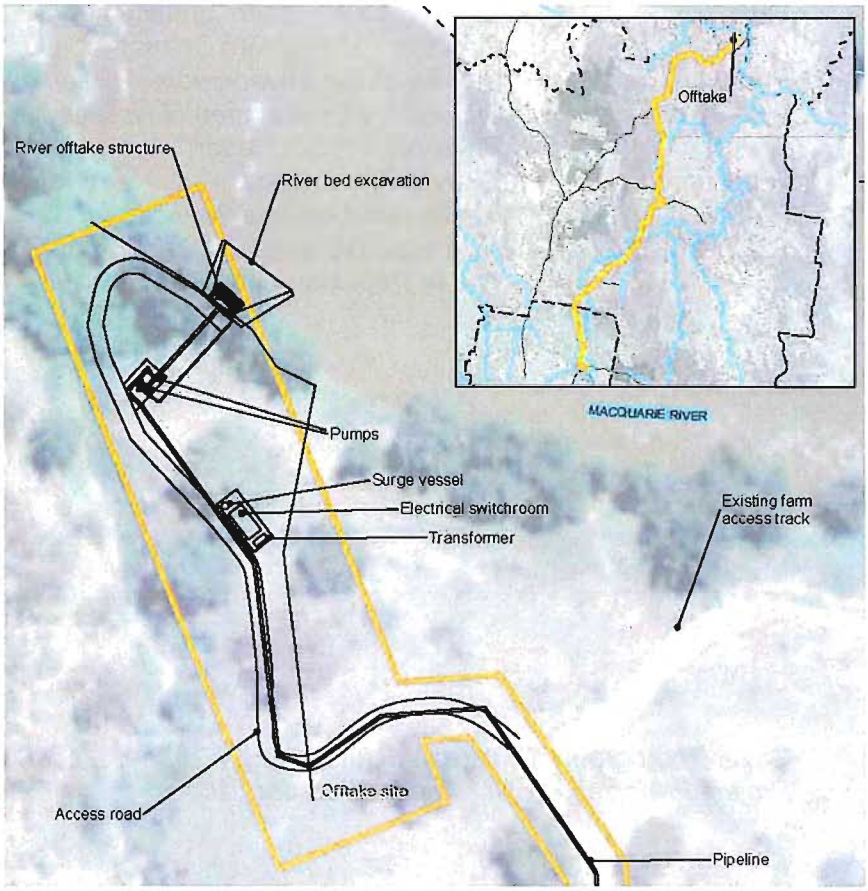
NSW GOVERNMENT | Planning & Infrastructure

MAJOR PROJECT ASSESSMENT: Macquarie River to Orange Pipeline Project Orange and Cabonne Local Government Areas (MP10_0235)



Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

May 2013

ABBREVIATIONS

CIV	Capital Investment Value
CENTROC	Central NSW Councils Regional Organisation of Councils
Department	Department of Planning & Infrastructure
DGRs	Director-General's Requirements
Director-General	Director-General of the Department of Planning & Infrastructure
DPI	Department of Primary Industries and includes the NSW Office of Water (NOW), Fisheries NSW, Crown Lands and Agriculture NSW.
EA	Environmental Assessment
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPI	Environmental Planning Instrument
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
Minister	Minister for Planning and Infrastructure
ML	mega litres
OEH	Office of Environment and Heritage
PAC	Planning Assessment Commission
Part 3A	Part 3A of the *Environmental Planning and Assessment Act 1979*
PEA	Preliminary Environmental Assessment
PPR	Preferred Project Report
Proponent	Orange City Council
RMS	Roads and Maritime Services
SEWPaC	Australian Government Department of Sustainability, Environment, Water, Population and Communities

Cover Photograph: Offtake structure layout (Source*: Macquarie River to Orange Pipeline Project Preferred Project Report, February 2013*)

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GLOSSARY OF TERMS

Term	Definition
80th Percentile	Refers to the flow in the Macquarie River where for 80 percent of the time the flow would be equal to or greater than this threshold
Available Water Allocations	The Department of Primary Industries (Office of Water) determination that specifies how much of a water entitlement licence holders can extract from a river or aquifer over the course of that year. Where this entitlement is less than 100% it is regularly reviewed.
Level 2 Water Restrictions	Permits all uses of water except where restrictions are imposed on residential and non-residential water use for lawn and garden watering, car washing, cleaning of exterior areas and topping up and filling of swimming pools.
Level 5 Water Restrictions	Imposes constraints on residential and non-residential water use including restricting: • residential water use to water gardens to once a week for two hours only; a three minute shower or one bath (100 mm depth) per person per day, only full loads of clothes permitted to be washed and restricting the use of evaporative air conditioners to between 07:00 – 24:00 daily with exemptions possible for aged accommodation or nursing homes. • non-residential water use for watering of gardens to once a week for two hours only and the use of water in all businesses (except for the construction industry eg. for use in mortar or concrete) to be in accordance with a Water Savings Action Plan.
Level 5A Water Restrictions	In addition to the constraints imposed under Level 5, further restrictions limiting the watering of gardens to only ½ hr per week would be imposed.
Level 6 Water Restrictions	Impose severe constraints on residential and non-residential water use including restricting: • residential water use to a three minute shower or one bath (100mm depth) per person per day, two full loads of clothes per week; and restricting the use of evaporative air conditioners to between 18:00 – 22:00 daily with exemptions possible for aged accommodation or nursing homes. • non-residential water use except for use associated with hospitals, hospices, nursing homes, child care, rehab centres, aged accommodation and pet care in accordance with a Water Savings Action Plan.
Secure Yield	The Secure Yield is defined as the highest annual water demand that can be supplied from a water supply system while meeting the NSW Security of Supply Basis. See also Appendix D *Independent Review of Hydrological Modelling* (Bewsher Consulting, April 2013), Appendix A for a more detailed definition.
Security of Supply Basis (NSW)	The Security of Supply Basis was developed for sizing water supply systems to ensure cost-effective systems are developed which can provide a water supply in future droughts without the need for excessive frequency, severity or duration of water restrictions. It is defined as: a) the duration of water restrictions do not exceed 5% of the time; b) the frequency of water restrictions do not exceed 10% of years (or one year in 10 on average); c) the severity of restrictions do not exceed 10%. (Systems must be able to meet 90% of the unrestricted water demand (which is an average 10% reduction in consumption due to water restrictions) through a repetition of the worst recorded drought, commencing with the storage drawn down to the level at which restrictions need to be imposed to meet a) and b).
Water Access Licence	A licence to allow access to water in accordance with the relevant Water Sharing Plan. A High Security Access licence – has priority over other access licences except for local water utility access licences, major utility access licences and domestic and stock access licences. During severe water shortage the following priorities are prescribed under the *Water Management Act 2000:* 1st – domestic supply for towns, utilities and basic landholder rights; 2nd – environmental needs; 3rd – commercial supply for towns and utilities high security needs; and 4th – other licensed needs.

EXECUTIVE SUMMARY

Orange City Council has lodged a project application for the construction and operation of a 39 kilometre long underground pipeline and associated infrastructure to transfer water from the Macquarie River to Suma Park Reservoir. The pipeline is located within the Cabonne and Orange local government areas. The project is a transitional Part 3A project.

The project includes: offtake and discharge structures; three pumping stations; a new and upgraded transmission line; and associated infrastructure. The project was developed in response to recent, severe drought conditions experienced in the region and is expected to improve water supply security for Orange for the next 26 to 58 years. The project is proposed to be operated so that water would be pumped more often when available to keep the water level in Suma Park Reservoir high instead of pumping a greater volume of water when the water storage level is low and which may coincide with low flows in the Macquarie River. It has a capital investment value of approximately $47 million with Australian and State Government grants totalling $38.2 million ($20 million from the Australian Government's Water for the Future initiative and $18 million from the NSW Country Towns Water Supply and Sewerage Program) and is expected to generate 100 construction and two operational positions.

The project environmental assessment was placed on public exhibition between 29 August 2012 and 15 October 2012. 140 submissions from the general public were received during the exhibition period. Of these 137 objected to the proposal. The remaining submissions raised concerns without stating a position. A further 25 late submissions were also received. Key issues raised included:

- aquatic and terrestrial ecology impacts;
- impacts on downstream users of the Macquarie River including the Macquarie Marshes;
- justification for the project and alternatives considered;
- impacts on recreational fishing; and
- sustainability of the project.

Four submissions were received from public authorities being: Environment Protection Authority; Office of Environment and Heritage; NSW Department of Primary Industries including NSW Office of Water, Fisheries NSW, Crown Lands and Agriculture NSW; and the Roads and Maritime Services. All indicated no objection to the project but did provide comments or recommended conditions of approval for the Department's consideration.

The Proponent submitted a Preferred Project Report, addressing the issues raised in submissions and proposed changes to the alignment, construction and operation of the pipeline. It also included supplementary reports on groundwater, hydrology and water security; water quality and geomorphology; terrestrial and aquatic ecology; air quality; noise; cultural heritage; landscape and visual impact; contamination and soils; and traffic and transport.

The Department has undertaken a comprehensive assessment of the merits of the project and is satisfied that it is required to help secure Orange's water supply and therefore is in the public interest. The Department considers that the justification for the project is clear, and does not dispute Orange City Council's need to diversify and augment its water supply system.

Notwithstanding, the Department engaged Bewsher Consulting to undertake an independent review of the hydrological aspects of the project and relevant issues raised in submissions to assist the Department with its assessment. As a result of this review and assessment, the Department recommends a variation to the project's operating parameters including the adoption of the 80th percentile flow (80 percent of the time the flow would be equal to or greater than this threshold) to determine the pumping trigger and an interim pumping trigger of 108 ML/day instead of the Proponent's proposed 38 ML/day.

The Department also considers that all environmental issues associated with the construction and operation of the pipeline have been addressed and can be managed to acceptable levels subject to the Proponent's Statement of Commitments and the Department's Recommended Conditions. The Department therefore recommends that the Project be approved.

1 BACKGROUND

Until more recently, Orange faced drought conditions and almost continuous water restrictions since 2003. Water security investigations commissioned by the Proponent have identified a current secure yield deficit of 650 mega litres (ML) per year which is predicted to increase as Orange's population grows and the effects of climate change are considered.

The Proponent has also adopted an integrated approach to water supply management which currently includes water conservation and demand management measures, stormwater harvesting schemes, extraction from ground water bores and treatment of effluent to supplement surface water supply and that captured by Suma Park and Spring Creek reservoirs (two reservoirs supplying Orange).

Orange City Council (the Proponent), has adopted a policy to provide sufficient secure yield to meet water demand in 10 years time and to consider water supply management over a 50 year planning horizon. Orange Council has an existing water supply entitlement to extract up to 7,800 ML/year for town water supply purposes from the Macquarie system. This entitlement is also included in the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources* (NSW Office of Water, 2012). The existing water supply system cannot deliver this supply with security. The Proponent has predicted that on average an additional secure yield of between 770 to 1020 ML per year would be required by 2035 depending on the rate of population growth and between 2,700 to 5,200ML per year when considering the potential impacts of climate change.

The *Orange Emergency Water Supply Further Feasibility Assessment* (MWH, 2010) considered a range of options to address this shortfall when less than two years water supply was available and Orange was on Level 5 Water Restrictions. The Macquarie River to Orange Pipeline (the Project) was one of the options considered. The Project consists of an approximately 39 kilometre underground pipeline between the upper Macquarie River and Suma Park Dam located in the Cabonne and Orange local government areas. The Project is expected to transfer an average of 1,616 ML per year (ranging from zero to 3,804 ML/year).

1.1 Location

The Project is located in the central west of NSW approximately 250 kilometres from Sydney on land within the Orange and Cabonne local government areas. The alignment runs generally to the north of Orange, commencing at the Macquarie River and mostly following Long Point Road, Oaky Lane and Ophir Road before discharging into Suma Park Reservoir. The project location illustrating the changes made to the alignment as exhibited in the Environmental Assessment is shown in Figure 1 (ie. the Preferred Project).

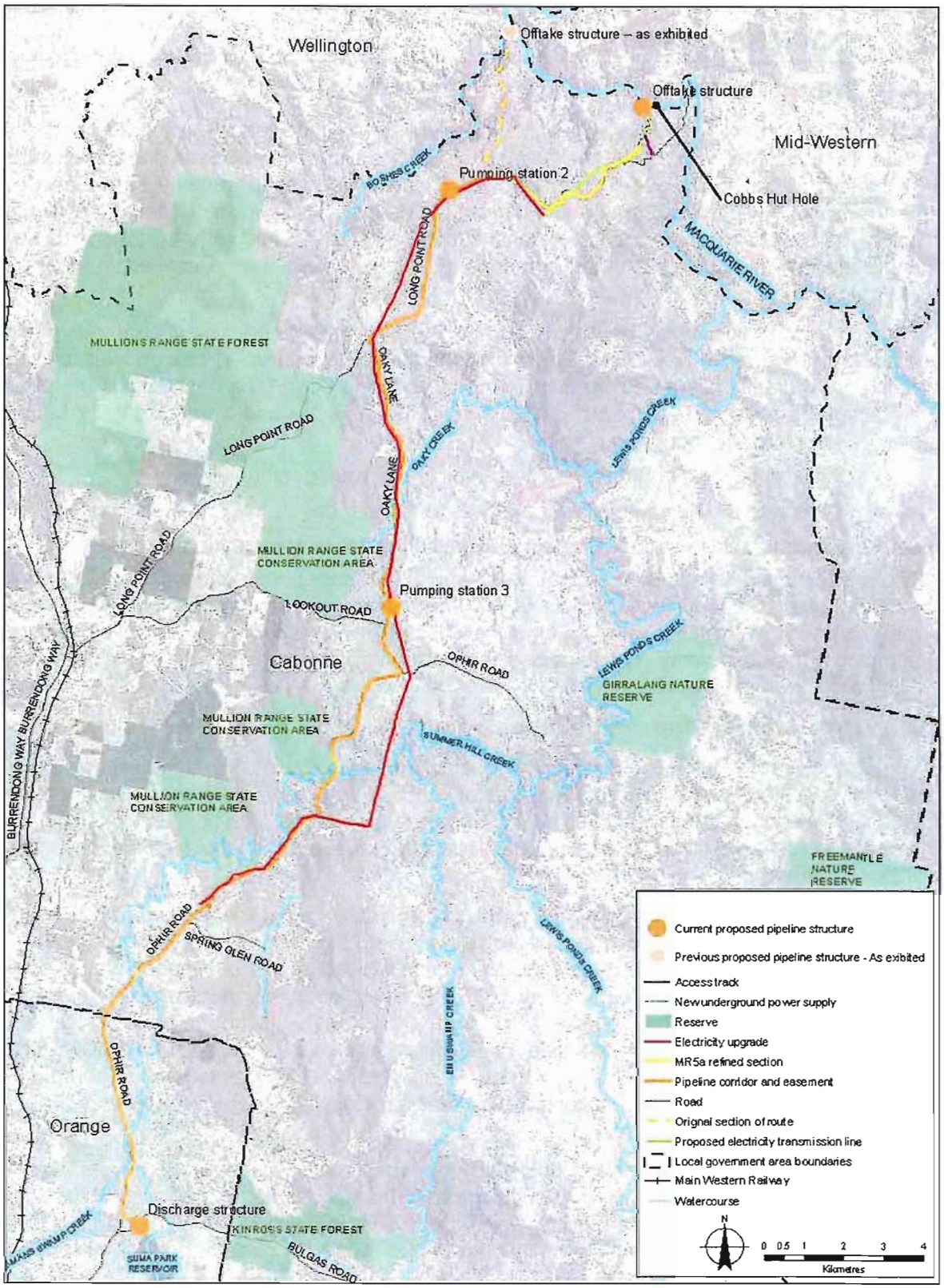
Orange City has a population of approximately 38,000 people and is a major service, commercial and administrative centre for central NSW. Orange is also an Evocity; a city identified in a State and Federal supported campaign to encourage capital city residents to move to regional cities.

The Cabonne local government area is predominantly focused on primary industry (agriculture, viticulture and horticulture) and mining as the basis of its local economy.

1.2 Surrounding Land Use

A variety of land uses are present along the proposed pipeline route. These include rural (grazing), rural residential, conservation reserves, crown land, forestry, infrastructure (roads and powerlines) and informal recreation use (fishing and canoeing). Disturbances from past mining activities (1850s to 1930s) are also evident.

The pipeline in the northern most section passes through remote undulating hills with steeper slopes and parts cleared for grazing with rocky outcrops. Further south the pipeline passes through areas with small hills and sheltered slopes and crosses several watercourses. Rural residential properties are scattered throughout the area with the pipeline passing through the outskirts of Orange at its southern most end.



Source: Macquarie River to Orange Pipeline Project Preferred Project Report, February 2013

Figure 1. Project location and changes to project as exhibited

2 PROPOSED PROJECT

2.1 Project Description

Orange City Council proposes to construct and operate an underground water pipeline to transfer water from the Macquarie River at Cobbs Hut Hole to Suma Park Reservoir, approximately 39 kilometres to the south, see Figure 1 above. The pipeline would traverse both Cabonne and Orange local government areas and incorporate ancillary infrastructure including an offtake and discharge structures; three pumping stations; two break tanks; telemetry systems and new and upgraded power supply. The key components of the project are described in Table 1 and illustrated in Figure 3.

The proposed project would be designed to transfer up to 12 ML per day over an average period of up to 19 hours per day (extraction is proposed to occur outside of peak power tariff periods which are currently between 7am and 9am and 5pm and 8pm). The operation of the pipeline is proposed to be defined by operating rules, where the project would extract up to 12 ML per day provided the following conditions are met:

- the storage level in Suma Park Reservoir is below 90 percent full;
- the flow in the Macquarie River exceeds 38 ML per day[1]; and
- the water quality in the Macquarie River is acceptable for extraction purposes.

The project would be operated so that water would be pumped more often (ie. not just during dry periods but as water becomes available and the relevant operating conditions and triggers are met) to keep the water levels in Suma Park Reservoir high as much as possible instead of pumping a greater volume of water when the water storage level is low and which may coincide with low flows in the Macquarie River.

2.2 Project Need and Justification

The Orange region has experienced drought conditions in the past and is likely to experience drought conditions in the future. Future rainfall-runoff is also considered more likely to decrease than increase when the effects of climate change are considered, with best estimates considering an eight percent reduction in water availability (*Water Availability in the Macquarie-Castlereagh,* CSIRO 2008).

The Federation Drought, from 1895 to 1902, was considered to be the worst on record. Dry conditions have also been recorded for the years 1937/38 to 1941/42, 1979 to 1983 and 2000 to 2010. From 2003, until more recently, Orange experienced almost continuous water restrictions with the more severe Level 5 and Level 5a Water Restrictions, being introduced from mid 2008 and from 31 January 2010 respectively. In May 2010, Orange was on the brink of level six water restrictions, which would have considerably restricted business and industry activity. However, even with recent rains and the dams currently at a high level (86.3 percent at 3rd February 2013[2]), water usage in Orange is still restricted and currently on Level 2 Water Restrictions.

