

MELBOURNE WATER - GETTING READY FOR DESALINATION



Paper Presented by:

Brie Jowett

Authors:

Brie Jowett, *Water Supply Operational Strategist,*
Julian Kinder, *Team Leader Water Control Centre,*
Dinesh Manivannan, *Water Supply System Project Manager,*

Melbourne Water



74th Annual Water Industry Engineers and Operators' Conference
Bendigo Exhibition Centre
6 to 8 September, 2011

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Brie Jowett, *Water Supply Operational Strategist*, Melbourne Water

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ABSTRACT

Victoria is currently building a desalination plant in Wonthaggi, capable of delivering up to 150 billion litres of drinking water a year.

This paper will discuss involvement of the Melbourne Water Operations Group in getting ready for desalination. It focuses on the water supply system changes required to receive water from the new plant.

Melbourne Water Operations Group was involved in three key aspects in getting ready for desalination:

- Asset integration works to reconfigure Melbourne Water's transfer system.
- Storage management to maintain water transfers and storage levels over the planning, construction, commissioning and operation of the desalination plant.
- Development of protocols for commissioning, operation and maintenance of the 84km pipeline between the desalination plant and Melbourne's existing supply network.

KEYWORDS

Melbourne Water Corporation (MWC), Cardinia Connection Alliance (CCA), Department of Sustainability (DSE), Connected Water Authority (CWA), Pressure Reducing Valves (PRV).

1.0 INTRODUCTION:

1.1 The Desalination Project

In 2007, the then Victorian Government, through the Department of Sustainability and Environment Capital Projects Division, entered into an agreement with AquaSure consortium to finance, design, build, operate and maintain a desalination plant and transfer pipeline and to design and build the underground power supply.

The desalination project includes the construction and operation of the desalination plant, marine structures, an 84km 1930mm transfer pipeline and an 87km underground power supply. The pipeline will connect into Melbourne's water supply network at Berwick and then flow into Cardinia Reservoir or direct into the supply system. There are six other supply points along the pipeline connecting to regional towns in South Gippsland and Western Port. The two-way pipeline means these towns will also be able to be supplied from MWC if necessary. This represents a significant increase to MWC water supply network and security of supply for these towns.

MWC was required to undertake modifications to its existing water supply pipe network to allow the Desalination pipeline to connect to its network at Berwick. From Berwick, desalination water will be piped north through an existing MWC transfer pipe (the Cardinia-Pearcedale main), and through a new 2.3km section of inlet water main which will deliver the water directly into Cardinia Reservoir.

The decision to reconfigure MWC existing outlet main from Cardinia to become part of the desalination inlet pipeline saved in the order of \$80million. This change required the review of operating pressures in the main and the subsequent requirement to upgrade fittings on this main.

The desalinated water will mix with harvested water in Cardinia Reservoir before being delivered to consumers in the South, South-East, Mornington Peninsula and Pakenham areas. Importantly, significant volumes of water can also be pumped north from Cardinia Reservoir to Silvan Reservoir via the new Cardinia pump station for delivery to other parts of the distribution network.

To complete the modifications to the existing water supply system, MWC formed the Cardinia Connection Alliance (CCA) with alliance partners John Holland, Sinclair Knight Merz (SKM) and Pipe & Civil.



Figure 1: Overview of Desalinated water in to Melbourne water supply system

2.0 DISCUSSION

2.1 Melbourne Water’s Asset Integration Project

The system augmentations required to MWC assets for the connection of desalination included the following key aspects:

- Connection works at Soldiers Rd, Berwick – Including the removal of a Pressure Reducing Valve (PRV) station, interconnection of three large water mains and provision of two connection points (Refer Figure 2).

2. Step 2 – Proactive maintenance:

The proactive maintenance program is implemented to ensure all assets have been checked and tested just prior to commencing a shutdown, to confirm if the asset is operational or requires repair or replacement.

