumps;
- Installation of new discharge line from the pump station, including new NSWWater compliant meter.

Meters and Telemetry:

- 112 new meters installed at farm outlets including 26 Bermad mechanical meters for the 1ML/day outlets, and 86 Pentair and/or Aquamonics Mag Flow meters ranging from 50mm to 300mm outlet size.
- Installation of telemetry (Aquamonics) to provide control and monitoring and interface with the ordering system.

5.7 System Automation

Automation of the irrigation pipeline and farm outlets will allow remote reading of all meters, as well as remote monitoring and control of all facets of pump and pipeline operation. Automation will also provide an interface for all customers with the electronic water ordering system.

The benefits of automation will include:

- a reduction in staff requirements and subsequent cost savings;
- more effective surveillance and monitoring of system operations and water take;

- a more timely response to customer water order requirements, including the ability for customers to track and take up surplus capacity in the pipeline to better meet crop requirements.

In addition, the inclusion of a new meter fleet will ensure that the PID complies with the new national metering standards required as part of the National Water Initiative.

Effective operation of the water ordering system will require ongoing customer training, which will be provided by Aquamonics as part of their contract.

5.8 New Operational Policies and Procedures

The replacement of the entire open channel system with a closed pipeline, has provided the catalyst and opportunity for the PID to revise its policies and operational procedures including its pricing policy.

New and revised policies and procedures include:

- Operational Rules for Irrigation Water Delivery (including ordering and transfers);
- Replacement, Upgrade and Decommissioning of Irrigation Outlets;
- Transformation of Water Entitlement;
- Termination of Delivery Entitlements;
- Pricing Policy; and
- Finance Policy.

5.9 Customer Information and Interface

With the installation of an electronic water ordering system, Hay PID customers will have the option of managing most of their interactions with the PID through their computers or phones. Considerable effort will be put into training and instruction in use of the electronic systems.

It is expected that some customers will continue to opt for a more traditional approach to water ordering and engagement with the PID, and a dedicated phone line will be set up for water ordering to cater for those customers not “on-line”.

The PID website will continue to be primary source of information for customers and PID staff will also provide direct person service to customers where required.

It is anticipated that over time most customers will opt into sourcing PID information and services via electronic means.

6 KEY LEARNINGS

6.1 Plan for Delays

One of the key learnings from the project is the need to build in a realistic timeframe to finalise funding contracts with Government, in order for project implementation and works to commence. As the Hay PID project impacted on all areas of the open channel system, the entire system required shutdown once decommissioning and construction commenced. It was originally expected that the bulk of the decommissioning of the open channel system and the installation of the pipeline could be completed over the winter period in 2016.

For this to happen the Funding Agreement between the PID and the Australian Government needed to be negotiated and executed by January-February 2016 at the latest. In fact, the Funding Agreement was not finalised and signed until April 2016, causing a significant delay in commencement of detailed planning and works commencement.

The PID considered holding over construction to the winter of 2017, however, the risk of price escalation and the requirement for all works and commissioning to be completed by 2019, meant that project commencement could not be realistically postponed.

There were also delays in commencement generated by customer concerns over the procurement process to be used by the PID for project management and construction contracts, requiring further detail on the procurement process to be developed and presented to Government and PID customers, prior to any funding being released to the project.

The most significant factor creating delays in construction was the exceptionally wet winter and spring in 2016. All up, the project was completed by September 2017, a total delay of some nine months. This meant that PID customers could not access irrigation water supply during the summer of 2016-17, and had to rely on income and feed generated by winter crops during the construction period. It should be noted that PID customers generally displayed a high degree of patience and understanding regarding the delay in commissioning the new pipeline system. This was in some ways supported through the delivery of stock and domestic water supply to all customers during the project construction phase via the separate and existing stock and domestic pipeline.

6.2 Project Timing and Staging

The urgency of commencing project works meant that individual aspects of the project were progressively in design, tender and construction phases. Tenders for decommissioning were progressed first, followed by pipeline design and construction with pump station design and construction tendered last.