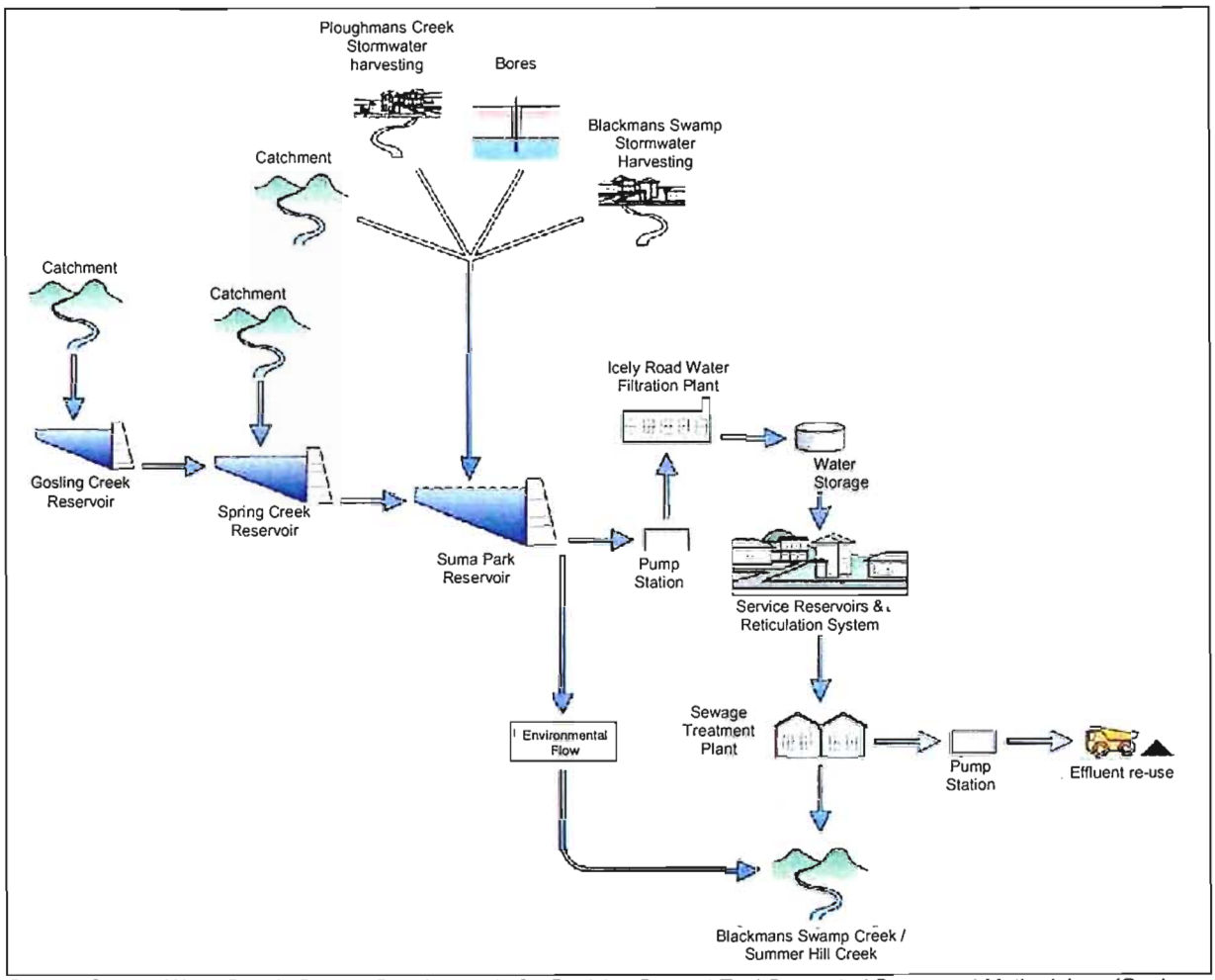
Orange City Council has adopted an integrated approach to water supply management which includes water conservation and demand management measures, stormwater harvesting schemes and ground water bores to supplement the surface water supply and that captured by Suma Park, Spring Creek and Gosling Creek reservoirs (see Figure 2). Treated effluent is also produced and 10 ML per day is currently allocated to the Cadia mine with the remaining effluent discharged to Summer Hill Creek.

[1] Earlier investigations proposed a 34 ML per day limit and reference to 34 ML per day is used in some of the specialist reports. The now proposed 38 ML per day is a more stringent criterion.

[2] http://www.orange.nsw.gov.au/site/index.cfm?display=147117&filter=i&leca=618&did=60025420

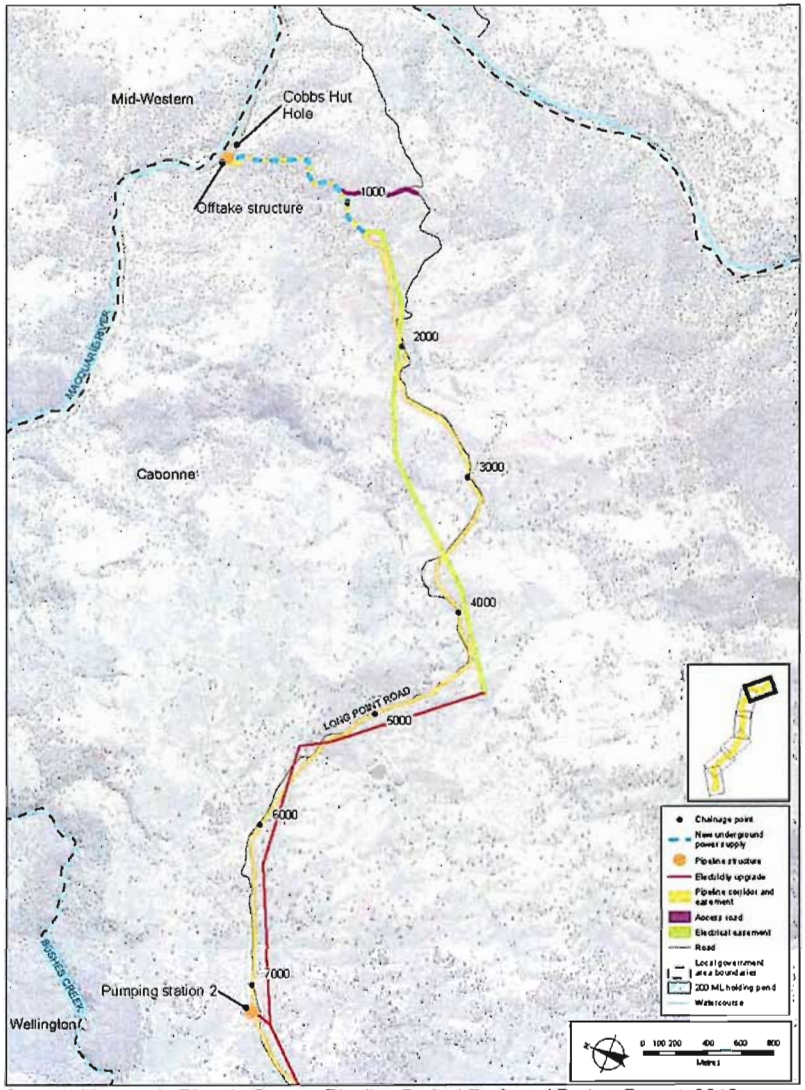
Table 1 Key Project Components

Aspect	*Description*
Project Summary	The construction, commissioning, operation and maintenance of an underground water pipeline and associated infrastructure to transfer water from the Macquarie River at Cobbs Hut Hole to Suma Park Dam. The project has a CIV of approximately $47 million and is expected to generate 100 construction and 2 operational positions and take approximately 18 months to construct.
Operation	Delivery of an average 1,616 ML/year of water from the Macquarie River to Suma Park Reservoir for an average of 135 days per year with a maximum extraction rate of 12 ML/day over 19 hours per day (extraction is proposed to occur outside of peak power tariff periods - 7am and 9am and 5pm and 8pm) when: • the storage level in Suma Park Reservoir is less than 90% full; • the flow in the Macquarie River exceeds 38 ML/day; and • the water quality within the Macquarie River is acceptable for extraction.
Water Pipeline	Approximately 39 km in length with a nominal diameter of 375 mm. The pipeline would be constructed underground within an approximate 6 to 10 m wide easement.
Offtake Structure at Macquarie River	The offtake structure would be formed by cutting into the Macquarie River bank and consist of a concrete structure trash rack enclosure surrounded by rock armouring. The offtake structure, associated pumping station and hardstand area would occupy approximately 1,500 m^2. The intake would be able to draw water from the Macquarie River at 177 L/s (litres per second) and include an air blast facility, trash screens and fine screens (2 mm).
Pumping Station 1 at Macquarie River	Two single storey brick masonry structures; one housing the pump motors and motor compressors (3 m x 4 m and 3.5 m high) and the other the motor control structure (6 m x 3 m). Both structures would be located above the 100 year average recurrence interval flood level.
Booster pumping Stations	Two booster pumping stations located at Chainages 7125 (Pumping Station 2, see Figure 2a) and 18984 (Pumping Station 3, see Figure 2c). Each may have an aboveground surge vessel, a pad-mounted power transformer, access road and small parking area and occupy a site of approximately 5,600 m^2. Pumping Station 2 would be housed in a 12 m x 4 m and 3.5 m high building with a separate motor control centre (3 m x 6 m) building and Pumping Station 3 would be housed in a single building (11 m x 7 m).
Discharge Structure at Suma Park Reservoir	The discharge structure consists of a concrete head wall and two wing walls approximately 3 to 5 m apart and 2 m high (approximately 400 m^2) located at the earth saddle dam at Suma Park Reservoir above the top water level. The pipeline would be cast into the pit with a valve to control discharge pressures and rip rap to prevent erosion.
New and Upgraded Power Supply	Approximately 3.1 km of new overhead power lines within a 20 m wide easement and 1.2 km of underground power line located within the 6 to 10 m wide pipeline easement to supply the pumping stations. Conversion of the existing single phase regulator to three-phase including the upgrade of the approximately 25 km of existing power lines, power poles and voltage regulators from Ophir Road to Long Point Road. Three new substations; located at the offtake site and the booster pumping stations.
Telemetry systems	Telemetry system to provide links to real time water quality monitoring and NSW Office of Water Gauging Station (421192).
Valves	Section/isolation valves typically located flush with the existing ground level on either side of a major crossing at the same depth as the pipeline with a spindle that rises to the surface enclosed in a valve box approximately 200 mm^2. Scour valves located at low points of the pipeline with a spindle and valve box installed flush with the existing ground level. The valves discharge to a 750 mm diameter scour pit 1 to 2 m deep and flush with the existing ground level. Air release valves located below ground and enclosed within a 1.2 m^2 pit with steel lids finished flush with the existing ground level.
Other Pipeline Infrastructure	Tapping points for the insertion of chlorine, cleaning stations approximately 5 m wide, 10 m long and 1 to 2 m deep and underground anchor or thrust blocks to mitigate hydraulic shock when pumps commence or cease operation.



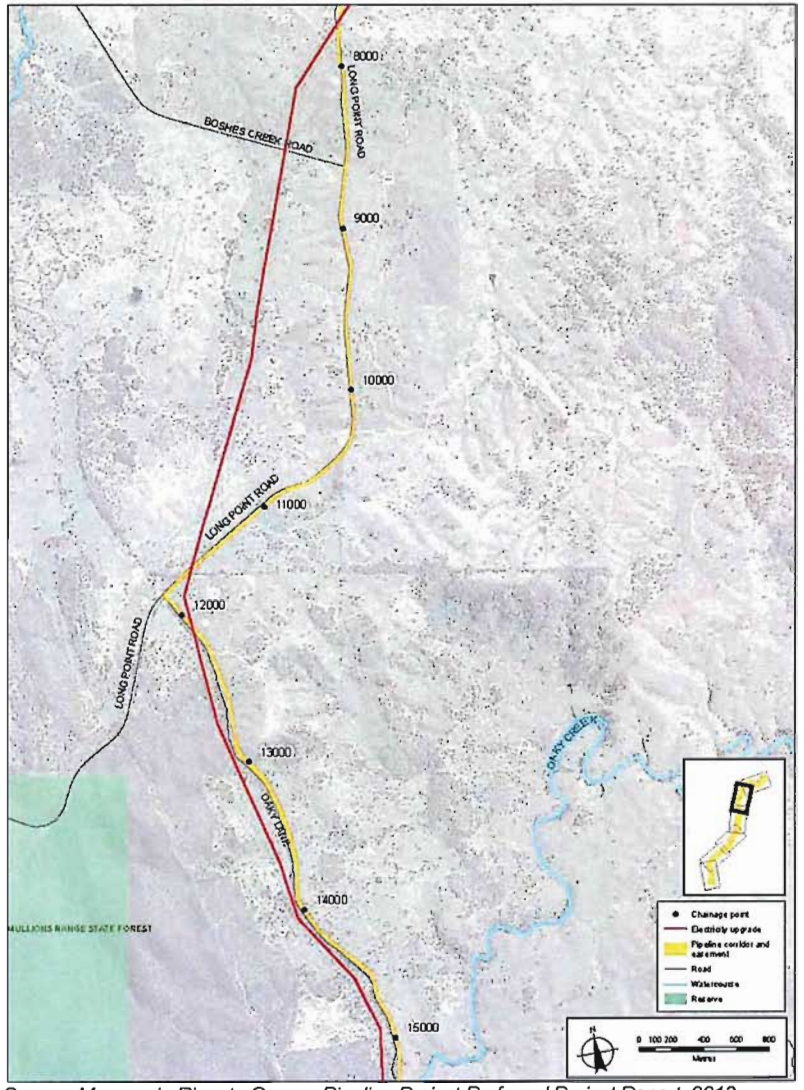
Source: Orange Water Supply System Development of a Decision Support Tool Suggested Scope and Methodology (Geolyse, January 2013)

Figure 2. The Orange Water Supply System



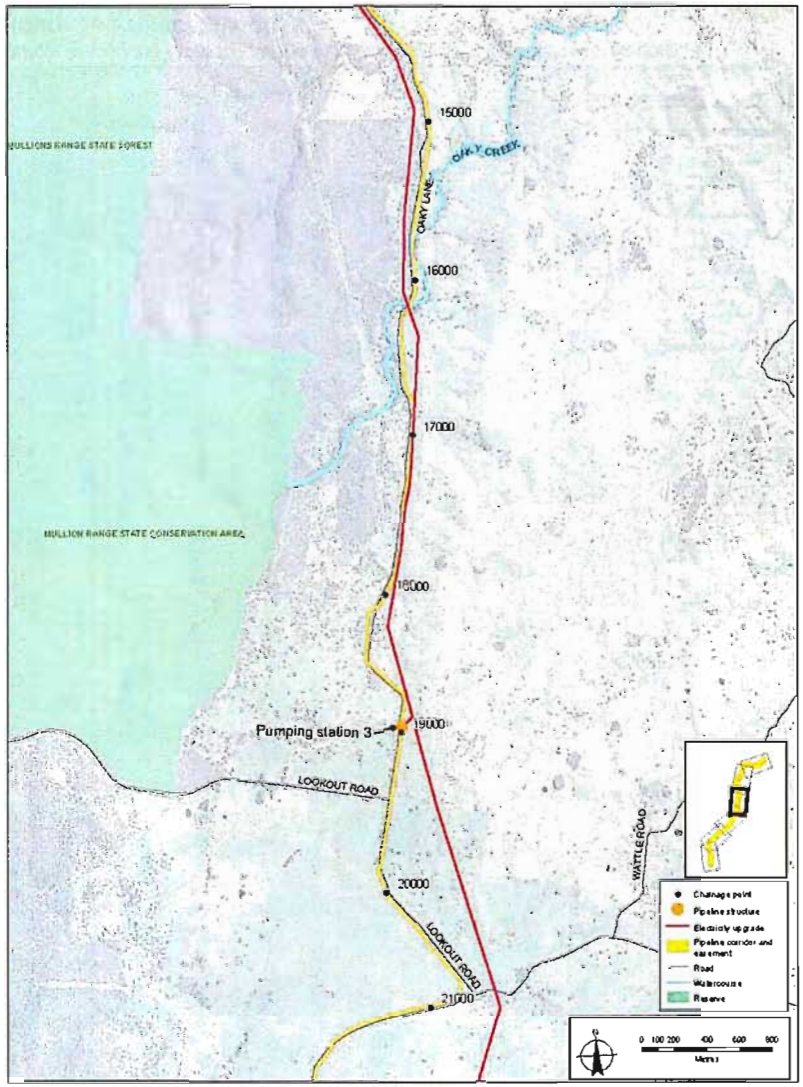
Source: Macquarie River to Orange Pipeline Project Preferred Project Report, 2013

Figure 3a Project layout



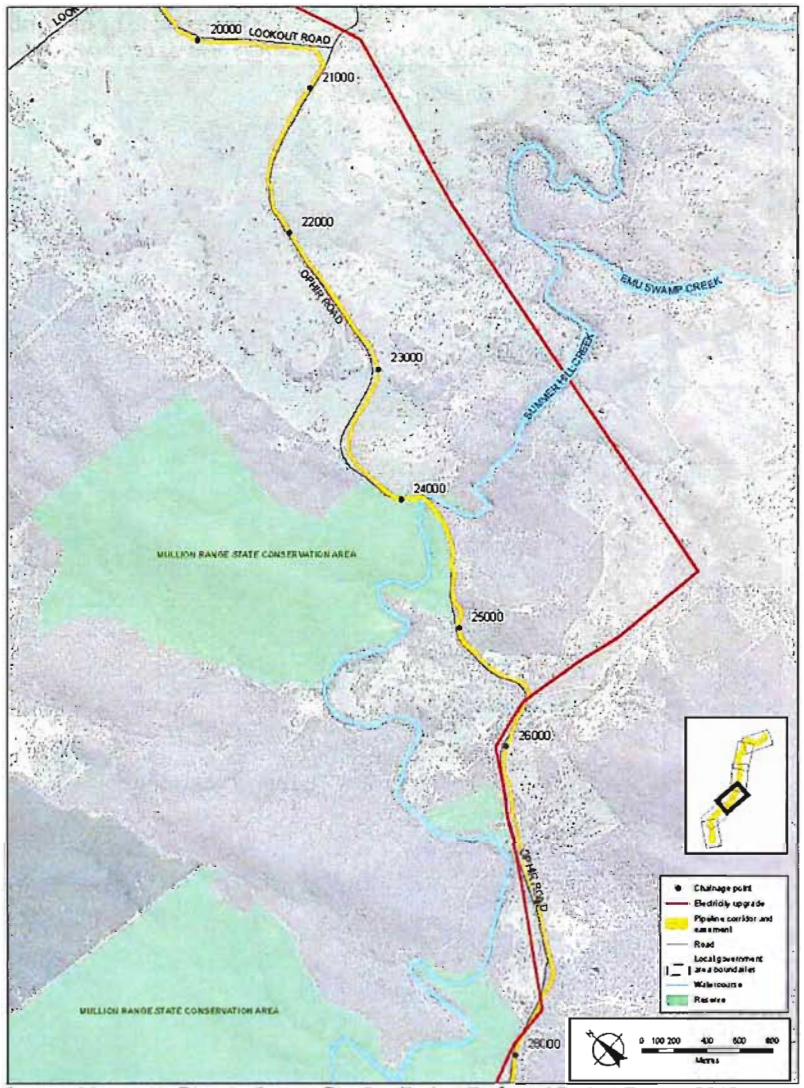
Source: Macquarie River to Orange Pipeline Project Preferred Project Report, 2013

Figure 3b Project layout



Source: Macquarie River to Orange Pipeline Project Preferred Project Report, 2013