Team Integration

It was identified from learning's from the North-South Pipeline project that having a MWC representative seconded to the alliance would be beneficial to the CCA. As such, Project Manager Julian Kinder was seconded full time for 6 months to the CCA as the Shutdown Manager. As part of the CCA team, Julian had input in the decision making process and project programming. He was an important asset to the team as someone who understood the transfer system, its people and its process. This ensured planning for shutdowns ran smoothly to meet the tight time frame whilst meeting system requirements.

During the six month secondment, Julian also received a well rounded view of the private industries requirements from design through to construction. This has enabled him to build and increase his construction knowledge and skill set, to the benefit of MWC.

Due to the adherence to these MWC procedures and team integration, a successful outcome was achieved in meeting the shutdown deadlines without any water quality issues, loss of supply or OHS incidents.

2.2 Storage Management

Impacts on Storages and System during Construction & Commissioning.

During the commissioning of Cardinia Pump Station, up to 300ML/d of water is pumped from Cardinia Reservoir to Silvan Reservoir, reversing traditional transfer flow directions. Commissioning commenced in March 2011 and is expected to be complete by late 2011.

A major impact has been the dramatic reduction required in transfers from Upper Yarra catchment (including Upper Yarra Reservoir, O'Shannassy and the Yarra Tributaries) to Silvan. This was because there was no ability for bulk transfer from Silvan to Cardinia during pump commissioning and Silvan having little storage capabilities with an operational range of only 4,000ML. To complicate matters stream flows from June 2010 to May 2011 returned to highest levels since 1996, double 30 year averages. This meant the need to transfer high volumes of water from the Upper Yarra catchment to Silvan and Cardinia was critical.

The Cardinia Pump Station commissioning also required careful management of our Monbulk and John's Hill service reservoirs. Each pump test reversed flow up the Silvan – Cardinia main causing initial turbidity spikes. The inlets to John Hills & Monbulk required close monitoring to ensure they were not filling during a high turbidity event. MWC and Yarra Valley Water worked together managing both reservoirs during the testing phase.

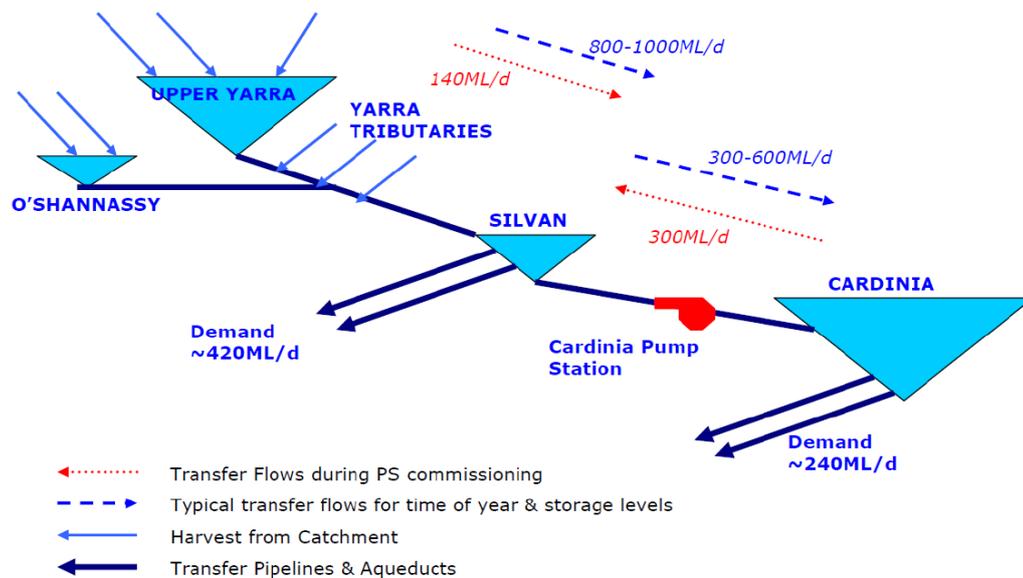


Figure 3: *Schematic of bulk water transfers between storages for Cardinia Pump Station Commissioning*