This meant that multiple tender information meetings needed to be conducted, increasing time and cost. As well, the sequencing of design and construct processes were not as streamlined as they could have been. With hindsight, it may have been better to invest more time in the early stages of the project to complete the design of both the pump station and pipeline, prior to going out to tender on all aspects of supply and construct at the one time.

The pump station was the final element of the project to be completed, meaning that testing of the pipeline system could not be done progressively, but had to wait until installation had been completed. Again, with hindsight, it would have been beneficial to have finalised the pump station installation at an earlier point in the project to facilitate progressive pipeline testing and monitoring of performance.

A positive aspect of the tender process was the scaling of supply of materials and construction activities to make it possible for local providers to successfully compete. However, this also complicated the interface between contracts, increasing the risk of creating gaps or overlap between services and supply, and mismatching specifications and standards.

6.3 More Specific Tender Documentation

The tender process was a “design and supply” process, which left some of the tender specifications open ended and more difficult to manage. It may have been better to have specified some aspects of design to a more detailed degree – for example pump selection and the number and size of farm outlets. However, this would have resulted in delays in the early stages of the project, may not have resulted in lower cost and may have limited the range of design solutions offered.

Design detail was specific around pipe sizes and outlet location in the tender process.

6.4 Quality Assurance

Issues arose with the quality of the pipeline supplied in some of the early stages of pipeline installation. A manufacturing error relating to the thickness of the pipe wall was identified through the site monitoring, testing and quality assurance process. This resulted in delays and meant that additional pressure testing was required once the pump station was operational. However, the manufacturer bore responsibility for the error and made good on their contract conditions, as well as covering the additional costs relating to testing and contingency measures.

There were also issues relating to the supervision of machinery operators around the newly installed pipeline. Due to the dry 2017 autumn conditions, compaction of the soil around some sections of the pipeline was insufficient, resulting in damage due to the movement of machinery above ground. The contractor undertook rectification works including digging up and reinstalling areas of the pipeline affected.

6.5 Loss of Critical Personnel

During construction, the Chair of the Project Control Board, Paul Geurtsen, had to step down due to ill-health. Austin Goodfellow, the designer of the pipeline, was available and willing to step into this role. By this stage, most of the procurement process had been finalised allowing the transition to be relatively smooth and seamless.

6.6 Retrofitting Existing Infrastructure

To reduce project costs and after internal inspection with a camera, it was thought that the existing DICL suction lines between the river and the pump station would be suitable to supply to the new pipeline. Just prior to commissioning, the system experienced a gasket and pipe flange failure in one of the existing suction lines and the decision was made to replace all DICL lines with new poly pipe. This was not part of the original project budget.

A high river at the time of the replacement of the suction lines added to the difficulty of the job, and all up the process resulted in a delay of around 3 weeks to testing and commissioning of the entire pipeline system.

7 CUSTOMER CASE STUDIES

The Hay PID supports a wide range of farming enterprises from commercial scale to lifestyle blocks. The following case studies provide a snapshot across this range. Despite all these case studies reducing the volume of their water holdings as part of the transfer to the Commonwealth Government, each of them expect to generate positive production gains and most importantly increase profitability as a result of the new pipeline system.

7.1 "Aroona" Ross Headon

Current Production System	
Total Farm Area	450ha
Area of Irrigation Layout	50ha
Type of Irrigation Layout	Lasered border check, with irrigation water delivered through open channels.
Typical Crop Rotation	Established winter pastures of sub-clover and rye grass, divided into two 25ha blocks. Dryland pastures on remainder of farm.
Estimated Annual Water Use	210ML over two autumn waterings (80ML first, 65ML second watering). One 65ML spring watering. Remaining water allocation sold on temporary market.
Estimated Annual Production	300 fat lambs per year.
Limitations with Existing Irrigation Delivery System	Pasture production limited by the ability to only water twice in autumn under rotational delivery. Losing 12 ML per watering event just to fill the channel to get water to pasture paddocks.
Future Production System	
Area of Irrigation Layout	70ha
Type of Irrigation Layout	No change to existing 50ha layout – recently re-lasered. New area of 20ha laser graded flood layout planned for summer pasture establishment.
Typical Crop Rotation	Continue with 50ha winter pasture (rye and sub-clover). Establish 20ha summer pasture (millet)
Estimated Annual Water Use	Three autumn waterings in March, April and May (will vary with rainfall), one spring watering on winter pasture (50ha). Summer watering of new summer pasture as required (20ha). Estimated annual use of 240ML.