Figure 3c Project layout

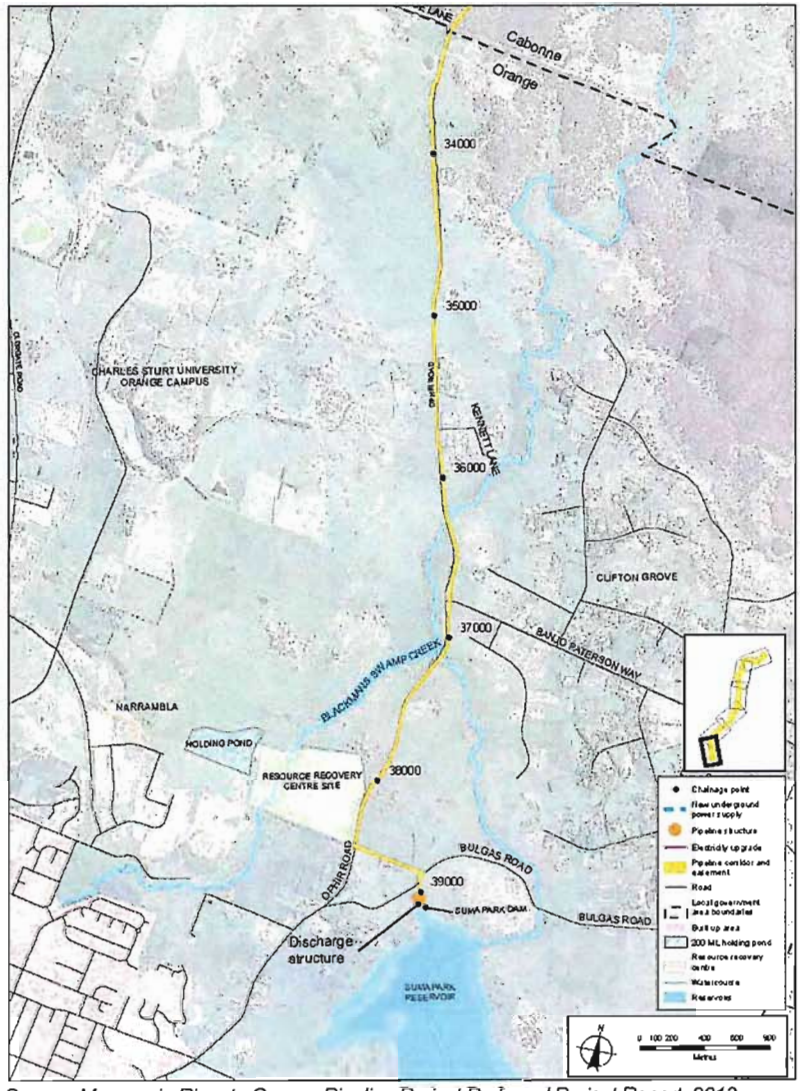


Source: Macquarie River to Orange Pipeline Project Preferred Project Report, 2013

Figure 3d Project layout

Source: Macquarie River to Orange Pipeline Project Preferred Project Report, 2013

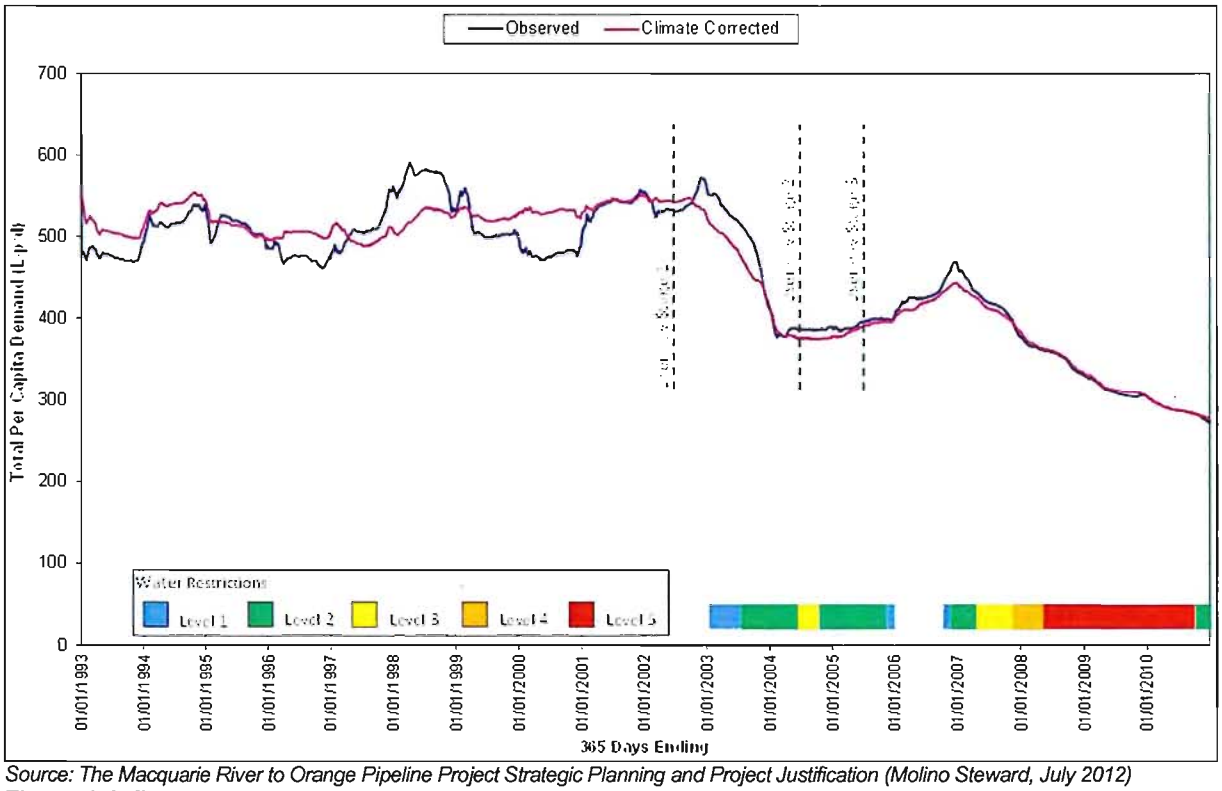
Figure 3e Project layout



Source: Macquarie River to Orange Pipeline Project Preferred Project Report, 2013

Figure 3f Project layout

To curtail demand for water, Orange City Council introduced user pay pricing of water from July 2002 and since 2003 has also imposed water restrictions for all years except for part of 2006. The effect of these demand management measures is shown in Figure 4, where the per capita demand decreased the most after User Pay Stage 1 was introduced and in response to the more severe water restrictions introduced from 2007 to 2010.



Source: The Macquarie River to Orange Pipeline Project Strategic Planning and Project Justification (Molino Steward, July 2012)

Figure 4. Influences on Water Demands

The most severe water restrictions imposed to date, Level 5A, were imposed on 31 January 2010. Level 6 water restrictions were being considered in May 2010 but were averted due to significant rainfall, however, as of August 2010 Level 2 water restrictions were re-introduced and currently remain in place.

During the last drought, Central NSW Regional Organisation of Councils (CENTROC) received funding to complete a water security study to investigate potential solutions to improve water supply security across the region. This study also considered options for improving water supply security of which the Macquarie River to Orange Pipeline project was one.

Security of Supply

In NSW, best practice water security is determined by the *NSW Security of Supply Basis* or the 5/10/10 rule. It is best practice for water supply systems to be sized so that the:

- duration of water restrictions do not exceed five percent of the time;
- frequency of water restrictions do not exceed 10 percent of years; and
- severity of water restrictions do not exceed 10 percent.

This means water supply systems must be able to meet 90 percent of the unrestricted water demand through a repetition of the worst recorded drought, commencing with the storage drawn down to the level at which restrictions need to be imposed to satisfy the above rules.

The 5/10/10 rule was designed so that water supply systems designed to meet this rule can be maintained with moderate water restrictions during a more severe drought than had been experienced in the past, without water restrictions that are too severe, too frequent and of excessive duration. In summary, a best practice water supply system would provide water security during a drought that is more severe than previously recorded with water restrictions in

place. These water restrictions, however, would be less severe, applied less frequently and for shorter periods of time than for a water supply system that does not meet the 5/10/10 rule.

Orange's water supply system does not currently operate in accordance with the 5/10/10 rule. The existing secure yield, that is the maximum supply rate of water that can be maintained while meeting the 5/10/10 rule, is estimated to be 4,750 ML/year but the calculated unrestricted demand is 5,403 ML/year. The secure yield of 4,750 ML/year comprises:

- 3,400 ML/year from Suma Park and Spring Creek Reservoirs;
- 900 ML/year from existing stormwater harvesting schemes in Blackmans Swamp and Ploughmans Creeks; and
- 450 ML/year from licensed bore extraction.

The secure yield figure is applicable to dry periods and any deficit in secure yield would likely be noticeable to the community during extended dry periods instead of during average or wet periods.

Council currently has an existing surface water entitlement[3] to extract up to 7,800 ML/year from the Macquarie River system for town water supply use, however, the existing water supply system can not deliver this supply with security as the calculated secure yield is only 4,750 ML/year. The capacity and licensing requirements of Orange's existing water sources are shown in Table 2.

Table 2. Capacity of existing water sources

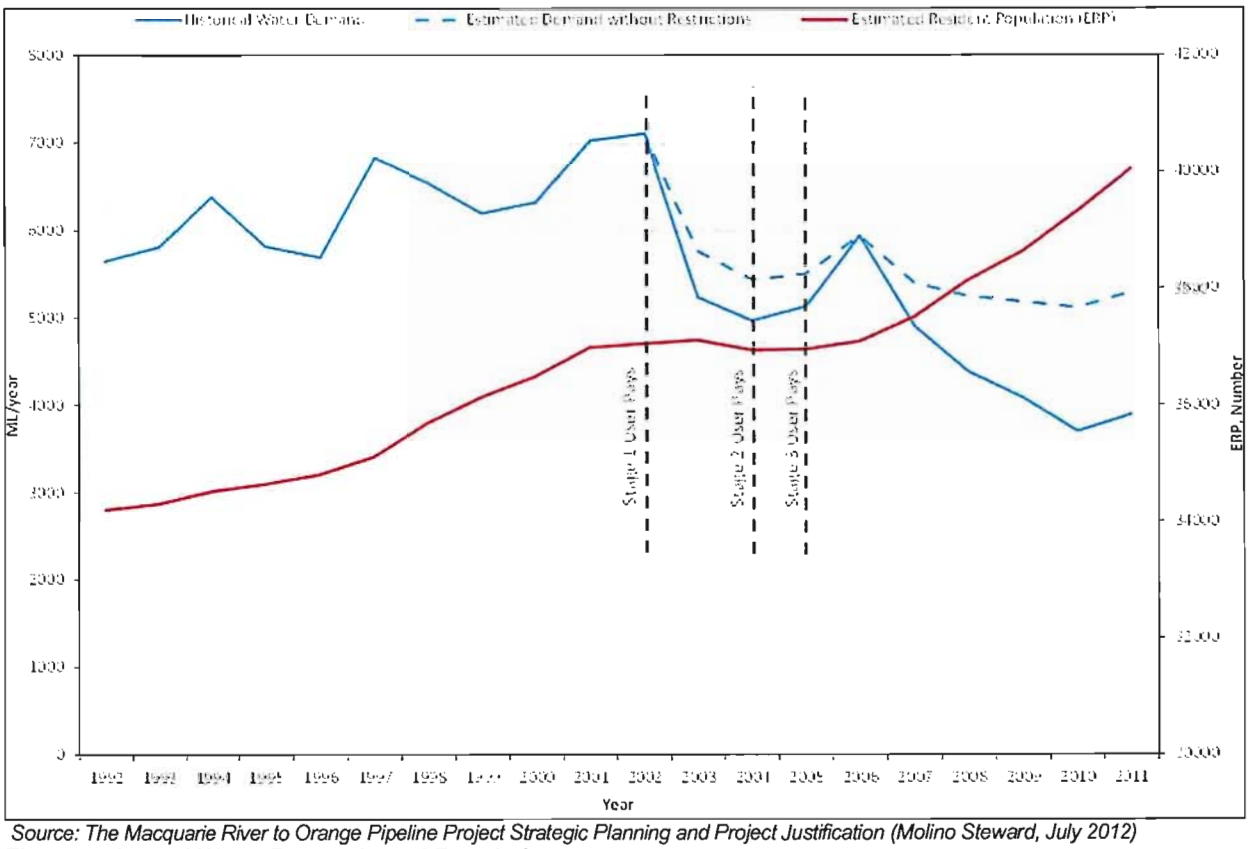
Water Source	Capacity/Licensing requirements
Suma Park and Spring Creek Reservoirs	• Combined reservoir capacity of 21,790 ML • Licensed to extract 7,800 ML/year
Stormwater Harvesting Schemes (Blackmans Swamp stage 1 and Ploughmans Creek)	• Blackmans Swamp stage 1 has emergency authorisation to operate only when flows in the creek exceed 1,000 L/s and Suma Park Reservoir is less than 50% full; and • Ploughmans Creek can operate whenever Suma Park Dam is less than 100% full. Council is currently seeking approval to increase the operation of Blackmans Swamp stage 1 when flows in the creek exceed 1,000L/s and Suma Park Reservoir is less than 100% full.
Bore extraction	Licensed to extract 463 ML/year

Calculated Unrestricted Demand

When considering the secure yield, the current underlying unrestricted water demand must be known to determine any shortfall in supply. The current demand is difficult to calculate due to fluctuations that are linked to the weather patterns, population size, business activity, price of water, the imposition of water restrictions and community attitude. Orange Council has calculated the underlying unrestricted demand by using data from December 2005 to October 2006 as the only period without water restrictions in place but with the user pays pricing system. Orange Council estimated that the current unrestricted demand is 5,403 ML/year as shown in Figure 5. This is equivalent to its residential target of 267 Litres per person per day (L/p/d) under Level 1 restrictions or a total per capita water demand of 404 L/p/d (when considering all water use). The calculated total per capita water demand is less than the previously adopted per capita demand of 467 L/p/d used in the *Orange Integrated Water cycle Management Concept Study* (MWH, 2007) or 435 L/p/d adopted by the *CENTROC Water Security Study* (MWH, 2009) and takes into account water savings from Council's major leak and pressure reduction program[4].

[3] This water entitlement is included in the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources.*

[4] Orange City Council undertook a major leak and pressure reduction program in 2009 to reduce system losses. An audit of the program identified a saving of 500 ML per year or approximately a 31 litre reduction in total daily per capita demand.



Source: The Macquarie River to Orange Pipeline Project Strategic Planning and Project Justification (Molino Steward, July 2012)

Figure 5. Annual Water Demands and Population

The existing secure yield is 650ML/year short of the estimated unrestricted demand. It is predicted that an additional secure yield of 770 to 1020 ML/year would be required by 2035 depending on the rate of population growth.

Orange Council has implemented several measures to reduce demand without implementing water restrictions. These include permanent water conservation measures to prevent excessive outdoor water usage, community education and public awareness campaigns to eliminate water waste, a showerhead exchange program and the ability for some new residential subdivisions to have access to dual water reticulation systems for potable and non-potable water.

The Department considers that adopting a current underlying unrestricted residential water demand of 267 L/p/d or a per capita daily demand of 404 L/p/d (which includes industry) is a reasonable assumption, noting that water demand does fluctuate with weather and is currently constrained by Level 2 Water Restrictions. The recent maximum residential water use coinciding with hot summer temperatures and low rainfall (4.8 mm), with Level 2 Water Restrictions in place, was 306 L/p/d recorded for the weeks of 11 January and 18 January 2013[5] and a monthly average consumption of 281 L/p/d for January 2013. Reflecting the variability in water use, during March 2013, Orange had 128.8 mm of rain and recorded a monthly average consumption of 191 L/p/d.

Population Growth

The population of Orange has grown on average 0.8 percent per annum averaged over the last nine years. The future population of Orange is predicted to continue to grow due to the:

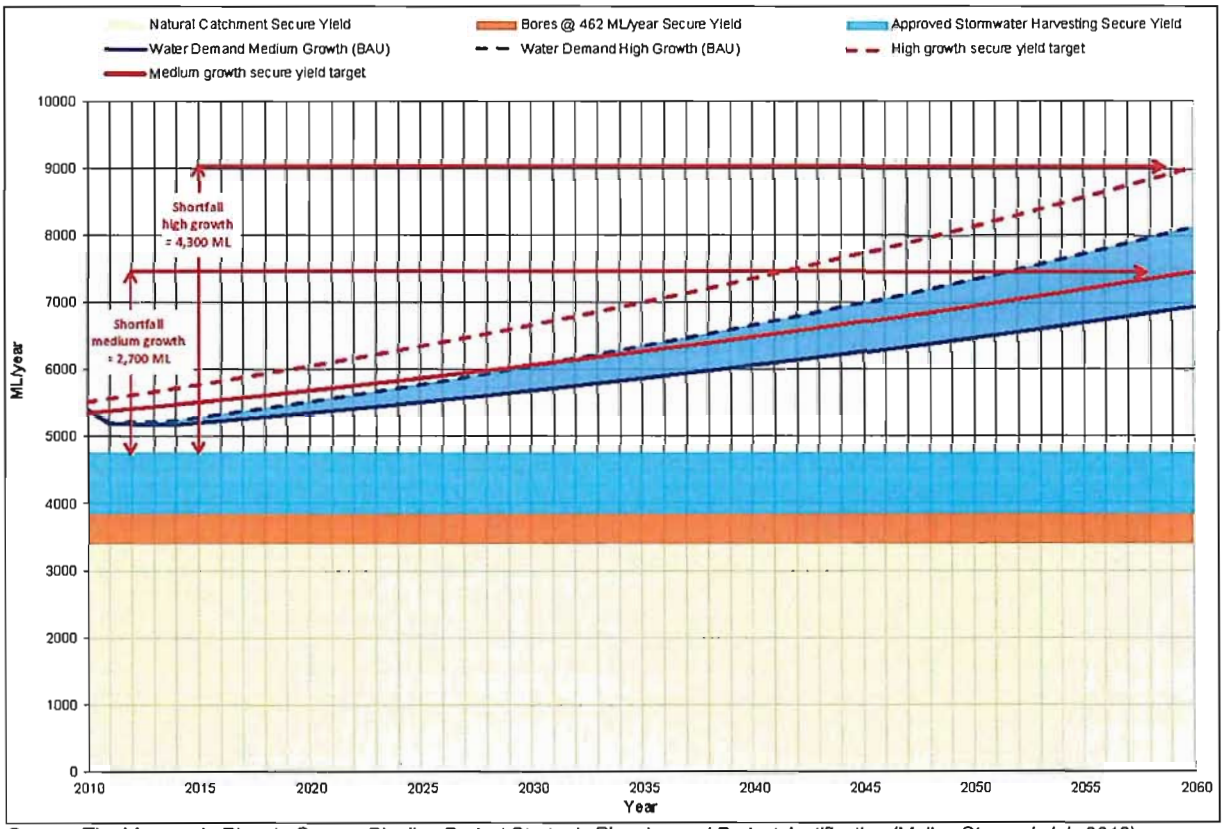
- lifestyle attractions of the area;
- expansion of Cadia mine;
- expansion of student accommodation at Charles Sturt University;

[5] Weekly and monthly averages of water usage are provided on Orange Council's water security website: http://www.orange.nsw.gov.au/site/index.cfm?display=201706#

- promotion of Orange as a regional centre for medical services; and
- as one of seven EvoCities targeting residents to move from capital cities to regional centres.

Two growth scenarios were considered; one of medium growth of 0.8 percent per year and one of high growth of 1.1 percent per year. The Proponent has also considered medium and high demand management scenarios when determining the future water demand and water security.

Figure 6 shows the predicted shortfall between the estimated secure yield of 4,750 ML per year and the secure yield target considering a medium and high growth forecast. For the medium growth forecast the shortfall is 2,700 ML/year by 2058 and for the high growth forecast the shortfall is 4,300 ML/year by 2059.



