

MACQUARIE RIVER TO ORANGE PIPELINE PROJECT



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ABSTRACT

To address the shortfall in supply and to provide certainty for the future, Orange City Council is constructing a pipeline from the Macquarie River to Orange. The design and development of this project has taken into account the existing and future water needs of the Orange community; justification of this project; projected population growth; secure water yields with demand management measures in place; and potential environmental, economic, community and climate change impacts.

Once fully operational, the project will provide for the water supply needs of Orange community until 2040 under high population growth, and until 2060 under a medium growth scenarios.

The project is being undertaken as part of a broad based water supply strategy for the next 50 years and beyond which focuses on ongoing water conservation, quality and demand management and the provision of key water supply infrastructure at least 10 years in advance of projected demand.

1.0 INTRODUCTION

Orange has experienced water shortages for some time. In May 2010, the city was on the brink of level six water restrictions, which would have severely restricted business and industry activity within the city.

Since 2002, Council has applied a water conservation and demand management program. As a result of this program, water consumption in Orange has reduced from a high of 7,120ML per year in 2002 to 3,708ML per year in 2010 under level 5a restrictions. However, the studies undertaken have identified that, even with these initiatives in place, the demand for water would continue to exceed the secure yield of the city's water supplies. Therefore, an additional water supply option would be needed in the short term to reduce the current and immediate shortfall as well as to provide additional supply to meet the needs of future growth.

Studies undertaken included the following:

- The existing secure yield of Orange's water supply is 4,750ML per year
- The underlying potable water demand for Orange is 5,400ML per year
- The existing secure yield is 650ML per year below the current underlying demand
- As growth continues, so will demand and the supply and demand gap will widen
- To meet existing levels of demand and short term growth (over the next 10 years), the existing water supply needs to be augmented by an additional 770ML to 1,020ML of water per year. If the high growth scenario was to eventuate, a 1,020ML of water per year augmentation would only last until about 2020, following which further augmentation would be required.

Council has considered a range of potential options within and surrounding Orange to augment its water supply, including:

- Installation of rain water tanks – on up to 10,000 buildings
- Indirect potable reuse involving membrane treatment of 10ML per day of effluent

- Groundwater extraction – this included pumping existing bores harder, installing additional bores and managed aquifer recharge.
- Stormwater harvesting – involving capturing and treating stormwater. Council had previously implemented stage 1 of this scheme. Two planned stages of expansion of this scheme were considered
- Extraction from Macquarie River – involving 39km pipeline to convey water from the river to Orange’s Suma Park Dam
- Extraction from Burrendong Dam – similar to the Macquarie River option, but would require significantly longer pipeline (approx. double)
- Mulyan Creek Dam – although a new dam would present significant environmental and community issues, it would have the potential to add 400ML per year secure yield.

Council has a water supply entitlement that provides access to 7,800ML per year of water for water supply purposes from the Macquarie River catchment. Orange’s main reservoir, Suma Park Dam falls within this catchment. The existing water supply system cannot deliver this supply with security and the addition of this project would provide a more diversified system, which would contribute to the future water security of the Orange community. Adding independent water sources to the system increases security.

Suma Park Dam has a catchment of 179² km. The Macquarie River has a catchment area of 7,100² km to the proposed offtake point.

The Macquarie River option was identified as the best single option to meet the short term and long term augmentation target. This option also has the flexibility to meet both current and future demands. Furthermore, the availability of a Commonwealth Government Grant makes it one of the most affordable options available, delivering the required increase in supply in both the short and long term for the lowest cost.

In 2010, in response to the water security shortfall, Council developed, investigated and assessed various strategic options prior to identifying a preferred development option (this project), and commissioning the concept design and environmental impact assessment process.

The strategic options considered included reducing demand and increasing supply, as well as the ‘do nothing’ option. The do nothing option would not resolve the existing limitations of the current water supply and would not provide for the current and future growth of Orange and expectations of the local community.

Council has already implemented a comprehensive suite of demand management measures to achieve a marked reduction in consumer demand. This includes Blackmans Swamp Creek Stormwater Harvesting, Ploughmans Creek Stormwater Harvesting, Bore water, water loss management, pressure reductions and water restrictions. There are limited additional demand measures that could be implemented to decrease demand further. The only option therefore is to develop options to increase supply.

Ten feasible supply augmentation options were shortlisted from a longer list of possible options, based on consideration of a range of social, economic, governance and environmental criteria. Feasible options were considered either in isolation or in combination, in terms of their ability to meet both short term (immediate) supply needs and the identified long term (50 year) augmentation target.

Council identified that the Macquarie Pipeline option (the project) is the only option that can deliver on immediate needs (an additional 1,000ML per year) as well as meeting water demands cost effectively in the longer term (a minimum of 2,700ML per year). Council commenced the development of this project in 2011. This included survey, investigation and design, environmental assessment, community consultation and landholders negotiations. The development phase of this project has cost approx. \$4M.