Estimated Annual Production	500 fat lambs per year
Advantages of New Pipeline	Location of farm outlet to pipeline now eliminates the need for open channel on farm, saving around 36ML per year (20% total water use). The timing of irrigation can now be made to suit pasture requirements, particularly several irrigations early in autumn and through summer. This will allow an increase in production of around 200 lambs per year (66% increase), through joining twice and greater lamb rate survival. Lambs can be held and sold across the year to take advantage of better prices – no longer a forced seller in spring. Will use all water allocation on farm production now that it can be used effectively to increase production levels rather than selling on temporary market. This represents an increase in local economic activity in the Hay district. Greater availability of cropping and farming options due to irrigation water availability as required and all year round. Contemplating a further 50ha irrigation development in 3 to 4 years which will require a purchase of water entitlement and annual allocation.
Estimated Changes to Profitability	Increased by 50%.

7.2 Dean and Donna Whitehead

Current Production System	
Total Farm Area	60ha
Area of Irrigation Layout	40ha
Type of Irrigation Layout	Laser levelled flood irrigation
Typical Crop Rotation	12ha oats and winter forage crops and 20ha of winter pastures
Estimated Annual Water Use	250ML (when in full production)
Estimated Annual Production	30 tonnes of hay and carrying capacity for 20 cows and calves and 20 weaners
Limitations with Existing Irrigation Delivery System	The long gap between watering opportunities under the rotational delivery system made it impossible to grow any type of summer crop or pasture, significantly reducing production over this period.

	The farm provides a supplementary income to the Whitehead's off farm income streams. The timing of rotational delivery was often impractical and clashed with other activities that were taking place both on and off the farm.
Future Production System	
Area of Irrigation Layout	40ha
Type of Irrigation Layout	Laser levelled flood irrigation
Typical Crop Rotation	Proposed to introduce a summer cropping and pasture component as well as winter cropping and pasture. This will be dependent on water allocations and seasonal conditions.
Estimated Annual Water Use	100ML to 125ML (depending on the scale of summer component). The Whiteheads will use water allocation attached to their water entitlement held within the PID as well as transfer in water available within the PID and from river based WALs.
Estimated Annual Production	30 tonnes of hay and carrying capacity for 20 cows and calves and 20 weaners.
Advantages of New Pipeline	Water will be available at the time when crops and pastures need it, increasing production levels from each ML of water applied. Water will be available at short enough intervals to establish summer crops and pastures, maintaining stock production through this period. The remote access capability of the new system means that the Whiteheads will have access to real time data when they are at their off-farm jobs. The Whiteheads expect to maintain existing levels of production using about one half of the volume of water. This will significantly decrease the cost of water and improve profitability.
Estimated Changes to Profitability	Increased by 40%

7.3 "Block 98" Shane McGufficke

Current Production System	
Total Farm Area	37ha
Area of Irrigation Layout	30ha
Type of Irrigation Layout	Lasered border check flood irrigation

Typical Crop Rotation	Oats and sub-clover cut for hay. The PID block supports a larger merino sheep enterprise outside of the PID boundary.
Estimated Annual Water Use	80ML (50ML first autumn watering and 30ML second watering)
Estimated Annual Production	
Limitations with Existing Irrigation Delivery System	The rotational delivery meant that crops had to be watered in autumn when water was available rather than when the crop needed it. The system restricted the types of crops that could be grown, particular summer cropping options.
Future Production System	
Area of Irrigation Layout	30ha
Type of Irrigation Layout	In the short term will continue with winter cropping and pasture cycle, but also considering a summer cropping schedule and the potential for permanent plantings including nuts.
Typical Crop Rotation	Winter and summer crop
Estimated Annual Water Use	100ML
Estimated Annual Production	Increased winter hay production in the short term estimated to be 150% of current production. Summer cropping options will increase production further.
Advantages of New Pipeline	Able to now consider high value and more profitable summer cropping options and permanent plantings.
Estimated Changes to Profitability	Increased profitability of between 30 and 50% targeted.