Source: The Macquarie River to Orange Pipeline Project Strategic Planning and Project Justification (Molino Steward, July 2012)
Figure 6. Future water security for existing water supply infrastructure without climate change

Climate Change

Overall future water availability through rainfall-runoff is considered more likely to decrease than increase when the effects of climate change are considered. Best estimates anticipate an eight percent reduction in water availability for the Macquarie-Castlereagh region (*Water Availability in the Macquarie-Castlereagh* CSIRO, 2008).

The impacts to the estimated secure yield for Orange, based on the NSW Office of Water's data for a one degree warming scenario, indicate a 26 percent reduction in the secure yield for Orange's water supply system. This reduction in secure yield could result in the shortfall increasing to between 3,800 and 5,400 ML/year over a 50 year planning horizon. The Department's independent expert, Bewsher Consulting, notes that the use of historical climate and historical climate adjusted for climate change is the best available approach at this time. The operation of the project is modelled to make the water supply system more resilient to the potential impacts of climate change.

Under this scenario, the Council would need to provide additional secure yield (depending on the rate of growth of water demand and the effects of climate change on the secure yield) in order to

ensure security of supply and to meet the 5/10/10 rule. The project is expected to increase the secure yield and provide water security for the next 39-58 years in the absence of the potential effects of climate change (best case) or 26 to 37 years with the potential impacts of climate change (worst case). Additional water sources would be required in order to increase the secure yield after this time and in line with Council's policy to provide sufficient secure yield to meet water demand in 10 years time and to consider water supply management over a 50 year planning horizon.

The Department is satisfied that there is currently a deficit in secure yield that was evident by the low availability of water for Orange and the duration and severity of water restrictions imposed during the last dry period. The Department is also cognisant of the assumptions used and uncertainty of modelling to determine underlying and future unrestricted demand, future growth forecasts and the effects of climate change on the secure yield. In noting this, the Department considers that Orange will need to continue to investigate further opportunities to improve the secure yield and supports the Proponent's commitment to consider water supply management over a 50 year planning horizon with the intention of implementing the secure yield in order to meet water demand in 10 years time.

Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources and Water Access Entitlements

Water is a constrained resource which is regulated by legally binding water sharing plans. Water sharing plans manage water for the environment and water users for a 10 year timeframe by setting rules for water trading, annual water allocations and priorities for allocation during dry periods. The water sharing plans also manage water extractions in accordance with the limit on extractions imposed by the Murray-Darling Basin Cap.

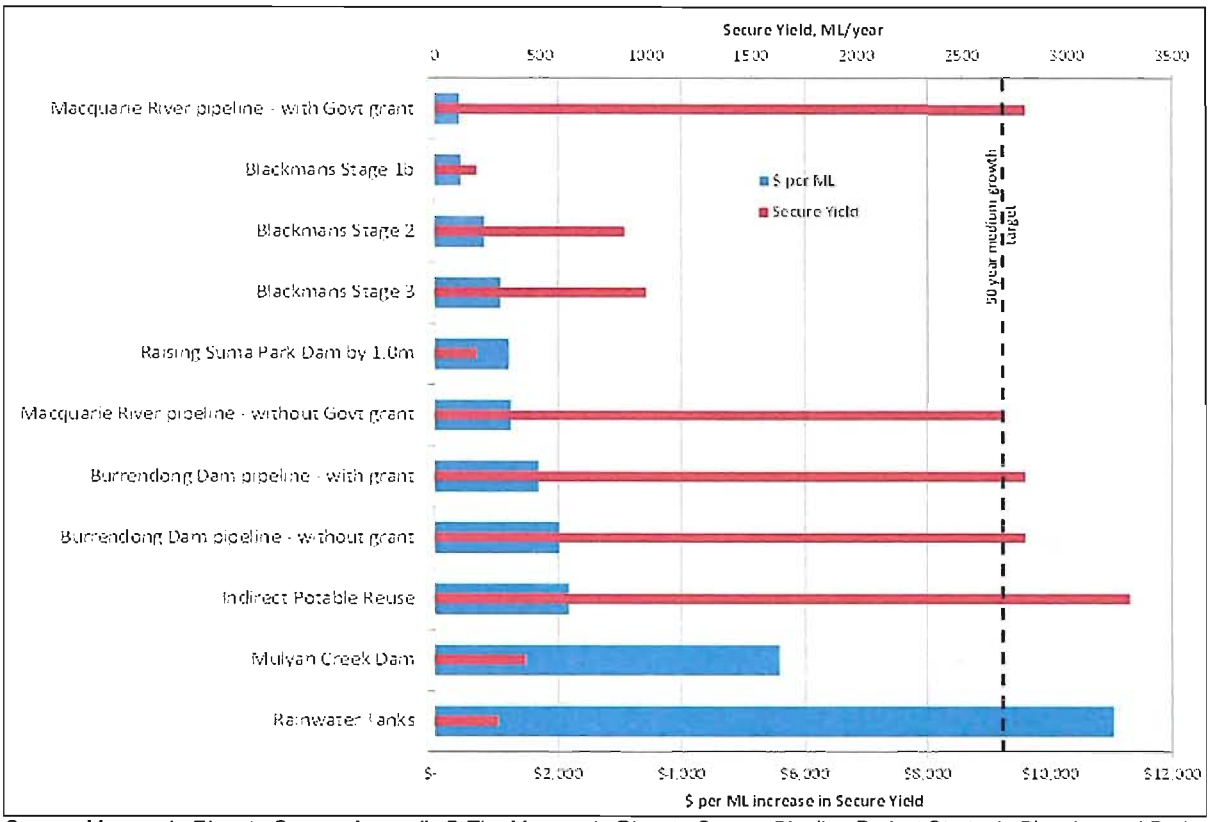
Council holds an option to purchase a 640 ML/year general security unregulated water access licence[6] and, should the project be approved, will purchase this licence. It proposes to meet the average annual extraction of 1,616 ML/year and up to 3,804 ML/year using the 640 ML/year general security licence and a temporary transfer of a portion of its existing town water supply access entitlement (7,800 ML/year) to the Macquarie River Pipeline. The temporary transfer is allowed by and in accordance with the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012* (Water Sharing Plan). Council will also continue to purchase water access licences as they become available, in accordance with the trading provisions of the Water Sharing Plan. There are no other existing water extraction licences in the unregulated section of the Macquarie River downstream from the offtake location that could be impacted by the project.

The Water Sharing Plan sets a 'cease to pump' threshold for water extraction under licence as being when there is no visible flow in the river. The Proponent proposes to avoid pumping water during low flows and has adopted a more stringent 'cease to pump' criteria than that in the Water Sharing Plan. This is further discussed in Section 5.1.

Alternatives

In determining options for increasing the secure yield, the Proponent has considered a wide range of Government policies, guidelines, agreements and studies. Shortlisted options considered are shown below in Figure 7 with respect to secure yield and cost and summarised in Table 3 along with commentary on their status. These options were selected from 35 potential water supply options considered by a review of available water resources as part of Draft *Orange Integrated Watercycle Management Evaluation Study* (Geolyse, 2012). In considering the options Council has set a short term (10 year) additional secure yield target of 1,000 ML/year and a long term (50 year) target of 2,700 ML/year.

[6] The purchase of this licence from an existing licence holder is in accordance with the trading rules specified under the water sharing plan.



Source: Macquarie River to Orange Appendix B The Macquarie River to Orange Pipeline Project Strategic Planning and Project Justification (Molino Stewart, July 2012)

Figure 7. Consideration of shortlisted options with respect to secure yield and cost

Table 3. Consideration of shortlisted options

Alternative	Secure Yield (ML/year)	Comments
Macquarie River pipeline – The subject of this report.	2,700	This option can meet the short and longer term secure yield targets. Cost is approximately $49.10 Million. When considered with Government grants this option is the cheapest in terms of cost per mega litre.
Burrendong Dam pipeline – Transferring water from downstream of Burrendong Dam approximately 78 km to Suma Park Dam with 4 pumping stations.	3,400	This option can meet the short and longer term secure yield targets. Requires purchase of a high security water licence. Cost is approximately $89.3 Million. Option is more expensive than the Macquarie River pipeline per mega litre of water transported even after considering the Government grants.
Stormwater Harvesting		This is a long term option with added uncertainty due to licensing difficulties in increasing use of the harvesting scheme due to concerns about the impact on flow regimes in Blackmans Swamp Creek and Summer Hill Creek. The construction of Blackmans Swamp Stage 3 is dependent on previous stages being completed. Council is, however, continuing to pursue this option as a supplementary option. Combined cost $27.8 million This option would be cheaper if licensing difficulties were overcome but could not solely meet the long term target.
Blackmans Swamp Stage 1b – Harvesting water when Suma Park Dam is less than 100%	200	
Blackmans Swamp Stage 2 – Off-line wetland, controlled outlet to creek and a higher capacity pump.	900	
Blackmans Swamp Stage 3 – Offline wetland, low flow harvest pumps, larger harvest weir, upgrade of batch pond treatment system, pumping station and treatment plant, duplication of rising main from	1,000	

Alternative	Secure Yield (ML/year)	Comments
batch pond to Suma Park Reservoir		
Indirect potable reuse with membrane treatment plant – Treatment of effluent with a zero liquid discharge membrane treatment plant	3,300	This option can only meet the longer term secure yield target as current treated effluent is assigned to Cadia mine until 2031. This option also requires further approvals, community acceptance and additional Council resources due to higher level of technology required to treat effluent. Cost $105.7 million
Increased pumping from existing groundwater bores – Increase extraction by approximately 100 ML/year	450	A licence has since been granted (March 2012) for the extraction of 463 ML/year and is now part of the water supply system. Cost $4.5 million
Raising Suma Park Dam – Increasing the dam wall height by 1m	100 to 200	Low yield and would likely trigger a review of environmental flow rules to increase environmental flows to Summer Hill Creek which may offset any increase in secure yield. This option is currently being investigated by Council in conjunction with dam safety works. Cost $3.6 million
Mulyan Creek Dam – A new 25 to 30m high dam wall with pipeline to Suma Park Dam	430	Low yield. Requires consideration of environmental flows in the environmental assessment process and issues surrounding land ownership. Cost $35.5 million
Rainwater tanks – Provision of 10,000 litre rainwater tanks connected for outdoor and toilet use for 10,176 households installed over 10 years	300	Low yield, uncertainty about level of household uptake, catchment restricted by roof area, water quality risks and ongoing Council role in monitoring and enforcement. Orange Council already has a rainwater tank rebate policy in place. Cost $45.6 million. This option is the most expensive when considering costs per mega litre.
Do nothing – Impose restrictions for longer periods more frequently	300	Inconsistent with the 5/10/10 rule and Orange Council's and Government water management policy.

Of the shortlisted options considered, the Macquarie River pipeline, the Burrendong Dam pipeline and the indirect potable reuse with membrane treatment options were identified as being able to meet the long term secure yield target when considered alone.

The short term secure yield target of 1,000 ML/year could be met by the Macquarie River pipeline, the Burrendong Dam pipeline and Blackmans Swamp Stage 3 stormwater harvesting options but uncertainty surrounding the implementation and operational licence conditions of Blackmans Swamp Stages 1 and 2 mean that this is not a short term option with added uncertainty about the ability to operate this scheme to meet the secure yield target. The Proponent is, however, still pursuing this option. The indirect potable reuse option would not be able to meet the short term target either as Cadia mine is currently entitled to 10ML/day of treated effluent from Council's sewage treatment plant until at least 2030. The volume of treated effluent available is also dependent on the population of Orange.

All shortlisted options except for the Macquarie River and Burrendong pipeline options would need to be combined with other options in order to meet the secure yield targets increasing uncertainty in delivery and cost. Of all options and combinations considered the two shortlisted pipeline options, the Macquarie River pipeline option was the preferred option based on the ability to meet the short term and longer term targets, capital and operating costs.

Submissions received raised the consideration of project alternatives as a key issue of community concern. Consideration of alternative or additional options that could be used to supply water to Orange that were not shortlisted above are summarised in Table 4 below.

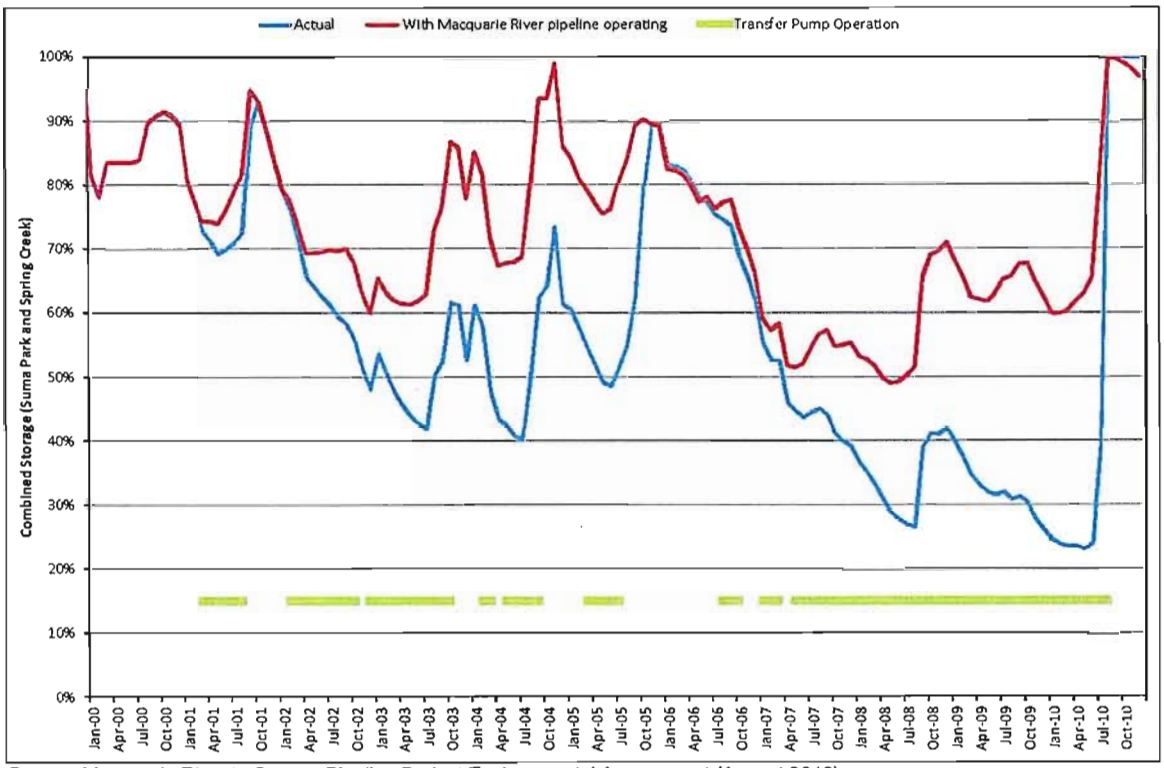
Table 4. Alternatives noted in Submissions Received

Alternative	Secure Yield (ML/year)	Comments
Groundwater options • Orange Basalts	No reliable estimate available.	Long term extraction limit nominated in the Water Sharing Plan exceeds the current and share components by a factor of more than two. Establishment of new bores is likely to prove difficult from an administrative and water policy perspective and would most likely need to be located a substantial distance from existing bores in order to avoid impacting existing users.
• Browns Creek Mine and nearby limestone areas	Not established but potential for 1,000 ML/year and may include Cowriga Limestone and part of the Blayney Volcanics	Water quality issues associated with presence of arsenic at high concentrations (114 micrograms per litre compared 7 micrograms per litre in the drinking water guideline level). Antimony concentrations were also above the guideline values. The potential presence of complex cyanides at depth are also of concern. Better quality water may be possible away from the immediate vicinity of the mine. However, as the mineralised area extends beyond the mined area due to hydraulic connectivity between the open cut, underground workings and the limestone aquifer, it is possible that water from the mine could drain into any constructed bore under pumping. Treatment of water quality issues is possible at additional cost. This option was not shortlisted due to additional work required to establish a sustainable extraction rate, understand hydraulic connectivity between aquifers and the mine and additional treatment costs (noting that if cyanide was detected in extracted water this would require a reverse osmosis treatment system).
Pumping water directly to the water treatment plant or a closed reservoir from the Macquarie River	Possible reduction of 100 ML/year to no change	Pumping water either directly to the Treatment Plant or to a covered reservoir would result in the water level within Suma Park Dam being kept at a higher level (water pumped from the Macquarie River would reduce the need to extract water from the Dam, keeping the Dam water level higher). There would be no benefit from reduced spill or evaporation loss. Operating the project to meet only the daily demand would save approximately 1 ML/year in evaporation and 3 ML/year in spill but would reduce the secure yield.
Augmenting Lake Rowlands	3, 150 ML/year	Central Tablelands current baseline water demand is 2,350 ML/year and includes a commitment to supply Cowra, during drought, with 1,278 ML/year. The demand is greater than the estimated secure yield resulting in no spare secure yield to supply Orange. The *Water Sharing Plan for Lachlan Unregulated and Alluvial Water Sources 2012* also places limitations on water access entitlements which would restrict the ability to obtain water access licences.
Managed aquifer recharge		Requires additional water to inject into the groundwater for later use. As more water cannot be generated from the catchment external supply sources are required to consider this further.
Transporting water by rail		Water carting has significant operating costs. Council investigated carting 3 ML/day from Blayney to Orange by rail at a daily operating cost of $153,983. Annually it would supply approximately 1,100ML/year at a cost of approximately $56 million. This option would cost more per annum than the overall Macquarie River pipeline project capital costs by three times.

A number of submissions raised the issue that an integrated regional solution, one that provides water to other towns, villages or water users along the pipeline route, should be pursued rather than pursuing an option that only supplies water to Orange. The Department is supportive of Orange City Council's participation and consideration of options identified through a regional water security study with Central NSW Councils Regional Organisation of Councils (CENTROC). The Department is not supportive of an approach which would allow additional connections which could ultimately place strong development or subdivision pressures on areas that have been identified through strategic planning to remain as low density rural towns or villages.

The Preferred Option

The operation of the Macquarie River pipeline, modelled for the period from January 2000 to December 2010, the most recent prolonged drought (see Figure 8), determined that Council's combined water storage would not have fallen much below 50 percent and water restrictions would have remained at level two or less.



Source: Macquarie River to Orange Pipeline Project Environmental Assessment (August 2012)

Figure 8 Combined Water Storages (actual and modelled with project for years 2000-2010)

Conclusion

The Department accepts that Orange's water supply system does not currently meet the NSW Security of Supply Basis and that this situation is only likely to worsen as Orange's population grows and the effects of climate change are taken into account. As stated in the CENTROC Regional Drought Management Plan water restrictions that are too frequent in urban areas will be disruptive to industry and commerce and may be detrimental to social and community values.

The Department is confident that Orange City Council followed a robust methodology to arrive at the preferred project. The Department is satisfied that a range of options have been considered and that this project would help diversify Orange's water supply system and alleviate water shortages during dry times and drought conditions. It is also consistent with best practice management of water supplies and the *National Urban Water Planning Principles* which set out key principles to achieve optimal urban water planning outcomes.

The Department is satisfied that Orange Council has considered a broad range of options in selecting the preferred option of the Macquarie River to Orange Pipeline and that some of these options are currently being pursued independent of this project application such as:

- the Blackmans Swamp stormwater harvesting scheme Stages 1b, 2 and 3;
- investigations into raising Suma Park Dam; and
- the rainwater tank rebate policy.

While other options may also provide short and longer term secure yield, the Department considers the preferred option selected:

- provides best value for money;
- uses a readily available water source where there is a good understanding of the raw water quality parameters; and
- is better understood in terms of hydrology and impacts to other water sources and users, particularly when compared to groundwater options.