Approval was received from NSW Department of Planning and Infrastructure on 18 June 2013. Approval was received from Australian Government Department of Sustainability, Environment, Water, Population and Communities on 19 August 2013.

2.0 DISCUSSION

The Macquarie River has been identified as being able to deliver an average yield of 1,616ML per year including:

- Meet best practice secure yield guidelines consistent with the NSW ‘water security of supply basis’
- Deliver a minimum of 1,000ML of water per year as additional secure yield, to satisfy supply needs in the short term
- Deliver a minimum secure yield of 2,700ML of water per year, to meet the expected demand to 2060
- Diversify Orange’s water supply sources in an environmentally sustainable way, to ensure resilience in times of drought
- Consist of components which can be delivered in the required timeframe
- Adapt to changes in demand and/or supply if they are impacted by climate change.

2.1 Key Project Components

The key project components include:

1. An offtake structure and associated pumping station at the Macquarie River – High lift vertical turbine pumps to draw in raw water at a design flow rate of 177L/s and transfer the water to a break tank with a total head of 311m. Up to 12ML per day would be extracted over an average period of 19 hours per day (to avoid peak power periods). The offtake module would incorporate trash screens to remove large floating objects from the intake water and fine screens (2mm) to prevent the uptake of and/or fouling by smaller objects and fauna.

The offtake structure incorporates features to minimise potential impacts including:

- Location of the structure in a section of the river with relatively slower flows – minimising potential for erosion impacts
- Filter module to minimise the uptake of smaller objects including aquatic organisms (such as eggs or larvae)
- The sizing of the large screen would provide a start up velocity of 0.05m² and the sizing of the fine screen would provide a start up velocity of 0.15m² allowing aquatic fauna to escape
- An air purge system to clean the fine filters, which would also operate to scare fish from the offtake chamber prior to start up
- The proposed 19 hour pumping period would provide less mobile aquatic organisms the opportunity to escape the inlet for a period of 5 hrs per day
- Scour protection around the intake structure to stabilise the embankment
- Telemetry to real time water quality monitoring, ensuring pumping does not occur during periods of poor water quality in the river.

2. The pipeline – approx. 39 km long. The first 2.6km will be 457mm Mild Steel Cement Lined (MSCL) pipe with a pressure rating of PN50. The remaining 36.4 km will be Ductile Iron Cement Lined (DACL) pipe with a pressure rating of PN35. Thrust restraints are conventional mass concrete where pressure and ground bearing capacity permit. Where the pressure is greater and ground bearing capacity is low, thrust restraints are provided by lengths of welded MSCL.
3. The entire pipeline will be laid underground in a trench ranging from 1.2m to 2.0m depth. Scour valves, air valves and section valves will be provided to maintain the pipeline as required. The pipeline is aligned parallel to public roads to enable ease of access for maintenance purposes.
4. Two booster pump stations and associated break tanks would be required to transfer water through the pipeline. These pumps are horizontal mounted end suction, with radially split multi stages with a total head of 185m each.
5. A discharge structure at Suma Park Dam.
6. Power supply upgrades and connection of telemetry systems –approximately 25 km of the existing power supply will be required to be upgraded to three phase 11kVa. Approximately 4 km of new power supply will be required to the three pump stations. Telemetry system will consist of a combination of micro wave and UHF radio to enable operation in accordance with design, permit real time operation of the pump stations and data capture.

2.2 Operating Regime

On average the project would:

- Deliver 1,616ML of water to Suma Park Reservoir
- Extract water from the Macquarie River 135 days of the year
- Have a maximum extraction rate of 12ML per day
- Pump water over a period of 19 hours per day

2.3 Operating Rules

The project would extract up to 12ML per day when the following conditions are met:

- The storage level of Suma Park Reservoir is less than 90% full
- The flow in the Macquarie River exceeds 108ML per day
- The water quality within the Macquarie River is acceptable for extraction.

A NSW Office of Water gauging station has been established to provide accurate flow and water level data. This station will be incorporated into the telemetry system to ensure pump operations would automatically meet the agreed operational triggers.

2.4 Water Quality

A Hazard Analysis and Critical Control Point Workshop have been undertaken that included a water quality model. Sampling has been taken from the river at regular intervals since 2011. Sampling has enabled Council to achieve a high degree of certainty in the average values for a number of water quality parameters. Council has confidence that the raw water from the Macquarie River will be successfully treated by the existing water filtration process without the need for augmentation.

2.5 Environmental Considerations

Environmental considerations including specialist assessments of ecology; heritage; soils and groundwater; hydrology; geomorphology; landscape and visual amenity; air; noise and vibration; and traffic were undertaken in preparing the environmental assessment. The environmental assessment has documented the potential environmental impacts of the project, considering both potential positive and negative impacts, and identifies mitigation and management measures to protect the environment where required.