7.4 Tom Jarratt

Current Production System	
Total Farm Area	4ha
Area of Irrigation Layout	3ha over 4 parallel bays
Type of Irrigation Layout	Laser levelled flood irrigation and one bay of fixed sprinkler
Typical Crop Rotation	1ha of paspalum, 1ha of lucerne, 1ha rye grass
Estimated Annual Water Use	26ML (at full allocation)
Estimated Annual Production	12 sheep

Limitations with Existing Irrigation Delivery System	Due to the infrequent watering under the rotational delivery establishment of paspalum pastures has been difficult. Production levels of winter pastures have been sub-optimal. Irrigation water is stored in a farm dam for delivery through fixed sprinklers over the lucerne paddock – this has led to high losses on farm.
Future Production System	
Area of Irrigation Layout	3ha
Type of Irrigation Layout	As above but considering pipelining remaining open channel on farm (some of the length of open channel on farm has been reduced by location of new pipeline outlet, creating immediate water savings).
Typical Crop Rotation	As above
Estimated Annual Water Use	21
Estimated Annual Production	Increased summer and winter pasture production levels to carry between 24 and 30 ewes. Optimal pasture production will allow double lambing, providing production of between 50 and 60 lambs per year.
Advantages of New Pipeline	Small volumes of irrigation water can be applied to crops and pastures to optimise production levels. Eliminates the requirement to store water on farm resulting in evaporative savings.
Estimated Changes to Profitability	From a loss making /break-even proposition to one generating a small annual profit of around $500/ha.

8 REFERENCES

Hay PID, 2012. *Hay PID Modernisation Plan*. A report prepared for the Hay PID by The Risorsa Group Pty Ltd, WCA Water Consultants, AK Environmental and proHort Management.

Hay PID, 2015. *Analysis of System Water Losses*. Report compiled for the Hay PID by The Risorsa Group Pty Ltd and proHort Management.

Appendix 1 – An Example of Communication Materials

The Riverine Grazier

HAY NSW

$1.80 Phone: (02) 6993 1002 Fax: (02) 6993 1386 Riverine_Grazier@bigpond.com The Heartbeat of Hay Wednesday March 23, 2016

$10m for Hay PID

A $10 million development has been announced for Hay Irrigation

Tenders will soon be called for the construction of a fully-piped and automated water delivery system for the Hay Private Irrigation District.

Construction is expected to start in May for completion by November.

This follows a successful application for Australian Government funding of $10,294,564 by the Board of Management of the Hay Private Irrigation District.

Hay PID manager, James Bisset said the board, and also previous boards, had been working towards this goal for many years.

"For Hay PID this will mean all of its open channel system will be converted to a fully-piped and automated water delivery system," Mr Bisset said.

"For our irrigators, this means there will be one more rotation mid-April after which water access will only be available through the stock and domestic pipeline.

"This project will endeavour to create longevity and versatility of cropping throughout the Irrigation District far into the future."

Red alert lifted

Murrumbidgee Regional Algal Coordinating Committee lifted all red alert warnings for blue-green algae in the Murrumbidgee River on Monday.

The red alert warnings for the Murrumbidgee River at Hay, Maude and Carrathool have been downgraded to Amber alerts, meaning that the water is safe for recreational purposes, as well as stock watering.

The red alert warnings for the Billabong Creek at Conargo and Wanganella remain in place.

Regular monitoring will continue and the alert will be lifted as soon as the high levels of algae dissipate.

Information updates about blue-green algae blooms and red level warning areas can be obtained from the Regional Algal Coordinating Committee freecall Algal Information Hotline on 1800 999 457 or visit – www.water.nsw.gov.au

Small Biz Bus returning to Hay

The Small Biz Bus is returning to Hay, offering free business advice to anyone interested.

The bus will be located in front of the Council offices on Tuesday, April 12 between 9am and 3pm.