The Proponent's preferred option will address both short and longer term water security for Orange and is consistent with Government initiatives, studies and plans for securing water supply in the region. It will also reduce the frequency and severity of water restrictions during dry periods. The preferred option meets the Council's policy of providing sufficient secure yield to meet water demand in 10 years time and to consider water supply management over a 50 year planning horizon. The Department also notes that adequate flows that meet Council's adopted cease to pump threshold of 38 ML/day, within the Macquarie River, are modelled to occur for at least 71 percent of the time and, therefore, considers the Macquarie River to be a viable water source based on extraction in accordance with the proposed operating rules.

The Department also notes that the project would be managed consistent with the water sharing plan which manages impacts to water users and environmental flows within the Macquarie River system. Furthermore, the Department supports Orange City Council's commitment in establishing pumping rules which are more stringent than those allowed under the water sharing plan by adopting a cease to pump threshold of the 80th percentile flow (ie. flows that will be exceeded 80 percent of the time) rather than the visible flow criterion adopted in the water sharing plan.

The Department recognises that should Orange continue to grow as forecast, further water supply is required in order to meet the 5/10/10 rule; to be consistent with Council's policy of providing sufficient secure yield to meet water demand in 10 years time; and to consider water supply management over a 50 year planning horizon. The timing of the need for additional water sources would depend on the rate of growth, the effects of climate change and overall water demand.

The Department considers that the need and justification for the project are clear and does not dispute Orange City Council's need to augment Orange's water supply system. Despite this, the remainder of this report considers whether the project is sustainable and whether the impacts are acceptable and justifiable. Whilst this project, as presented, would appear to fulfil the need, some issues have been identified in terms of the operational parameters (eg. the cease to pump trigger) of the project and these are the subject of more detailed consideration in Section 5.

3 STATUTORY CONTEXT

3.1 Major Project

On 16 December 2012 the then Minister for Planning declared the project to be subject to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) under section 75B of that Act. Therefore the Minister for Planning and Infrastructure is the approval authority.

Continuing Operation of Part 3A

Part 3A of the EP&A Act, as in force immediately before its repeal on 1 October 2011 and as modified by Schedule 6A to the Act, continues to apply to transitional Part 3A projects. Director-General's environmental assessment requirements (DGRs) were issued on the 24 March 2011 and supplementary DGRs issued on the 27 February 2012 in respect of this project and the

environmental assessment report was submitted prior to 30 November 2012. The project is therefore a transitional Part 3A project.

Consequently, this report has been prepared in accordance with the requirements of Part 3A and associated regulations, and the Minister (or his delegate) may approve or disapprove of the carrying out of the project under section 75J of the Act.

Delegation

On 14 September 2011, the Minister for Planning and Infrastructure delegated responsibility for the determination of project applications under Part 3A of the *Environmental Planning and Assessment Act 1979* to the Director-General where:

- a relevant local council has not made an objection; and
- a political donations disclosure statement has not been made; and
- there are less than 25 public submissions in the nature of objections.

The Minister for Planning and Infrastructure, on the 14 September 2011, delegated his functions to the Planning Assessment Commission for projects, other than applications made by or on behalf of a public authority. As a public authority does not include a local authority for the purposes of the delegation, the Planning Assessment Commission can therefore determine the project under delegated authority.

3.2 Permissibility

The proposal is located on land within the Orange and Cabonne local government areas in the zones shown in Table 5. The State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) applies to the project. Division 24 of the Infrastructure SEPP relates to water supply systems with Clause 125 stating that water reticulation systems may be carried out on behalf of a public authority without consent on any land. The Proponent is a public authority, for the purposes of the Infrastructure SEPP as defined under Section 4 of EP&A, and all works will be carried out by or on behalf of the Proponent and therefore the project is permissible within all zones.

Table 5. Relevant zones under Orange and Cabonne Local Environment Plans

Orange Local Environmental Plan 2011	Cabonne Local Environment Plan 2012
RUI Primary Production	RUI Primary Production
R5 Large Lot Residential	R5 Large Lot Residential
SP2 Infrastructure	

3.3 Environmental Planning Instruments

There are no other environmental planning instruments (apart from the Infrastructure SEPP) that substantially govern the carrying out of the project.

3.4 Objects of the EP&A Act

Decisions made under the EP&A Act must have regard to the objects of the Act, as set out in Section 5 of the Act. The objects are:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecologically sustainable development, and

(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

Of particular relevance to the environmental assessment and eventual determination of the subject project application by the Minister or his delegate, are those objects stipulated under section 5(a). Relevantly, objects (i), (ii), (iii), (vi) and (vii) are significant factors informing determination of the application (noting that the proposal does not raise significant issues relating to land for public purposes, community services and facilities or affordable housing). With respect to ecologically sustainable development, the EP&A Act adopts the definition in the *Protection of the Environment Administration Act 1991*. This is discussed further in Section 3.5.

In addition to the above, the agency and community consultation undertaken as part of the assessment process (see Section 4 of this report) address objects 5(b) and (c) of the Act.

3.5 Ecologically Sustainable Development

The EP&A Act adopts the definition of Ecologically Sustainable Development (ESD) found in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

(a) the precautionary principle,
(b) inter-generational equity,
(c) conservation of biological diversity and ecological integrity,
(d) improved valuation, pricing and incentive mechanisms.

It is important to recognise that while the EP&A Act requires that the principles of ecologically sustainable development be encouraged, it provides other objects that must be equally included in the decision-making process for any proposal.

The Department has considered the need to encourage the principles of ecologically sustainable development, in addition to the need for the proper management and conservation of natural resources such as: water resources; the orderly development of land considering landuse; the need for the project as a whole (which comprises a utility provision); and, the protection of the environment including threatened species in Sections 2, 4 and 5 of this report.

The Department considers that the project generally promotes the principles of ESD as it is proposed to be undertaken in a manner that minimises environmental impacts, including biodiversity, and inter-generational equity through provision of water supply over the longer term for the city of Orange.

3.6 Statement of Compliance

The Department is satisfied that the Director-General's environmental assessment requirements had been complied with.

3.7 Environment Protection and Biodiversity Conservation Act

On 22 December 2011, the project was determined to be a "controlled action" under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as it was considered likely that the proposal could have a significant impact on:

- listed threatened species and communities under sections 18 and 18A;
- wetlands (Ramsar) under sections 16 and 17B; and
- listed migratory species under sections 20 and 20A.

At the same time, the Proponent was advised that the project would require assessment through the accredited assessment process under the NSW EP&A Act. This means that separate assessment processes are not required under both the EPBC Act and the EP&A Act, and the NSW assessment process has been accredited for the purpose of the assessment requirements of the EPBC Act. However, the Commonwealth Minister for the Environment maintains an independent approval role, and the Commonwealth provides input to certain stages of the assessment process.

The Department has consulted the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) throughout the assessment process, and the Department's assessment of Commonwealth matters is detailed in Section 5 of this report.

4 CONSULTATION AND SUBMISSIONS

4.1 Exhibition

Under section 75H(3) of the EP&A Act, the Director-General is required to make the environmental assessment (EA) of an application publicly available for at least 30 days. The Department publicly exhibited the EA from 29 August 2012 until 15 October 2012 (48 days) on its website, and at the following exhibition locations:

- Orange City Council, Civic Centre, Cnr Byng St and Lords Place, Orange;
- Orange Library, Civic Square, 147 Byng St, Orange;
- Cabonne Council, Molong, 101 Bank Street, Molong;
- Cabonne Council, Environmental Services, Main Street, Cudal;
- Nature Conservation Council, Level 2/5 Wilson Street, Newtown; and
- Department of Planning and Infrastructure, Information Centre, 23-33 Bridge Street, Sydney.

The Department also advertised the public exhibition in the Central Western Daily, the Western Advocate, the Sydney Morning Herald and The Daily Telegraph on 29 August 2012 and notified relevant State and local government authorities in writing.

The Department received 144 submissions during the exhibition period of the EA – four submissions from public authorities and 140 submissions from:

- the Members for Dubbo, Bathurst and Orange;
- the general public; and
- special interest groups.

The Members for Bathurst and Dubbo raised concerns that the proposed pipeline could limit economic growth in their respective areas due to possible future limitations on access to additional water for their respective communities and the Member for Orange supported an assessment of the project based on its merits. The template email submissions received from Keep Australia Fishing were counted as separate submissions.

An additional 25 submissions were received after the exhibition period closed. These include a submission from Central NSW Regional Organisation of Councils (CENTROC) supporting the

Proposal, a supplementary submission from the Orange and Region Water Security Alliance[7], a submission from the Dubbo Field Naturalists & Conservation Society Inc., two individual submissions and a further 20 template email submissions from keep Australia Fishing objecting to the Proposal. The issues raised in these late submissions are also considered.

The Minister for Planning and Infrastructure also received 48 postcards during and after the exhibition period requesting the Minister refuse the project due to impacts to native fish habitat and low flows in the Macquarie River. The issues raised on these postcards were forwarded to the Proponent for consideration and have also been considered by the Department but are not reflected in the numbers of submissions quoted.

A summary of the issues raised in submissions is provided below.

4.2 Public Authority Submissions

Five[8] submissions were received from public authorities:

Environment Protection Authority (EPA) supports the project subject to the proposal addressing comments about construction noise, vibration and blasting and has recommended conditions of approval for the Department's consideration.

Office of Environment and Heritage (OEH) raised concerns about the impact to the aquatic environment including on threatened species and the Macquarie Marshes, the sustainability and efficiency of the proposal, impacts to hollow bearing trees and the options to offset residual impacts.

NSW Department of Primary Industries (DPI) submission includes comments by the NSW Office of Water, Fisheries NSW, Crown Lands and Agriculture NSW.

The NSW Office of Water supports the project and commented on the application of the Macquarie-Bogan Unregulated and Alluvial Water Sharing Plan, Water Access Licence, accuracy of low flow modelling and recommended conditions of approval.

Fisheries NSW states that the proposal's operating rules are unlikely to cause a significant impact to threatened species or populations and raised concerns about the impacts of the changed flows on aquatic habitat downstream of the offtake and of Suma Park Dam and suggested recommended conditions of approval.

Crown Lands provided comments on the use of several parcels of Crown land and waterways by the Proposal.

Agriculture NSW raised has no objections or comments on the proposal.

Roads and Maritime Services (RMS) noted that the Proposal does not cross any classified roads but did comment on potential interactions of construction traffic and that local school bus services should be limited where possible.

Central NSW Regional Organisation of Councils (CENTROC) supports the Proposal noting CENTROC's involvement in investigating potential solutions to improve water supply security across the region. CENTROC endorsed the results of these investigations including the identified shortcomings in Orange's water supply and the Macquarie River to Orange Pipeline as a solution to these shortcomings as a critical step in delivering regional water security.

4.3 Public Submissions

164[9] submissions were received from the public. This included submissions from the following special interest groups and organisations:

- Bundi Fishing Club;

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[7] This supplementary submission is not counted as an additional submission. Further correspondence from Orange and Region Water Security Alliance has also been considered by the Department.

[8] This number includes the submission from CENTROC received after the exhibition period closed.

[9] This number includes late submissions received.

- Central Acclimatisation Society – Sofala Branch;
- Central West Environment Council;
- Cenwest Environmental Services;
- Daroo Orange Urban Landcare Group;
- Dubbo Field Naturalists & Conservation Society Inc.;
- Environmentally Concerned Citizens of Orange;
- Featherdale Wildlife Park;
- Friends of the Macquarie;
- Inland Rivers Network;
- Inland Waterways Rejuvenation Association;
- Keep Australia Fishing;
- Macquarie Marshes Environmental Landholders Association;
- Mudgee District Environment Group;
- National Parks Associate of NSW;
- Nature Conservation Council of NSW;
- NSW Bird Atlassers;
- NSW Council of Freshwater Anglers;
- Orange and Region Water Security Alliance;
- Orange Field Naturalist & Conservation Society Inc.;
- Orange Ratepayers' Associate Inc.;
- The Wilderness Society; and
- University of Western Sydney.

Of the 164[10] public submissions, 161 objected to the project. Three submissions did not object but raised concerns about the proposed project. No public submissions supported the project. The issues raised in public submissions include:

- aquatic ecology;
- flora and fauna;
- hydrology;
- justification and options considered;
- noise;
- heritage;
- visual, amenity and recreational use;
- decommissioning;
- road and traffic;
- consultation;
- property values and economic considerations;
- environmental assessment;
- health; and
- electricity use and transmission.

[10] This number includes late submissions received.

The key issues raised in public submissions are listed in Table 6.

Table 6. Summary of Key Issues Raised in Public Submissions

Issue	Proportion of submissions (%)
• Impact to endangered aquatic species.	89 (59%)
• Extraction will create barriers to fish passage during low flows.	67 (44%)
• Other options, that may have a lesser impact on the environment and are cheaper, have not been investigated.	64 (42%)
• The Project is contrary to recovery plans for threatened species.	54 (36%)
• Loss of aquatic habitat will result in greater impacts to species using Gardiners Hole, one of the largest holes in the upper Macquarie River.	51 (34%)
• The aquatic assessment is flawed and a full ecological assessment is required.	50 (33%)
• Impact on recreational fishing and reduce the amenity of the area.	49 (32%)
• A regional water solution that also provides water to other areas as well as Orange should be investigated.	43 (28%)
• Slope instability and access roads during construction and operation.	43 (28%)
• The unrestricted water demand used in the modelling is too high.	33 (22%)
• Suma Park Dam should be raised. Safety concerns were also raised about the dam.	29 (19%)
• Impact to roadside vegetation and wildlife corridors.	28 (18%)
• The stormwater harvesting schemes should be utilised to their full potential and expanded.	21 (14%)
• The EA is not valid as Council is investigating other options.	21 (14%)
• Over allocation of water resources and impacts to downstream water users.	19 (13%)
• The pipeline should be from Burrendong Dam instead of the upper Macquarie River.	18 (12%)
• Flows of 38 ML/day are too low to be considered moderate flows.	15 (10%)
• Consultation has not been transparent or adequate.	13 (9%)
• Sufficient information has not been provided in the Environmental Assessment.	11 (7%)
• The survey methodology used in the flora and fauna report is not appropriate.	10 (7%)
• The proposed water extraction regime wastes money and water as it is predicted to result in increased flows from Suma Park Dam.	9 (6%)

The Department has considered the issues raised in submissions in its assessment of the project in Section 5.

4.4 Proponent's Response to Submissions

The Proponent provided a response to the issues raised in submissions (see Appendix C) in the *Macquarie River to Orange Pipeline Preferred Project Report* (GHD, February 2013). The Preferred Project Report outlines changes to the proposal as exhibited (see Figure 1). The project was revised following the Proponent's consideration of the issues raised in submissions and additional environmental and engineering investigations and includes:

- the removal of the last four kilometre section of the pipeline, the offtake at Gardiners Hole and ancillary infrastructure between Long Point Road and the offtake site on the Macquarie River immediately upstream of its confluence with Boshes Creek from the proposal;
- a new 6.5 km section of pipeline and associated changes to the power supply and ancillary infrastructure between Long Point Road and a new offtake site on the Macquarie River at Cobbs Hut Hole (approximately 3.8km east or upstream of the original offtake site);

- a new access road, approximately 14 km long, from Long Point Road to a point approximately 640 m from the offtake structure at Cobbs Hut Hole; and
- associated changes to the existing power supply arrangements as described in Table 7.

Table 7 Changes to Key Project Components

Aspect	*Description in EA*	*Description of change*
Offtake Structure and pump station location	Immediately upstream of the confluence with Boshes Creek in Gardiners Hole	Cobbs Hut Hole approximately 4.6 river kilometres upstream of Gardiners Hole (3.8 km east or upstream)
Pipeline	Approximately 37 km long	Approximately 39 km long The location of pipeline between the Cobbs Hut Hole and a point near Long Point Road has changed
New Power Lines	Approximately 4.1 km	Approximately 4.3 km with 1.2km underground
Upgraded Power Lines	22.5km	25km Change in location of the revised pipeline location
Access road to offtake structure	4km	1.4km

The Preferred Project Report has resulted in a reduction of impacts to vegetation and the potential for greater impacts to aquatic ecology and hydrology when compared to the project as presented in the Environmental Assessment. A summary table of the changes to environmental impacts is included in Appendix D of this report.

5 ASSESSMENT

The Department considers that the need and justification for the project are clear and has therefore focused its assessment on whether the project as proposed is sustainable and whether the impacts are acceptable and justifiable. The Department considers the key environmental issues for the project to be:

- sustainability and socio-economic considerations including impacts to other water users and operating costs;
- hydrology – impacts of proposed water extraction on river flows and availability of water for other users; and
- aquatic and terrestrial flora and fauna.

Other issues raised in submissions such as geomorphology and watercourse impacts, water quality, heritage and recreational fishing impacts are considered to have been adequately addressed and are considered in Section 5.5.

5.1 Sustainability and Socio-economic Considerations

Supply Security and Diversification

The proposal aims to increase water supply diversity in order to help meet the current and future water demand as Orange's population grows. The growth of Orange as a regional major service, commercial and administrative centre for central NSW is supported and consistent with it being identified as an Evocity, a city in the State and Federal government supported campaign to encourage capital city residents to move to regional centres.

The proposal would diversify and augment the existing water supply captured by the reservoirs, stormwater harvesting scheme and bores; and would help improve water supply resilience during dry conditions and security of supply. The proposal is expected to extract an average annual 1,616 ML/year (between zero to 3,804 ML/year) when the pumping rules are met. The

Proponent's model shows that the likelihood of Council imposing severe water restrictions on the community and businesses during periods of drought is reduced with the proposal.

Operating Rules

Orange Council has proposed pumping rules that would balance the need to secure a diversified water source for Orange with the aim of protecting low flows in the Macquarie River. The operating rules would allow a maximum extraction of 12 ML/day over 19 hours per day when:

- the storage level in Suma Park Reservoir is less than 90 percent full;
- the flow in the Macquarie River exceeds 38 ML/day; and
- water quality in the Macquarie River is acceptable for extraction.

The operation of the project would pump water from the Macquarie River more often to keep the water levels in Suma Park Reservoir high instead of pumping a greater volume of water when the water storage level is low and which may coincide with low flows in the Macquarie River.

Modelling shows that the worst case extraction of 12 ML/day at a 38 ML/day flow would occur approximately 17.5 days or 0.11 percent of total pumping days (15,905 days) over the 118 years modelled; and that by aiming to keep the water level in Suma Park Reservoir above 90 percent, the chances of natural flows overtopping the dam increases during wet or average conditions. During dry periods there would be a reduced likelihood of flows overtopping Suma Park Dam as water levels in the dam are expected to be lower with more capacity to retain natural flows.

Impacts on Other Water Users

The proposal aims to access water consistent with the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*. The role of the water sharing plan is to share water between all users and the environment, improve the health of rivers, provide security of access for water users, meet the social and economic needs of regional communities and facilitate water trading.

Orange Council has an existing water supply entitlement to extract up to 7,800 ML/year of water for town water supply purposes from the Macquarie system. This entitlement has been accounted for in the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources* (NSW Office of Water, 2012); however, Council's existing water supply system cannot deliver this supply with security. Orange Council has also committed to purchasing water access licences and has an option to purchase a 640 ML/year general security unregulated water access licence in accordance with the trading rules set out under the Water Sharing Plan. The general security water access licence is currently inactive. Water access licences are also discussed in section 5.2.

Modelling indicates that the Project would have no detrimental affect on water management downstream of Burrendong Dam. This is due to the large buffering of flows provided by the Burrendong Dam impoundment and the management of water allocation in accordance with the *Macquarie-Cudgegong Water Sharing Plan*. The project would similarly not affect upstream water users, such as Bathurst town water supply, as the Project is based on known current upstream requirements and prevailing river flows; does not rely on any changes to the operation of Bathurst water supply system; and is located sufficiently downstream of Bathurst so as to not affect the operation of its water supply system.