The main potential impacts include:

- Impacts to terrestrial native flora and fauna and heritage sites as a result of clearing and disturbance during construction
- Impact to aquatic ecology at the offtake site
- Water quality impacts during construction
- Geomorphological impacts to watercourses crossed by the pipeline
- Visual impacts from introducing new permanent structures in the landscape
- Amenity related impacts during construction eg noise, dust, traffic
- The need to acquire a permanent pipeline and power easement

The majority of the potential construction related impacts would be effectively managed by the implementation of best practice construction management and implementation of management plans.

2.6 Social and Economic Considerations

The main socio-economic consequences of the project are:

- An increase in water rates
- Improved water security for the existing and future community
- Need for land acquisition for the easement
- Employment during construction
- Amenity related impacts during construction

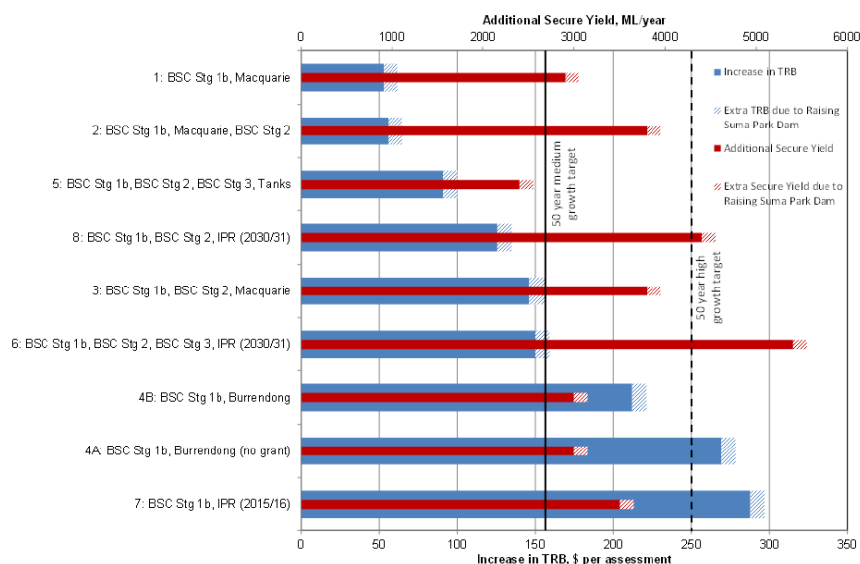


Figure 2: Average \$ per annum increment on Typical Residential Bill

As this figure shows, the project (Macquarie Pipeline with Government Grant) combined with the already completed stormwater harvesting stage 1b, will result in an increase of approximately \$52 per year on the typical residential bill.

2.7 Construction

The \$47M project represents a combined investment from the Federal Government - \$20M, State Government - \$18.2M and Orange City Council - \$8.8M. The project budget has been estimated at \$47m and construction commenced in October 2013. It is estimate that the project will be completed by December 2014. Representatives from the NSW Office of Water and Department of Sustainability, Environment, Water, Population and Communities are overseeing the project to ensure the project to ensure project delivery outputs within time, budget and quality.

Orange City Council is managing the contract with an experienced team of staff utilising contracts project management system – Aconex. Contacts were developed in consultation with legal consultants for the following major contracts:

- Supply and construction of the pipeline project – including pipes, pumps, low voltage electrical switchgear (Leed Constructions)
- Power supply for the project – includes high voltage power supply to the three pump stations (Poles & Underground)
- Refurbishment of the existing power supply (Essential Energy)

2.8 Property Construction and Management Plans

Individual property management plans have been developed in consultation with individual landowners with respect to property access arrangements, rehabilitation of the construction corridor, management of the easement and maintenance of the project.

These plans have been individually prepared for each property and include the development of farm maps that include specific conditions as listed in the signed property access agreements. The plans include clean down procedures for all construction plant and vehicles when entering and leaving properties.

A key focus of the plans are the provisions for the long term rehabilitation of the construction corridor including control measures to rehabilitate the affected areas in relation to weeds, soil erosion and long term rehabilitation.

3.0 CONCLUSION

The Macquarie Pipeline to Orange Pipeline Project is justified because it:

- Responds to a recognised need and is consistent with local and regional water and land use planning
- Provides a number of benefits, the most important of which is its contribution to the future water security of the Orange community
- Is in the public interest and the site is suitable for the project
- Is consistent with the objects of the EP&A Act and the principles of ecologically sustainable development.

There is a justified need for the project to deliver water security to Orange. The project was developed as an outcome of an extensive range of studies, investigations and strategy options. These studies considered a range of possible alternatives to the project.

The consequences of not proceeding with the project are considered unacceptable and the Macquarie River to Orange Pipeline Project will deliver the best value for money water security for the Orange community that will meet both short term and long term water supply demands.