Business advice provided free of charge includes face-to-face guidance and support, delivered by experienced small business operators.

Small Biz Bus is a NSW Government initiative and its visit to Hay will be hosted by Hay Shire Council and Riverina Business Enterprise Centre (BEC).

The Riverine Grazier
HAY NSW
$1.80 Phone: (02) 6993 1002 Fax: (02) 6993 1386 editor@thegrazier.com.au The Heartbeat of Hay Wednesday May 10, 2017

Efficiency the key to new-look Hay PID

The face of Hay Irrigation Area – the oldest irrigation district in New South Wales - has changed forever.

Gone is the 30 km open channel which provided water to the properties for a century.

In its place – a modern high-tech fully piped system which allows users to order their water with the click of a finger via mobile phone or computer.

Hay Private Irrigation District Manager, James Bisset said the major modernisation program was being carried out in conjunction with PIIOP Round 3 grants – converting the open channel system to a fully automated piped water delivery system.

"Throughout the next month, the final aspects of the system will be installed, including new water meters and training offered to its members," Mr Bisset said.

"This will enable them to place their water orders at their convenience via their mobile phones or computers.

"It will also accommodate those members who wish to order water via the personal touch over the telephone.

"The new technology will offer the availability to view history of use, previous water orders and available water as well as providing an online message system.

"The new system will reduce water loss and give the HPID members access to their available water, far greater than the open channel system could deliver."

Mr Bisset said HPID members had been extremely patient and cooperative throughout the construction phase of the new system. He said the tender process adopted by Hay Private Irrigation District enabled many local contractors the opportunity to become a part of this extensive project.

"The support of Hay Shire Council and all the successful contractors has been the most valuable part of this project," Mr Bisset said.

"As this project nears completion, the board of management of Hay Private Irrigation District looks forward to another 100 years of continued operation of the oldest irrigation district in NSW."

See photos page 5.

Changing the face of water delivery for Hay PID

Crighton's Rural Engineering won the contract to install new meters at Hay Private Irrigation District as part of the multi-million dollar upgrade. Local employees, Chris and John Weymouth are pictured during installation. The meters will be fenced by Tony Stephens after installation.

There has been much activity with Ward Bros flattening and levelling areas which once featured the open channels. Story on page 1.

Tyler Jones and Zac Dye from Peter Learmonth's Riv Poly team are pictured attaching the pipes to the meters.

Hay Private Irrigation board members announced and pipeline almost finalised

Hay Private Irrigation District (PID) election were held on Tuesday August 1 with Sam Barnes, Tom Jarratt, Dean Whitehead, Brian Doyle and Lionel Garner elected to the board of management until 2020.

Grant Kelson nominated for a board position but was not elected. The election was conducted by Roy Sullivan and James Bisset.

The pipeline project is entering its final stage of construction, and the pipeline is currently being filled and pressure tested (commissioned). This process is to identify any faults or leaks in the more than 30 kilometres of pipe installed during the project.

Local business RivPoly, successfully secured the pipe laying tender and will be on hand to undertake any remedial works during the testing phase.

Aquamonix, the meter and control supply tenderer, have been commissioning the meters and this process will continue for several weeks. Aquamonix are also developing training information, which will be uploaded to the PID web site, to assist customers in ordering water through the new system.

The installation of river pumps has been completed and the pump station has been refurbished.

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Manager: Mr James Bisset

HAY PRIVATE IRRIGATION DISTRICT NEWSLETTER – JUNE 21/6/ 2016

The Board of Management of the Hay Private Irrigation District are extremely pleased to inform all its customers of the progress of its modernization programme and the construction of the irrigation pipeline scheme.

An information day and general meeting were recently held on June 9, 2016. Both the information day and general meeting were well attended by Hay PID members. During the general meeting two of our members put forward recommendations, which the board discussed at length at a special meeting held on June 16, 2016. Motions were moved, seconded and passed in relation to the recommendations. We have included copies of the minutes from the general meeting and the special meeting for our member's information. We have also included the schedule of fees for the 2016/17 season.