Operating Costs

The project at maximum operation would require 1,409 Kilowatts (KW) of electricity and have an annual energy consumption of 26,771 KW hours per day. This is estimated to be equivalent to 3.59 kilo tonnes (kT) of carbon dioxide per year. The Department is supportive of Council's aim to address these impacts through its Distributed Energy Plan to deliver significant financial and environmental benefits to Orange through reduction in energy use and substitution of coal-fired electricity with lower carbon alternatives.

The costs associated with operating the pumping stations and offtake have been reduced by operating the pipeline during off-peak times (currently 9 am to 5 pm and 8 pm to 7 am) and is

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expected to cost approximately $728,500 per year. It is expected to increase a typical residential bill by $52 per year. Orange City Council considered the possibility of a 100 percent increase in power costs or approximately $71 per residence per year.

In practice, the operation of the water supply would be governed by a Decision Support Tool which would consider how the different water sources would be managed to best balance the following objectives:

- minimising raw water costs;
- maximising the use of existing surface water systems;
- sustainably managing water drawn from bores, Blackmans Swamp Creek, Ploughmans Creek and the Macquarie River;
- providing flexibility to consider demand and supply indicators; and
- accounting for environmental flow releases from Suma Park Dam.

Consideration

Supply Security and Diversification

The Department accepts that the predicted growth of Orange is consistent with government policy and observed and predicted population growth. Even in the absence of population growth there remains an existing deficit in secure yield compared to the calculated current unrestricted demand (see Section 2.2). The existing water supply system, comprising natural inflows, stormwater harvesting and groundwater extraction, does not provide security of supply for Orange's current demand.

The most recent drought (2000 – 2010) has demonstrated that a repeat of similar drought conditions with an increased population would likely result in Council imposing Level 6 Water Restrictions. This would severely impact on the amount of water available for residential, commercial and industrial use. If an augmented water supply were not made available, this would result in impacts to residential, commercial and industrial activity in Orange.

The Department considers that the implementation of frequent and constraining water restrictions could hinder the ability of Orange to grow as envisaged. This could ultimately be to the detriment of Orange's economy and community, and the broader NSW economy.

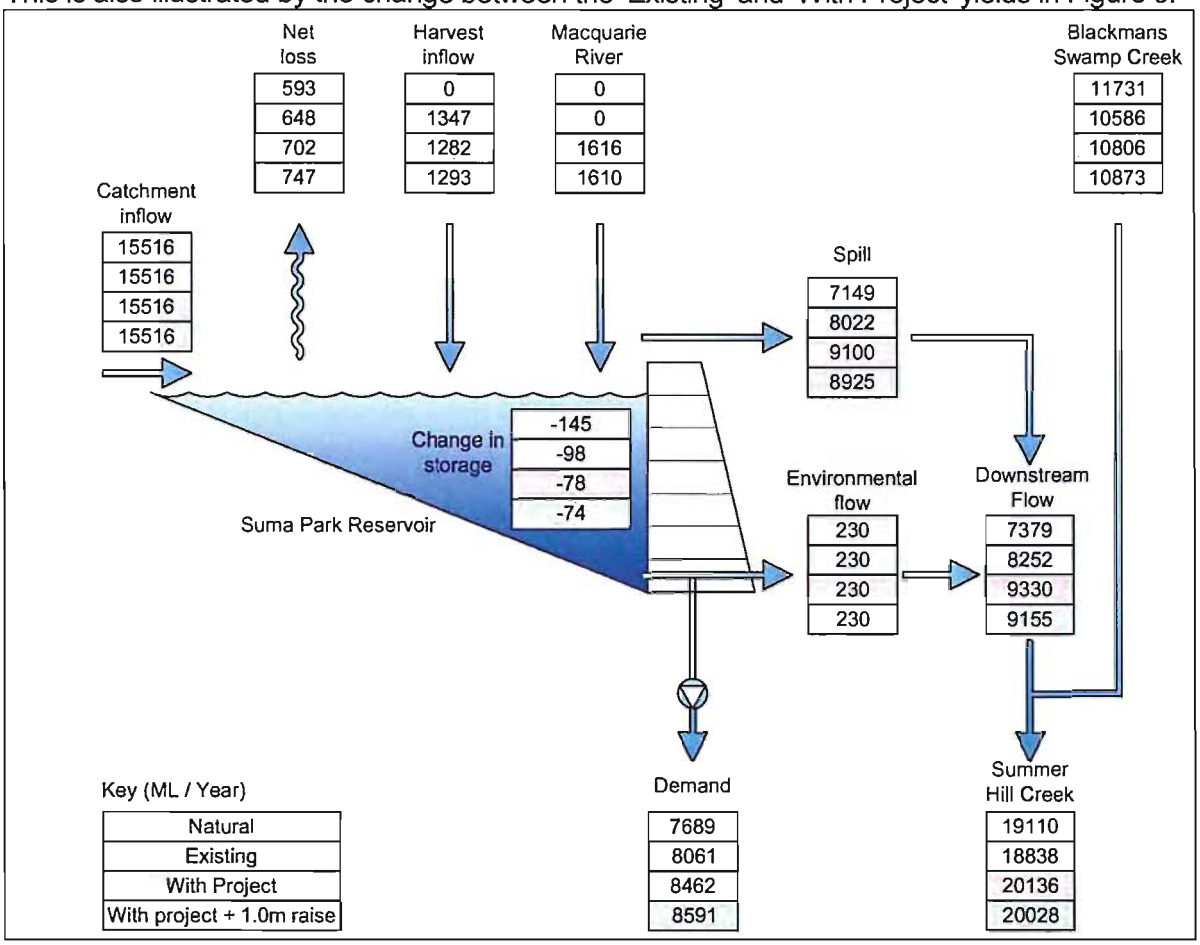
In order to increase security and diversity of supply, Orange City Council proposes to operate the project to ensure water is available during dry periods. In effect, water would be pumped more often (ie. not just during dry periods but as water becomes available and the relevant operating conditions and triggers are met) to keep water levels in Suma Park Reservoir high as much as possible instead of pumping a greater volume of water when the water storage level is low and which may coincide with low flows in the Macquarie River. Modelling shows that the likelihood of Council imposing severe water restrictions on the community and businesses, during periods of drought, is reduced with the operation of the proposal.

A number of submissions were critical of the project's resources and energy cost in extracting water from the river, only to have much of it spill from the reservoir into Summer Hill Creek and back to the Macquarie River downstream of the offtake point. The 1,616 ML/year proposed to be extracted from the Macquarie River would be offset by increased spills (number and volume) totalling approximately 1,300 ML/year from Suma Park Dam to Summer Hill Creek and back to the River resulting in a net extraction of approximately 320 ML/year downstream of the Summer Hill Creek and Macquarie River confluence. The increased flows in Summer Hill Creek are due to a combination of:

- increased spill volumes from Suma Park Dam; and
- reduced operation of the Blackmans Swamp Creek stormwater harvesting scheme resulting in increased flows to Summer Hill Creek[11].

[11] Flows from Blackmans Swamp Creek into Summer Hill Creek are a result of the project keeping water levels higher in Suma Park Dam, so that the operation of the stormwater harvesting scheme is reduced. The harvesting scheme is licensed to operate when water levels in

This is also illustrated by the change between the 'Existing' and 'With Project' yields in Figure 9.



Source: Macquarie River to Orange Pipeline Project, Hydrology and Water Security Assessment (Geolyse, July 2012)
Figure 9. Suma Park Reservoir average annual water balance

The OEH submission requested consideration of a covered reservoir for water storage as a way to reduce the increased spill to Summer Hill Creek instead of pumping to Suma Park Dam. Council considered this as an alternative (see Table 4). Pumping water either directly to the treatment plant or to a covered reservoir would result in less water from Suma Park Dam being used and the water level in the Dam remaining higher. Higher water levels in Suma Park Dam mean there would be less available capacity in the Dam to retain natural inflows following rain events. This option would result in no benefit to reducing spills to Summer Hill Creek or through evaporation loss.

The Department notes that the EA and PPR represent a maximum operating scenario where the project was modelled to operate whenever the pumping rules are met. The assessment demonstrates that the project can meet the long term and short term deficit in secure yield but it does not need to be operated to that maximum scenario, at least in the short term, and operation of the pipeline can be implemented in stages as demand grows with population growth.

The Department understands that the project would be operated in a staged manner by initially reducing the amount of water extracted by the project and increasing the amount over time as demand increases with population growth. This could be achieved by adopting one or a combination of the following operating rules:

- lowering the trigger level in Suma Park Reservoir (ie. below 90 percent);
- increasing the river flow trigger (ie. a trigger level that would be greater than 38 ML/day);

Suma Park Dam are below 50 percent, however one of the triggers for operation of the project is that water levels in the dam fall below 90 percent).

- reducing the daily volume transferred from the river (ie. pumping for less than 12 ML/day); and/or
- adopting a percentage of river flow for extraction at any given time (ie. limiting extraction by pumping no more than a nominated percentage of the river flows at any one time).

Reducing the amount of water extracted would reduce the annual average spill from Suma Park Dam, however, it could also mean that less water would be available should extended dry conditions be experienced.

The Department considers that the operation of the project in stages and in accordance with Council's Decision Support Tool, as outlined in the Preferred Project Report, would allow for optimisation of the water supply system and take into consideration all available components of the water supply system as well as responding to prevailing circumstances. In considering the issues raised in submissions about the sustainability of the proposed project, the Department has considered the risks of impacts of the proposal and the measures proposed to avoid and minimise impacts to the environment as well as the consequences of the proposal not proceeding (see following sections for consideration of environmental issues). The Department notes that modelling anticipates that more water will be available during dry and drought periods such that water restrictions are not required to be as severe.

The Department considers that, by providing a more diverse and secure water supply without pumping when flows in the Macquarie River are below the 80th percentile flow and ensuring that the true costs of this security of supply are realised by the community, it has considered the principles of ecologically sustainable development. The project is therefore considered to be a sustainable option for increasing water supply for Orange.

Impacts on Other Water Users

The Department has also considered submissions concerned about the impact to other water users being able to increase their access to water in order to meet their future demand. Water is a finite resource and water availability during times of drought is a broader community issue which is not limited to town boundaries. The Department notes that it is not the role of this Project to pre-empt future proposals where there are no existing approvals or commitment from Government or industry to proceed with such. Any future proposal will need to consider the hydrological environment including relevant water sharing plans, water access licence availability and the impacts of that proposal at that time.

The Water Sharing Plan includes objectives to manage water sources to ensure equitable sharing between users, and provide opportunities for enhanced market-based trading of access licences and water allocations within environmental and system constraints. The Department considers that the Project is consistent with the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*.

The Department notes that the operation of the project would not impact water users in Dubbo, downstream of Burrendong Dam, as the project is not expected to alter the way water use is managed by the *Macquarie-Cudgegong Water Sharing Plan*. There are no water access licences between the offtake location and Burrendong Dam but there are landholders with basic rights to access water for stock and domestic purposes. Stock and domestic water use rights are protected as the project limits operation so as to maintain the 80th percentile flow. Stock and domestic water users can continue to access water to the cease to pump threshold in the Water Sharing Plan, where there is no visible flow. This is considered to be the 95th percentile flow.

Impacts to Bathurst, located upstream of the offtake location, are also not expected, nor is there a requirement for Bathurst to change the way it operates its water supply system to accommodate this project.

The Proponent has committed to purchasing additional water access licences as they become available in accordance with the trading provisions of the Water Sharing Plan. Water Access Licences are discussed further in Section 5.2. Any future projects by any other water user would be subject to the same requirements or the prevailing government policies at that time.

Submissions received raised concerns about the purchase and use of a 'sleeper licence' or a licence which is currently not being used. The concern relates to an increase in extraction from the Macquarie River over and above that currently experienced by reactivation of an inactive licence.

The water sharing planning process acknowledges that future water use can increase above the extraction limit established in the Plan through:

- issuing of new specific purpose access licences;
- increased basic landholder rights; or
- through the activation of inactive share components of existing licences through business expansion or trading.

The Department accepts there will be an increase in water extraction that is consistent with the Water Sharing Plan, which also establishes rules and priorities for adjusting allocations due to any increase in average annual extraction against the long term average annual extraction limit. The Department notes the *Macquarie Bogan Unregulated and Alluvial Water Sharing Plan* also has a growth in use response trigger set at a five percent increase in extraction within the whole water source over a five year period. DPI (NOW) considers, however, that the activation of this licence, while currently not being used, is not expected to result in a growth in use response under the Water Sharing Plan such that it would result in a five percent increase. Notwithstanding, should water use exceed the long term average annual extraction limit, water allocations would need to be adjusted in accordance with the priorities in the relevant Water Sharing Plan.

The Department has also considered submissions questioning the use of water for the Cadia Mine's expansion. Cadia Mine is currently entitled to 10 ML/day of treated effluent from Council's sewage treatment plant until at least 2030. The Department notes the *Director-General's Environmental Assessment Report for the Cadia East Project* (Department of Planning, 2009) which states that additional water required for the expansion of the Mine will not be obtained from Orange and Cadia Mine will instead focus on other sources of water and water efficiency measures in order to meet its water demand. The Project does not envisage additional supply of water to Cadia Mine. Despite this, it is not the role of the planning and assessment process to determine the customer base.

Operating Costs

The Department notes that the operation of the project will increase costs to water users but that the option selected by Orange City Council has been demonstrated to provide the best value for money with and without the Government grants. The Department is supportive of the proposal to manage Orange's water supply system through the Decision Support Tool which aims to minimise raw water costs and maximise the use of existing surface water systems. This would keep the operating costs to the minimum necessary.

The Department is also supportive of Council's ongoing schemes to assist rate payers in reducing their water consumption and with payment, should they experience hardship; in meeting the additional costs including ongoing showerhead replacement program, internal water audits, rainwater tank rebates, periodic payments, individual arrangements; and pensioner statutory and voluntary rebates.

Overall, the Department considers that the project responds to environmental, economic and social considerations for Orange by adopting a cease to pump trigger that maintains the 80th percentile flows; by considering impacts to industry, commerce and residents should ongoing and severe water restrictions need to be imposed; and in considering options to improve the secure yield.

The Department considers the Orange Water Management Strategy adopts a 50 year broad-based strategy focusing on ongoing water conservation, quality and demand management with the intention to have water supply infrastructure in place at least ten years in advance of projected demand. The Department also considers that the Project is consistent with the objectives of the

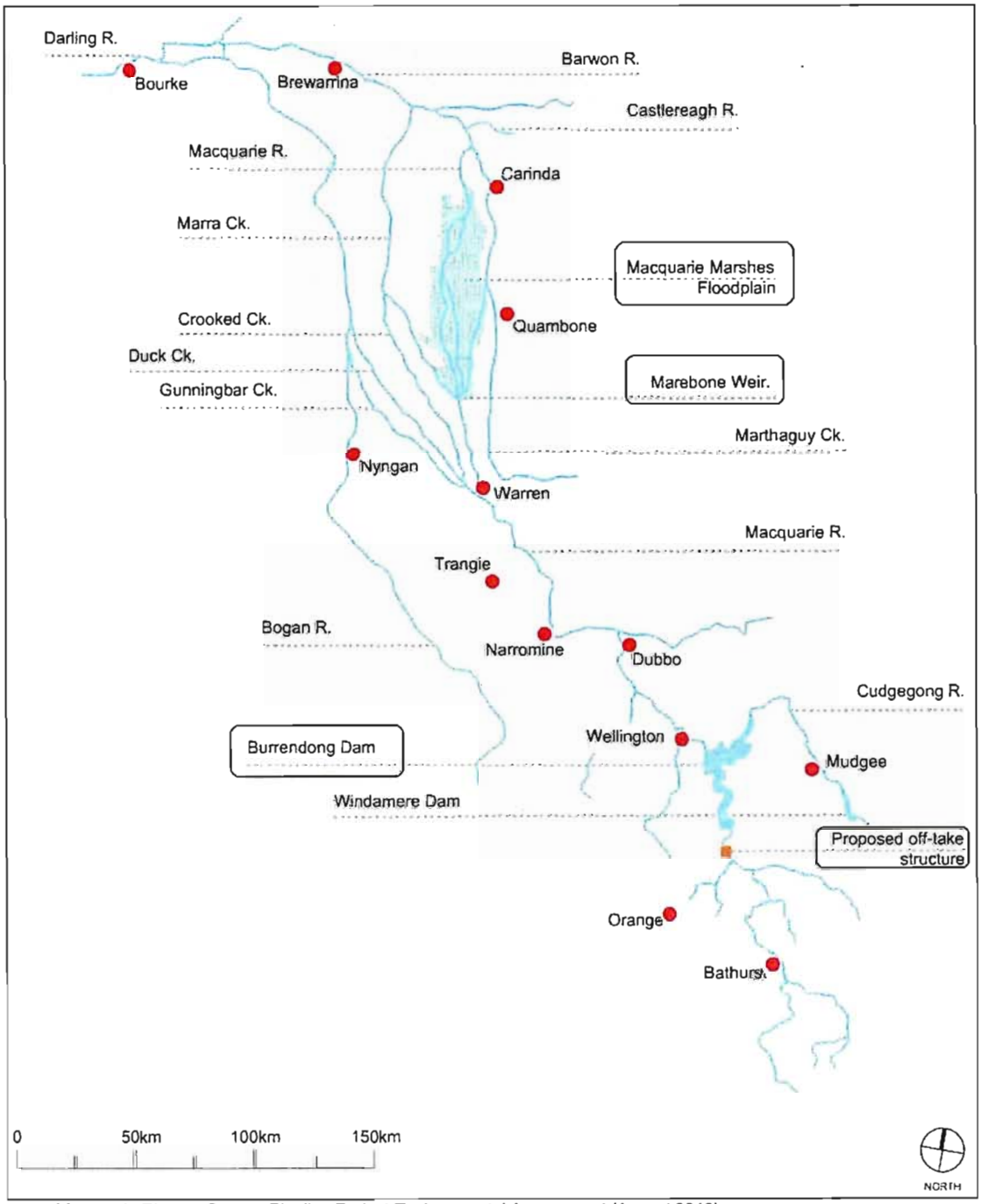
National Water Initiative (national initiatives for water reform endorsed by the Council of Australian Governments in 2004) including:

- preparation of water plans with provision for the environment;
- improving the pricing of water storage and delivery; and
- meeting and managing urban water demands.

5.2 Hydrology – Impacts of proposed water extraction

Macquarie River

The Macquarie River System is shown in Figure 10. The average annual flow within the Macquarie River at the proposed offtake point exceeds 300,000 ML/year.



Source: Macquarie River to Orange Pipeline Project Environmental Assessment (August 2012)
Figure 10. Macquarie River System

The proponent proposes to operate the project in accordance with specific operating rules (see Section 5.1). The operating rules require flows at the offtake point greater than 38 ML/day before

pumping could commence while also meeting other criteria. Flows greater than 38 ML/day in the River, based on the "Scenario B" model (refer to Table 8 for a summary flow data), are expected to occur for at least 71 percent of the time. The proposed pumping rules were selected to ensure that the daily downstream flow does not fall below the modelled 80th percentile flow (22 ML/day), based on the "Scenario B" model.