During commissioning of the Desalinated Water Supply Transfer Pipeline and Pump Station, scheduled to commence in late 2011, water will initially be supplied from Cardinia Reservoir to fill the pipeline for hydrostatic testing. Following hydrostatic testing of the pipeline the Desalination Transfer Pump Station and PRV's will be commissioned, sending water back and forth to Cardinia from the Desalination Transfer Pipeline. These two stages have less impact on the reservoir storage volumes, but water quality impacts and associated shutdowns will need to be managed by operations.

The commissioning and reliability testing periods for the Desalination Plant will then commence. MWC Operations must manage Cardinia Reservoir levels to ensure storage space is available for this water regardless of system wide storage levels. Following the very wet 2010/2011 season, in average or wet conditions for the remainder of 2011, the Upper Yarra Catchment will require careful management to achieve this goal.

Future Impacts on Storage Management when Desalination Plant is operational.

In average or dry conditions (based on 2000-2010 averages), the desalination plant will be a strategically significant part of Melbourne's water supply network. The Cardinia Pump Station and associated system augmentations allow water to be transferred from Cardinia Reservoir to Silvan reservoir in significant volumes. This not only allows the distribution of desalination water to the entire supply network, but increases MWC flexibility to utilise storage in Cardinia for harvest water. It will allow for the transfer and temporary storage of water from higher fire risk storages in fire danger periods, without limiting where this water may be used once it reaches Cardinia Reservoir.

Prior to the desalination project, Cardinia Reservoir has typically operated within operational ranges of 160,000ML to 210,000ML. Following completion of the desalination plant, it is expected to operate at higher levels, up to its maximum operating level of 265,000ML. Post commissioning and reliability testing periods, maximising storage capacity whilst optimising the system for water quality and costs will be inputs to consider when determining how much desalination water to order.

The major challenge of managing this source of supply will be timing. Management of the storages over the spring season will be the most challenging period each year, as the desalination supply order for that year will be committed based on storage levels and long-term weather forecasts from the previous year. If seasonal conditions change from forecasts, Cardinia Reservoir capacity will be required for both storage of additional harvest from the Upper Yarra catchment as well as committed desalination water volumes.

2.3 Having The Right Protocols In Place

AquaSure in consultation with DSE, MWC and other connected water authorities have developed protocols to manage the scenarios for commissioning and ongoing plant operations and to meet the requirements of the Project Deed and Water Interface Agreement. The documents cover both the day to day contractual and reporting activities between all parties. The purpose, roles and responsibilities are clearly identified within each document. The protocols include:

- Communications, Reporting, roles and responsibilities
- Access to facilities, land and systems
- Information Management
- Incident Management
- Risk Management
- Water Flow Metering
- Management of Water Quality Exceedence
- Delivery Point Supply
- Water supply
- Shutdown, Reverse flow and Restart
- Commissioning and testing the transfer pipeline

All Protocols are expected to be finalised by mid to late 2011.

3.0 ACKNOWLEDGEMENTS

Thanks to members within the Melbourne Water Operations and Technical Support teams who are working on the Desalination Integration works, Cardinia Connection Alliance works and in preparing Melbourne Water to receive the desalinated water.

4.0 CONCLUSIONS

Desalination provides a crucial alternative source to secure Melbourne's water supply against its traditional rainfall dependency. The Cardinia Pump Station and system augmentations provide MWC with increased flexibility in storage and distribution of harvest and desalinated water. Getting ready for desalination has required extensive planning and the development of ongoing operational relationships and protocols.

Having operational resources embedded in the CCA alliance to deliver the asset integration works and dedicated representatives for storage management and the development of protocols has ensured success of the integration of the Desalination project and associated works.