Tenders are being advertised shortly for the start of the project, which will commence with decommissioning of outlets and infrastructure. Tenders will be available at request and on our Hay PID website.

We are marking out new outlet positioning for the project with streamers and marker pegs. If any members have questions in relation to the positioning of their outlets, please contact James Bisset. We will endeavour to update all of our members with information on the progress of the pipeline as it comes to hand.

The Board of Management would encourage all its members, it they have any questions please do not hesitate to contact any member of the board and / or James Bisset.

This is an extremely exciting time for all members of the Hay PID and we hope this project will create opportunity for the continued operation of the Hay Private Irrigation District.

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HAY PRIVATE IRRIGATION DISTRICT NEWSLETTER – JULY 25/7/ 2016

The Board of Management of the Hay Private Irrigation District would like to take this opportunity to keep all its members informed of the progress of the Hay PID's modernisation project which will convert all the open channels into a fully piped water delivery system.

Two tenders have been advertised over the last month. These were well supported with six tenders received for the decommissioning of outlets, control structures and crossings. The successful tender for decommissioning was Greg Donahue Earthmoving and Jacka's Excavations. The tender for the supply of pipe and fittings received six tenderers, with the successful tender being Darling Irrigation. All tenders were advertised on Tender Link and several state and local newspapers.

Tenders are presently being called for pump supply and installation and reconfiguration of the pump station. Shortly we will also release tenders for weld and install of pipe and fittings, decommissioning of earthworks and channel system, meter supply, control and install. Decommissioning will commence within the next two weeks. We would like to inform all members that there may be disruptions to telephone and stock and domestic water supply during this phase. We hope to receive patience and cooperation from all members during this time. We would like people to be aware that there will be heavy machinery and trucks operating within close proximity to homes and roadways.

The rain is a welcome event across the Riverina. Although welcome, this had led to delays in estimated completion time for the new pipeline project. We will endeavour to keep our members informed and we appreciate their patience as we work towards completion.

If anyone has any questions in relation to the project please do not hesitate to call James Bisset on 0427 005576 or any of the board members of the Hay Private Irrigation District.

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HAY PRIVATE IRRIGATION DISTRICT NEWSLETTER – AUGUST 2016

The Board of Management of the Hay Private Irrigation District would like to keep all its members informed of the progress of the modernization program to convert all open channels to a fully piped water delivery system.

Tenders have been awarded for decommissioning of structures and outlets. We are pleased to announce that a local consortium made up of Jacka Excavations and Donohue Earthworks were the successful tenderer.

As many members would have seen, decommissioning has now commenced. We appreciate our member's patience and cooperation throughout this process. The safety of our members and the public is an extremely high priority, so we ask our customers and the public to be careful in the vicinity of excavation work.

The second tender awarded was for supply of pipe and fittings and has been awarded to Darling Irrigation. Pipe has already started to arrive and will be located at various stockpile sites around the district, awaiting installation.

Tenders for weld and install of pipe and decommissioning of the open channel system recently closed and will be awarded in the near future.

Tender for supply of pumps has been awarded to Grundfos Pumps. Our Stock and Domestic system consists of 4 Grundfos pumps and we have had extremely favourable operation results from these.

The wet weather, although welcome throughout the district, along with the unavoidably lengthy tenders process, has meant that the estimated completion date will be pushed back. We will work hard to reduce the completion time and will do everything within our power to minimize any delay in water delivery throughout the 2016/17 water season. We will also endeavour to keep all our members and the Hay community informed as to the progress of the project as information comes to hand.

Below are some before and after photos of the progression of the PIIOP modernization project so far.

Pictured left: The Main channel prior to decommissioning. **Above:** Decommissioning under way.

Pictured Above: Removing the old and making all accessible by vehicles again.
GOING..... GOING ..... GONE

Recently we had a site visit by the PIIOP administration, **(pictured right)** who spent time with us looking over the project. They were, over all, impressed with our progression and look forward to their next visit.

Let there be pipes, and they have started arriving **(below & below right)**

We appreciate the co-operation and patience of our members. If any members wish to **trade water**, at any time, please do not hesitate to contact James Bisset in relation to this or any other aspect of the pipeline project.