Table 8. Summary and description of model scenarios

Model	Duration	Description	80th Percentile flow
Scenario A	118 years	Closely matches historical streamflow but does not correlate with observed drier conditions from 2000-2010. This was assumed to be due to a change in the catchment response resulting in reduced runoff.	55 ML/day
Scenario B	118 years	Considered to be more realistic of future river conditions should reduced runoff conditions prevail.	22 ML/day
IQQM[12]	117 years	Calibrated on pre-2000 data.	92 ML/day

Table 9 illustrates the annual river flow and the modelled volume extracted for the years 2000-2010 using the Scenario B flow series, should the project been operational at that time.

Table 9. River flow and modelled extraction by the project between 2000 and 2010

Year	Annual Macquarie River Flow ML	Annual Extraction ML	Volume Extracted as Percentage of Annual River Flow
2000	535818	0	0.00%
2001	119474	2208	1.80%
2002	39531	2784	7.00%
2003	88200	3480	3.90%
2004	70665	1716	2.40%
2005	219387	1320	0.60%
2006	51803	1164	2.20%
2007	118157	3036	2.60%
2008	92543	3612	3.90%
2009	33225	2784	8.40%
2010	767339	2508	0.30%
Totals	2136143	24612	1.20%

The modelled flow series selected to determine the 80th percentile flow, "scenario B", was selected by the Proponent as a conservative basis for the impact assessment as it examines how the system could operate if reduced runoff catchment conditions prevail, as was observed from the years 2000 to 2010. By using "scenario B" the 80th flow percentile is calculated to be 22 ML/day compared to "scenario A" which is 55 ML/day. "Scenario A" closely matches the historical streamflow records, however, "Scenario B" is considered to be a more realistic assessment of future river conditions and a more conservative basis for the impact assessment compared to "scenario A".

The assessment used 118 years of historical rainfall data and 60 years of river flow data to evaluate how the project may have operated had the project been operational during that time. Council's model considered three drought periods, including the Federation Drought of 1895-1902, considered to be the worst on record, and two wet periods (1916-1918 and 1973-1976).

[12] as recommended by Bewsher in the interim until revised modelling carried out

The maximum extraction of 12 ML/day on a 38 ML/day flow day would be 31.5 percent of the river flow at the offtake point. These conditions are modelled to occur on approximately 17.5 days or 0.11 percent of total pumping days (15,905 days) over the 118 years modelled. The reduction in water level at the proposed offtake point at Cobbs Hut Hole (approximately 1.1 km long and 4.15 m deep at the lowest point in Cobbs Hut Hole during 38 ML/day flow) during this extraction would be 45 mm. The reduction in water level, at Cobbs Hut Hole, during low to moderate flows (80^{th} to 50^{th} percentile flows)were modelled to be 11 to 14 mm and during moderate to high flows (40^{th} to 10^{th} percentile flows) 1 to 5 mm.

The proposed pumping rules would mean that pumping would occur intermittently and over a maximum of 19 hours per day resulting in changes to flow volumes and water heights downstream of the offtake location. The water levels in pools and at riffles, however, would respond to the natural flows within the river when pumping ceases.

Suma Park Dam and Summer Hill Creek

Spills from Suma Park Dam are expected to increase by approximately 1,078 ML/year[13] as a result of pumping water from the Macquarie River to the reservoir when the water level at Suma Park Dam is less than 90 percent as there will be less capacity to retain natural inflows from the catchment. While this would not occur during dry or drought periods, it does offset the long term average water extraction in the Macquarie River, such that the net extraction from the Macquarie River, when also considering changes to the Blackmans Swamp Stormwater Harvesting Scheme, would be approximately 320 ML/year. Blackmans Swamp Creek stormwater harvesting scheme can only be operated when Suma Park Reservoir is less than 50 percent full. The operation of this stormwater harvesting scheme would be reduced as the project could be operated whenever the water level in Suma Park Reservoir is less than 90 percent.

Flows in Summer Hill Creek are predicted to increase to 18,838 ML/year as a result of the project. This would see proportionally greater increases in the volume of low flows (26-57 percent) from increased spills from Suma Park Dam than low to moderate flows (7-10 percent) and moderate to high flows (4-10 percent). The impact of flows in Summer Hill Creek to aquatic ecology is also considered in section 5.3.

The modelled flow depth change for the 80^{th} and 90^{th} percentile flow was an increase of between 30 to 36 mm respectively and changes to channel velocity from a reduction of 0.17 m/s to an increase 0.28 m/s. These changes are considered insignificant to the creek system and do not include influence of tributary inflows downstream of the confluence with Blackmans Swamp Creek.

Cobbs Hut Hole to Burrendong Dam - Unregulated Section

No water licences have been issued for the river section between the offtake point at Cobbs Hut Hole and Burrendong Dam. Basic stock and domestic rights as defined in the Water Sharing Plan would not be affected by the proposed project. This is discussed in Section 5.1.

Approximately 1,616 ML/year will be extracted from the Macquarie River or a reduction in average annual inflow of approximately 0.16 percent of the long term average annual inflow to the Burrendong Dam System. This does not take into account the increased inflows from Summer Hill Creek. During the dry periods modelled, a reduction of between 0.32 percent and 0.67 percent of the inflows to Burrendong Dam, could be expected as a result of the project as shown in Table 10.

[13] This figure is for spills from Suma Park Dam only and does not include flows from the reduced operation of Blackmans Swamp Creek stormwater harvesting scheme.

Table 10. Inflows to Burrendong Dam during dry periods

Dry Climate Period	Base Case (ML)	With Project (ML)	Change over period considered (ML)*	Percentage change over period
1895/96 – 1902/03 (8 years)	5,704,800	5,684,300	-20,400	-0.36%
1937/38 – 1941/42 (5 years)	1,855,300	1,842,900	-12,400	-0.67%
2001/02 – 2006-07 (6 years)	3,197,900	3,187,500	-10,400	-0.32%

** Period considered is stated in the first column*
Figures do not include increased inflow from Summer Hill Creek and consider the 12/34 rule instead of the 12/38.

Burrendong Dam to Marebone Weir – Regulated Section

Any direct impact of the proposed water extraction on users downstream of Burrendong Dam is buffered by flow regulation through Burrendong Dam in accordance with the *Macquarie-Cudgegong Water Sharing Plan*. The Department of Primary Industries, NSW Office of Water (DPI (NOW)) determines water allocation for licence holders in July each year. This allocation is regularly reviewed where the allocation is less than 100 percent.

The average daily announced available water allocation available at Burrendong Dam is expected to decrease by 0.1 percent per day from 52.6 percent to 52.5 percent as a result of the project. For the 118 years modelled, there were 23 years when the water allocation from Burrendong Dam is reduced (on average by 1.1 percent) and six years when the water allocation increased (by approximately 1.2 percent). The increase is due to interactions between Windamere Dam and Burrendong Dam. It also identified 88 years where there was no change to the announced available water allocation due to the operation of the project. The project would not result in a change to high security diversions of 21.8 GL/year. Impacts to water users downstream of the offtake, including the Macquarie Marshes, would be negligible.

Macquarie Marshes

Marebone Weir is the last structure to regulate flows to the Macquarie Marshes and is located approximately 330 km downstream of the project (see Figure 10). The Macquarie Marshes Nature Reserves are shown in red in Figure 11.

Water for the Macquarie Marshes is allocated as a general security water allocation in accordance with the *Macquarie-Cudgegong Water Sharing Plan*. The project is expected to reduce the average annual general security diversions from an average of 355.5 GL/year to 354.9 GL/year, or by 600 ML/year.

The Macquarie Marshes holds a total general security entitlement of 262,150 ML/year. Modelling indicates a reduction in average annual general security entitlement of 250 ML/year. During the dry periods modelled, the change in general security diversions was between +3.1 percent to -2.9 percent downstream of Burrendong Dam depending on the management of water in accordance with the Water Sharing Plan.

The impact to the Macquarie Marshes from water extraction during the year where the modelled maximum extraction event occurred (extraction of 3,876 ML/year in 1896/97) was also considered. The results showed a reduction in the annual flow in 1896/97 to the Macquarie Marshes of 1,766 ML/year and a reduction in maximum daily flow of -2 ML/day.

The average streamflow reduction at Marebone Weir is expected to be 500 ML/year or 0.12 percent of the long term average annual flow (426,500 ML/year) and up to 0.8 percent during dry periods as a result of the project. These are considered the worst case scenario as it does not take into account increased flow from Summer Hill Creek. This is also based on a previously considered rule where 12 ML/day would be extracted when flows were 34 ML/day instead of the EA adopted 38 ML/day. DPI (NOW) notes that the resultant impacts on downstream users including the Macquarie Marshes is very conservative in that the impacts are likely to be overstated. The impact to ecological processes of the Macquarie Marshes is considered in Sections 5.3 and 5.4.

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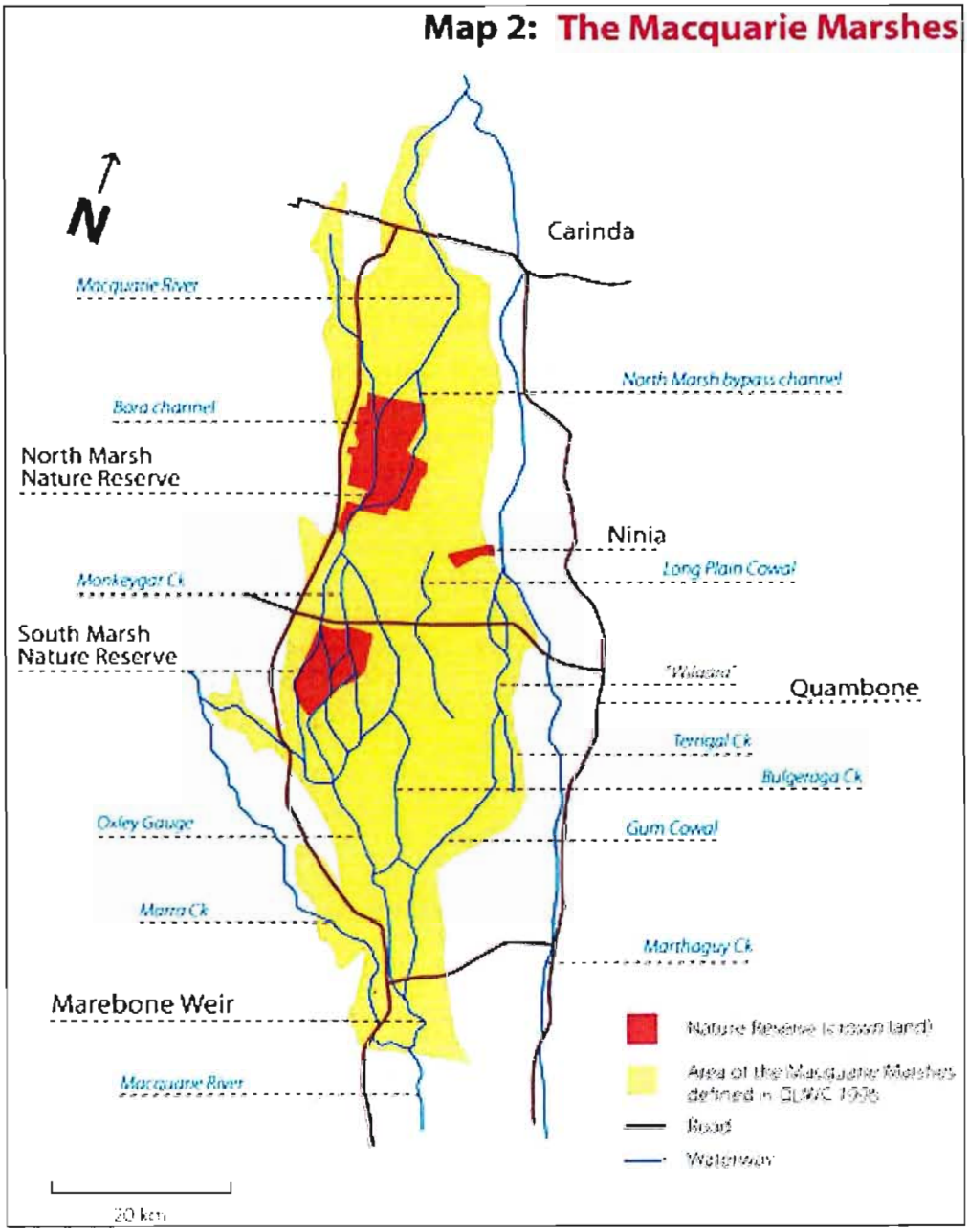

Source: http://www.macquariemarshes.org.au/wp-content/uploads/2009/06/map-2.jpg
Figure 11. Macquarie Marshes

Consideration

Cease to Pump Threshold

The Department notes that the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources* (October 2012) sets a visible flow criterion as the cease to pump threshold for extracting water. Pumping is not permitted from natural pools when the water level in the pool is lower than its full capacity, *i.e.* when there is no visible flow into and out of that pool. The Department supports the Proponent's approach to adopt a more stringent cease to pump threshold, being the modelled 80th percentile flow, and notes that this approach is consistent with the *Advice to Water Management Committees – No. 6 Daily Extraction Management in Unregulated Rivers* (NSW Government, 2002) and above the cease to pump threshold starting point defined as the 95th percentile.

The 80th percentile flow (80 percent of the time the flow would be equal to or greater than this threshold) or low flow was based on modelled river flow series and "scenario B". The Department notes that "scenario B" is considered by the Proponent to be a more conservative and realistic assessment of future river conditions than "scenario A" assuming that reduced runoff conditions prevail into the future (ie. the 38 ML/day cease to pump threshold would be the equivalent of the 93rd percentile). Should future flows be more similar to "scenario A" than "scenario B" the project would extract water at the 93rd percentile (flow of 38 ML/day would be exceeded 93 percent of the time) and would protect the very low flows and the basic rights of water users as the cease to pump threshold corresponding to the Water Sharing Plan 'no visible flow' threshold is considered to be the 95th percentile. The Department accepts this approach as conservative for establishing secure yield and impacts to ecology and water level at Cobbs Hut Hole. However, the Department does not consider the model to be appropriate for determining the 80th percentile flow. The reasoning for this position is outlined below.

To summarise, the modelled flows under "scenario A" indicates there is more water in the river than under the modelled "scenario B". This affects the modelled 80th percentile flow and the calculated 'cease to pump' threshold. Under "scenario A" the cease to pump threshold would be 70 ML/day not 38 ML/day as derived from "scenario B". As "scenario B" assumes there is less water in the river any impacts from pumping 12 ML/day are considered to be worse than if the same impact assessment was done under "scenario A" for impacts related to ecology and water level of Cobbs Hut Hole.

The Department, in considering the models used to determine the 80th percentile flow series, notes that Bewsher Consulting, the Department's independent hydrology expert, does not agree with the Proponent's approach to modelling and the use of "scenario B" to calculate the 80th percentile flow. Bewsher Consulting states that the inability of the model to replicate observed conditions post 2000 was more likely due to the model responding to the substantially drier conditions rather than a change in catchment response as proposed by the Proponent.

Bewsher Consulting suggests that if the data set derived by the DPI (NOW) from the IQQM for the Water Sharing Plan was used for the period from 1890 to 2007 this would result in:

- an 80th percentile flow of 92 ML/day;
- a cease to pump trigger level of 108 ML/day; and
- a secure yield of 2,900 ML/year.

The IQQM (Integrated quantity and quality model) model has been subject to broader and more rigorous review and has been used widely by government water agencies in NSW and Queensland for over a decade.

This suggests that there is substantially more water in the system than Orange City Council's model suggests. The Department also notes that the NOW data set (IQQM) is not without uncertainty and notes Bewsher Consulting's recommendation that either the Proponent's or NOW's model be improved and verified to more accurately calculate the 80th percentile flow. Bewsher Consulting also notes that by adopting a cease to pump threshold of 108 ML/day consistent with using the IQQM data, the secure yield is likely to increase from 2700 to 2900 ML/year, a potential benefit to the long term sustainability of the project and its ability to respond to future growth in demand.

The Department accepts that there are limitations with all of the models and that the 80th percentile flow ranges from 38 ML/day to 108 ML/day depending on which one is chosen. Further refinement of the models would provide a greater level of certainty. The Department recommends a conservative approach until such time as this certainty can be improved and therefore recommends adopting an interim cease to pump threshold of 108 ML/day. Once the model refinements have occurred and a greater level of confidence of the river flow is obtained, with peer review by DPI (NOW), the recommended condition of approval would allow the Proponent to seek, from the Director General, a lower cease to pump threshold based on maintaining the 80th percentile flow.

The impact to the water level at Cobbs Hut Hole during a 12 ML/day extraction when the river flow is 108 ML/day at the offtake point would be approximately 15 mm compared to 45mm with the preferred project. While the Department recommends the interim threshold of 108 ML/day the consideration of impacts is based on the proposed 38 ML/day cease to pump rule as a conservative assessment should the more accurate 80th percentile be somewhere between 38 ML/day and 108 ML/day. The Department's consideration of impacts from extraction on aquatic habitat and ecology is in Section 5.3.

Operation

The amount of water extracted would vary depending on the climatic conditions at the time. Table 11 summarises the operation of the project during dry, wet and averaged for all 118 years modelled.

Table 11. Summary of modelled operation of the project during historic drought and wet periods and average annual extraction

	Historical Drought Periods (1895-1902,1982-1983, 2002-2003)	**Historical Wet Periods (1916-1918 and 1973-9176**	**Average Annual Extraction for all 118 years considered**
Average annual extraction (ML/year)	1,792 – 2,335	708 – 951	1,616 (from 0 – 3,804[14])
Percentage of river flows	1 -2.4%	0.11 – 0.2%	1.6
Number of pumping days	149 – 237	59 – 79	135 (from 0 – 317)
Largest annual extraction (ML/year)	3,876[15] in 1896		

The Proponent proposes to operate the project based on receiving data at 15 minute intervals from a DPI (NOW) Gauging Station 421192, located upstream of the offtake structure. A gauging station measures the height of water at a location. The relationship between river height and flow is determined through actual stream gaugings (measures of the river flow which can only be measured manually) and low river height corresponds to a low river flow. The DPI (NOW) commented that until there are enough stream gaugings to provide confidence in the river rating, a higher pumping trigger should be adopted to account for any margin of error in the gauging station. The Department notes that there have been only 16 river gaugings to date, the latest being 15 January 2013 recording a river flow of 7.99 ML/day. These generally correlate with the river rating curve for the Gauging Station 421192 (see Figure 12), though there are insufficient data points to allow for confidence in the river rating. Therefore the Department has recommended a condition to ensure that the cease to pump threshold pumping trigger includes the margin of error for the flow rating until DPI (NOW) is satisfied that the flow rating correlates with the flows in the Macquarie River at that gauging station.