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HAY PID NEWSLETTER – MARCH 2017

The pipeline project for the Hay Private Irrigation District continues to move forward with the awarding of the final tenders early in the New Year. The supply of meters and the automated control solution was awarded to Aquamonix. The meter install and pump install was awarded to Crighton's Rural Engineering. The pump control solution was awarded to Ibis, from Griffith.

All the pumps have now been supplied from Grundfoss and have been delivered. The stainless-steel components that will be used in the metering outlets are being delivered and will soon be assembled and installed, along with all the meters.

It was decided to expand on the pipeline installation by joining Lateral 7 with the main line at the Five Ways area. This ring-main line will create the ability to maintain additional flows to both the Five Ways and Lateral 7.

As part of the new pipeline, all ordering will be able to be carried out on your phone, by computer or by contacting your management team by phone during office hours. As part of this process, training days will be offered in the upcoming months. To assist us with developing this process we will require all our customers' phone numbers and email addresses to which messages will be able to be forwarded to these contact details. We would appreciate it if all our customers could complete the form below and return it to the Hay Private Irrigation District via email or post.

The board would like to thank all its members for their patience during this construction phase and will endeavour to keep our customers updated with a completion time as the construction enters these final stages.

James Bisset
Hay Private Irrigation District - Manager

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May 2017 Newsletter

The board of management of the Hay Private Irrigation District would like to thank all its members for their patience throughout the year. Without their cooperation, the exhaustive amount of work required to convert the open channels to an automated piped system could not have been achieved. The list of works completed is extensive – the main pump station has been completely refurbished and as to date the two main pumps housed within the station have been installed. The entire pipeline has been laid and the finishing components have commenced installation.

Many of our customers will notice the meter installations and the on-farm pipe work being installed. In the near future, we will be notifying all members in relation to training days to assist our customers in the automated ordering system, which will give them access to the operation of the new pipeline and will enable them to view history of use, previous water orders and track water availability, as well as providing an online message system. Orders can be placed at customer's convenience using mobile phones or laptops, but also accommodates those who wish to order over the phone.

Again, the board would like to thank its members for their patience during this time and look forward to the continued operation of the Hay Private Irrigation District.

The board of management would also like to notify its members of the upcoming election for board members for the Hay Private Irrigation District. Nominations will be called for throughout June 2017 and postal votes will be received during July 2017.

Appendix 2 Testimonials from Customers

HAY PID CUSTOMER TESTIMONIALS – as discussed with and recorded by James Bisset (HPID District Manager)

JOCK DUNN
LOT 26-1

"With the announced allocation from Water NSW only at 33%, with the new irrigation piped system, I have been able to order water when my Lucerne crop has required to be irrigated, whereas in the past with such a low allocation I would have had to irrigate my fields when an irrigation rotation was scheduled. Many times in the past those rotations did not occur when my crops needed irrigating. The flexibility of the new system, I feel, has more than doubled my cropping ability."

PETER ROSSER
LOT 47

"My irrigation lot, prior to the installation of the new system, had its own open channel which delivered water from the main channel to my lot, which is 800 metres from the main channel, through 2 neighbouring properties. The new system delivers water directly into my head channel, located on my irrigated fields. I estimate over a 30% saving and I have irrigated my paddocks a number of times. There has also been saving in time, as the automation of the new system means I have water instantaneously available directly onto my bays, almost as soon as my outlet is opened."

DARREN TAPPER
LOT 132 & 61

"I am a new customer to the irrigation district. I have recently bought a house with a small irrigated holding adjacent to this property, which with the new piped system, gives me the opportunity, even on such a small holding, to give me the best ability to produce and maintain a small area holding. I have also purchased a larger holding and am considering a new crop for the irrigation district – such as cotton. I would only consider this because I now have access to a regular, reliable on-call water system. Although the open channel rotation system had been utilized over a long time by the irrigation district, the ability to grow crops such as cotton and/or other horticulture would not have been possible under the previous system. The ability to order water when it is required is high on my list of priorities for farming."