[14] This figure is based on the current proposal to extract 12ML/day when flows are 38ML/day or greater

[15] This figure is based on the original proposal to extract 12ML/day when flows were 34ML/day or greater

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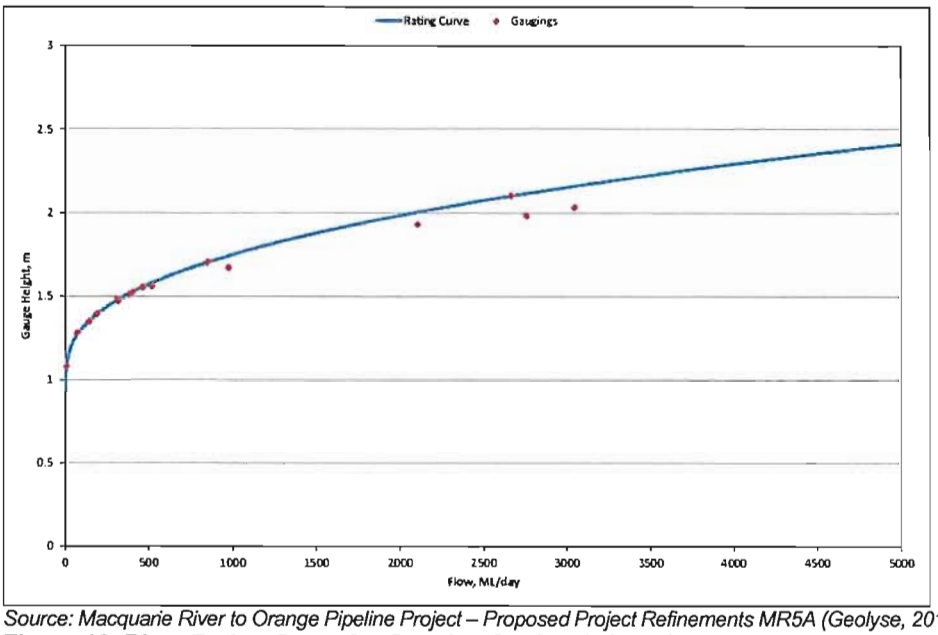

Source: Macquarie River to Orange Pipeline Project – Proposed Project Refinements MR5A (Geolyse, 2013)
Figure 12. River Rating Curve for Gauging Station 421192 (showing all 16 river gaugings)

Spills from Suma Park Dam and flow in Summer Hill Creek

The Department notes that the average yearly flow in Summer Hill Creek is predicted to increase as a result of the project due to dam levels likely being higher prior to and during wet periods than without the project. This would result in the dam having less available storage capacity to retain natural flows during this period. The monthly distributions of spills from Suma Park Dam to Summer Hill Creek are not expected to change, but the frequency, duration and volume of spills are expected to increase. The difference between the average annual transfer (1,616 ML/year) and the increase in average annual spill into Summer Hill Creek immediately below Suma Park Dam would be 538 ML/year (ie. the net extraction volume from the Macquarie River with a 38 ML/day cease to pump threshold) or approximately 1298 ML/year when also considering changes to the operation of the Blackmans Swamp Stormwater Harvesting Scheme downstream of the Blackmans Swamp Creek and Summer Hill Creek confluence.

The Department considers the impact of extraction on flows downstream of Summer Hill Creek confluence with the Macquarie River would be offset by the increase in flows from Summer Hill Creek. However, the Department notes these are not included in the river flow model. Based on the increased inflows, the maximum extraction and impact would be experienced between the offtake point and the confluence with Summer Hill Creek with the average annual flow downstream of Summer Hill Creek being less. The Department accepts this is a consequence of the dam storage capacity and the need to pump when the operating rules are met but also when there is more water in the Macquarie River system to avoid pumping in lower flows wherever possible. The Department has considered the impacts on the aquatic habitat and ecology along Summer Hill Creek in section 5.3.

Submissions received raised concerns about the long-term sustainability and efficiency of the proposed project with respect to pumping water into the reservoir only to have it result in increased spills into Summer Hill Creek. Issues surrounding sustainability and efficiency have been considered further in Section 5.1 and issues surrounding aquatic habitat and ecology in Section 5.3.

Cobbs Hut Hole

The Department accepts that river flow is not static and at any one time the flow is typically falling or rising. A maximum reduction of 45 mm in water level would be a relatively rare event predicted to occur approximately 17.5 days or 0.11 percent of total pumping days (15,905 days) over the 118 years modelled. There are two figures for the maximum reduction in water level (39 mm and 45 mm). One is calculated from the most recent rating table for the river gauging station at Cobbs

Hut Hole and the other is modelled. The Department has adopted 45 mm as the maximum water level reduction based on Bewsher Consulting's consideration that the 45 mm water level reduction is a more accurate estimate. The Department also considers that the typical water level reductions, or water level reductions more frequently experienced, of 11 to 14 mm during low to moderate flows and 1 to 5 mm during moderate to high flows would be difficult to discern from the effects of wind and water movement.

Bewsher Consulting considers that the proposed interim pump trigger of 108 ML/day would result in a worst case reduction in water level of approximately 15 mm. This is a function of a river generally flowing over a wider area and at higher velocities and higher flow rates. Further consideration of the impacts from the reduction in water height on aquatic habitat and ecology is considered in Section 5.3.

Water Access Licences

Orange Council proposes to purchase a 640 ML/year unregulated water access licences, should the project be approved, and transfer a portion of its existing town water supply access entitlement (7,800 ML/year) to the Macquarie River pipeline to meet any short fall in extraction (a shortfall of up to approximately 3,236 ML/year when considering the largest annual extraction of 3,876 ML/year[16]). The Department is satisfied that the Proponent has the ability to obtain sufficient water access licences to allow it to operate the project in accordance with the provisions of the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*. Orange City Council's commitment to continued licence purchases as they become available and in accordance with the trading provisions for the Water Sharing Plan is noted. The Department also notes that the existing secure yield shortfall of 650 ML/year could be met mostly by the 640 ML/year unregulated water access licence.

A number of submissions questioned the type of licence the Proponent intends to purchase and whether this licence was considered a "sleeper licence" that could result in an increase in current water use in the Macquarie River. The Department notes that the Water Sharing Plan acknowledges that water use can increase for a variety of reasons (refer to Section 5.1). Water access licence holder allocations would be adjusted by DPI (NOW) in the event that extractions exceed the long-term average annual extraction limit in accordance with the rules and priorities of the Water Sharing Plan. The Department notes the *Macquarie Bogan Unregulated and Alluvial Water Sharing Plan* also has a growth in use response trigger set at a five percent increase in extraction within the whole water source over a five year period and that DPI (NOW) does not expect this to be reached through the activation of this licence.

The sleeper licence could be activated following purchase by anyone or by the existing licence holder in accordance with the Water Sharing Plan. The Department accepts that water use is most appropriately managed through the provisions of the relevant Water Sharing Plan in a way to ensure equitable sharing between users within environmental and system constraints and considers that the Project is proposed to be operated consistent with the provisions of the water sharing plan including the use of its current water access licence or any additional licences obtained through the trading provisions of the plan.

Downstream Water Users

Both Bewsher Consulting and DPI (NOW) commented on the approach to assessing impacts downstream of the confluence of Summer Hill Creek and the Macquarie River, noting that the assessment was very conservative as it did not account for increased inflows from Summer Hill Creek. The Department also notes that the average reduction in inflow to Burrendong Dam does not equate to the same reduction in flows to the Macquarie Marshes due in part to flow regulation through Burrendong Dam and the operation of the *Macquarie-Cudgegong Water Sharing Plan* which includes interactions with other water sources.

There are no water access licences between the offtake site and Burrendong Dam and as the project would not extract water to the water sharing plan cease to pump threshold, where there is

[16] See Table 11.

no visible flow in the Macquarie River, basic stock and domestic access to water would be protected.

For users downstream of Burrendong Dam the Department considers, the operation of the *Macquarie Cudgegong Water Sharing Plan* effectively buffers the impacts of the project on access to water by setting the rules for how water is to be released. The impact on water access licence holders' ability to access water downstream of Burrendong Dam, including the ability to provide water for environmental functions of the Macquarie Marshes, is considered to be minimal (see Table 12 for a summary of impacts to the Macquarie Marshes during the modelled year 1896/97) and considered in greater detail in Sections 5.3 and 5.4.

Table 12. Water for the Macquarie Marshes for the modelled year 1896/97*

	Base Case	With Project	Change
Annual (ML/year)	109,581	107,815	-1,766
Maximum Daily Flow (ML/day)	3,429	3,427	-2
Average Daily Flow (ML/day)	300	295	-5
Minimum Daily Flow (ML/day)	3.8	3.9	+0.1
Monthly Flows (ML/month)			
July	24,017	23,855	-162
August	16,672	16,560	-112
September	5,913	5,892	-21
October	3,024	3,023	-1
November	9,429	9,431	+3
December	6,989	6,921	-68
January	10,870	10,866	-4
February	3,666	3,437	-229
March	2,290	2,194	-97
April	2,126	2,122	-3
May	2,088	2,089	0
June	22,497	21,424	-1,073

** These results do not consider increased flows from Summer Hill Creek and are based on the originally proposed rule of extracting 12 ML/day when flows were 34 ML/day.*

The Department notes the submission from the OEH identified limitations of the Integrated Quality and Quantity Model (IQQM) in accurately accounting for water allocations for environmental flows and specifically for the Macquarie Marshes. In particular, the model lacks the ability to allocate water to the Macquarie Marshes as would likely be required by OEH and as currently occurs in response to ecological processes. Instead the model assumes all water allocated for the Macquarie Marshes is released in one month. Notwithstanding, the OEH concedes that while it might be possible, it would be difficult for a model to be developed to more accurately replicate the actual water allocation. The Department has considered this limitation in its review of the project and notes that the model used is that currently adopted by DPI (NOW) as being the most appropriate model to monitor the effects of water usage. This model was used in developing the water sharing plans and for auditing NSW compliance with the Schedule E to the *Water Act 2007* (Commonwealth) or the Murray-Darling Ministerial Council Cap. The Department has therefore not considered this issue further.

The Department recognises that hydrological impacts to the Macquarie Marshes are predicted to be minimal and considered to be very conservative by both Bewsher and DPI (NOW) as the modelling did not take into account the additional inflows to the Macquarie River from Summer Hill Creek resulting from the project. Further consideration of the impacts of the project on water to the Macquarie Marshes is included in Sections 5.3 and 5.4.

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5.3 Aquatic Ecology

As previously stated, the aquatic assessment based on a 38 ML/day cease to pump trigger level instead of the Department's recommended 108 ML/day trigger level, would result in a more conservative assessment of the impacts to aquatic ecology.

Macquarie River, Summer Hill Creek, Suma Park Reservoir and Burrendong Dam

Only one threatened species (EPBC listed Murray Cod) and seven native fish, yabbies, freshwater prawns and shrimp were recorded in surveys for the project. An additional 15 native species (including six threatened species) and five alien species have been recorded in the Macquarie River system. A threatened population of Freshwater Catfish has been recorded. Table 13 summarises the conservation status and listing of the threatened species and population.

The platypus (*Ornithorhrynchus anatinus*) is protected under the *National Parks and Wildlife Act 1974* and was also addressed in the assessment.

Table 13. Threatened species and populations potentially occurring in the Project Area

Species	FM Act	EPBC Act
Trout Cod *Maccullochella macquariensis*	Endangered	Endangered
Macquarie Perch *Macquaria australasica*	Endangered and presumed extinct	Endangered and presumed extinct
Murray Cod *Macullochella peelii peelii*	N/A	Vulnerable
Flat Head Galaxias *Galaxias rostratus*	Critically endangered and presumed to be locally extinct	N/A
Southern Purple-Spotted Gudgeon *Mogurnda adspersa*	Endangered	N/A
Silver Perch *Bidyanus bidyanus*	Vulnerable	N/A
Freshwater Catfish *Tandanus tandanus*	Threatened Population	N/A

A restocking program of threatened, native and alien species has taken place in the Macquarie River system including Lake Burrendong for the following species:

- Murray Cod (mostly downstream of Cobbs Hut Hole) and Trout Cod (mostly upstream of Cobbs Hut Hole) in the Macquarie River;
- Golden Perch, Murray Cod, Trout Cod, Brown Trout and Rainbow Trout in the Turon River (the confluence with the Macquarie River);
- Rainbow Trout and Trout Cod in Ophir Creek;
- native Freshwater Catfish, Brown Trout, Rainbow Trout, Redfin Perch and European Carp in Burrendong Dam; and
- Rainbow Trout into Summer Hill Creek.

The success of the threatened and native species restocking programs is not known.

The Macquarie River is formed by the joining of the Fish and Campbells Rivers, and extends north-west to the Barwon River upstream of Bourke. The river flows in a northward direction from near Oberon and is impounded by Burrendong Dam, upstream of Wellington.

Aquatic habitat in the vicinity of the offtake location consists of deep pools, silty and sandy substrate, cobbles, large boulders, bedrock and woody snags. Instream aquatic vegetation was noted as being scarce and the riparian strip generally consisted of exotic grasses, shrubs, River She-Oak and Eucalyptus with the pool edge supporting a diverse range of aquatic macroinvertebrates.

The installation and operation of instream structures that alter natural flows; removal of large woody debris from rivers and streams; and the degradation of native riparian vegetation are listed

as Key Threatening Processes listed under the FM Act. Potential impacts to aquatic ecology from construction of the project include loss and modification of habitat (aquatic and riparian), increased turbidity, water quality impacts from accidental releases of contaminants resulting and disruption to movement from the use of a coffer dam resulting in injury or mortality. Operational and construction impacts are considered below and in Section 5.5 - Geomorphology and watercourse impacts.

Offtake Structure – Cobbs Hut Hole

The offtake site at Cobbs Hut Hole identified in the PPR is approximately 4.6 river kilometres upstream of Gardiners Hole, the site nominated in the EA. The water level in Cobbs Hut Hole is controlled by rock bar sections creating a river pool approximately 1.1 km long. Cobbs Hut Hole contains a greater variety of aquatic habitat and is therefore considered to support a more diverse range of aquatic fauna than Gardiners Hole.

Suitable habitat may exist in the vicinity of Cobbs Hut Hole for the species listed in Table 13. Potential impacts to aquatic ecology from the operation phase include modification of habitat, disturbance from noise/vibration, entrainment (to be pulled along with the current from the offtake) or impingement (colliding with the offtake structure) of fish eggs and larvae, increased risk of predation, alteration of flow regime and exposure to contaminants from spills and leaks from the pump causing injury or mortality.

The project would not impact on temporal variability of the river flow regime (ie. floods, high, medium and low flows) and is unlikely to result in changes to migration, spawning or recruitment cues for threatened fish species. Impingement and entrainment is possible should water extraction coincide with spawning, hatching or larval stages. The assessment considers that the impact of extraction on these lifecycle stages is likely to be small as:

- threatened fish species distribution is likely to occur over a relatively large geographic range;
- the modelled extraction between June and December (more than 50 percent of the year and consistent with key migration, spawning and recruitment months of many species) consists of approximately 36 percent of yearly extraction and 0.2 – 0.6 percent of the average monthly flows; and
- intermittent nature of pumping outside of peak power times.

Suma Park Dam typically receives spring runoff so extraction is expected to be the lowest during spring (refer to Figure 13) and the pumping frequency is also likely to be less during this period.

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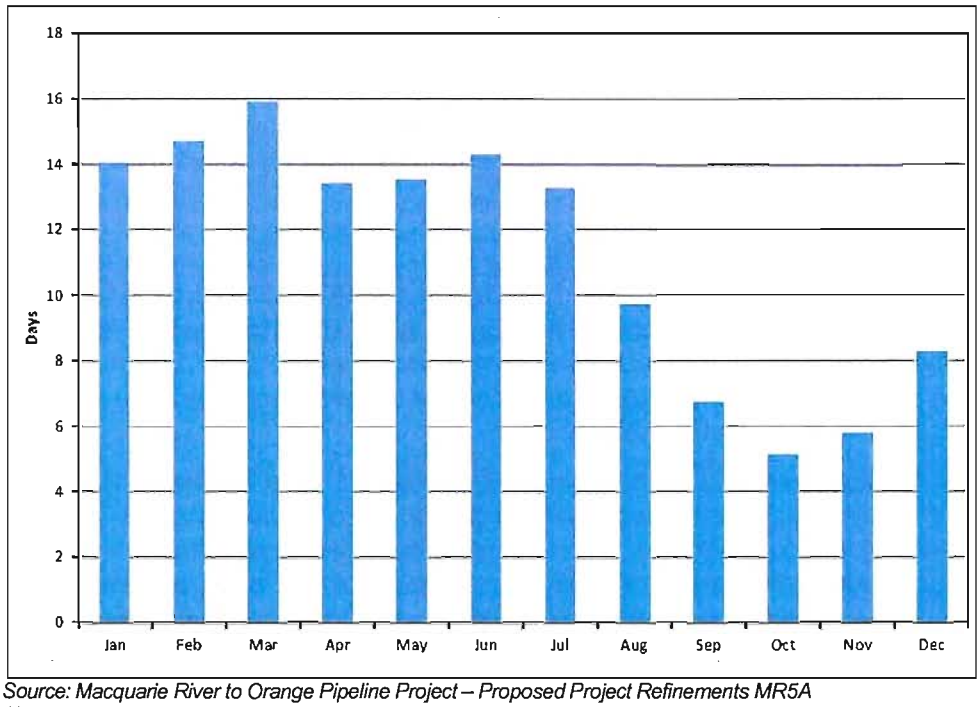


Source: Macquarie River to Orange Pipeline Project – Proposed Project Refinements MR5A (Geolyse, 2013)

Figure 13. Average pumping days per month

To minimise the impact to eggs and larvae further, filters are proposed to be cleaned by an air purge system at the start and end of the extraction period and operated slowly at first before ramping up to the maximum extraction rate. It is anticipated that this would disperse any nearby fauna and deter them from the area whilst extraction occurs.

Juveniles and adult fish are unlikely to be affected by impingement and entrainment from the operation of the offtake as juveniles and adults are stronger swimmers and not impacted by currents to the same extent as eggs and larvae. Potential impacts on juvenile and adult threatened species, such as the Trout Cod, Macquarie Perch and the Murray Cod, include disturbance from the intermittent operation of the offtake structure as fish may shelter in this area.

The impact from disturbance caused by the operation of the offtake has the potential to impact any Murray Cod residing in the offtake area in particular as it is thought to be a mostly sedentary and territorial species which remains in specific holes or snags except during spawning migrations. The operation of the pump, therefore, has the potential to disturb any Murray Cod in the area such that it may leave its territory in search of another.

Fish Passage

Water extraction would reduce the stream depth and may decrease habitat availability depending on the magnitude of the reduction. Based on the review by Bewsher Consulting, as discussed in Section 5.2, the Department has adopted the maximum reduction in water level as 45mm calculated from the most recent rating table at Cobbs Hut Hole instead of 39 mm modelled by the Proponent. The maximum reduction was modelled during a 12 ML/day extraction at 38 ML/day flow occurring 0.11 percent of the total pumping days modelled. Water level reductions would be typically between 1 to 5 mm during moderate to high flows and 11 to 14 mm during low to moderate flows.

Reduced water flow across riffle sections (areas containing boulders or rock bars behind which pools such as Cobbs Hut Hole can form) has the potential to create barriers to fauna passage. The reduction in water flow depth and flow velocity would result in different impacts for narrow and wide riffles although impacts to habitat along the margins are not expected to be adversely affected.

It is difficult to model the impacts across riffles due to the complexity and variability of riffles, however a simplistic model across a rock bar showed that water flows to retain water depths of 20

and 30 cm across a five metre wide riffle section would require 75 ML/day and 150 ML/day and for riffles 20 m wide flows of 297 ML/day and 584 ML/day.

The effect of extraction on the number of days that a flow depth of 20 cm and 30 cm would not be maintained across a riffle structure of given width is shown in Table 14, ranging from 0.4 days at a 20 m wide riffle to 6.6 days at a five metre wide riffle.

Table 14. Number of days flow of 20 and 30cm due to the operation of the project is not maintained

Riffle Width (m)	Reduction in flow depth exceeding 20 cm (days per year)	Reduction in flow depth exceeding 30 cm (days per year)
5	6.6	3.1
10	2.9	1.4
15	1.8	0.6
20	1.4	0.4

The modelled assessment notes that riffle habitats are not uniform and can contain many potential routes for fauna passage with areas of high and low velocity flows. So even when flows are less than 20 or 30 cm over a riffle fish passage may not necessarily be affected and notes that the reduction in volume for a pool is much smaller than for the riffles and could provide sufficient volume for refuge for species during times when flows across riffles are reduced so that passage is not possible.

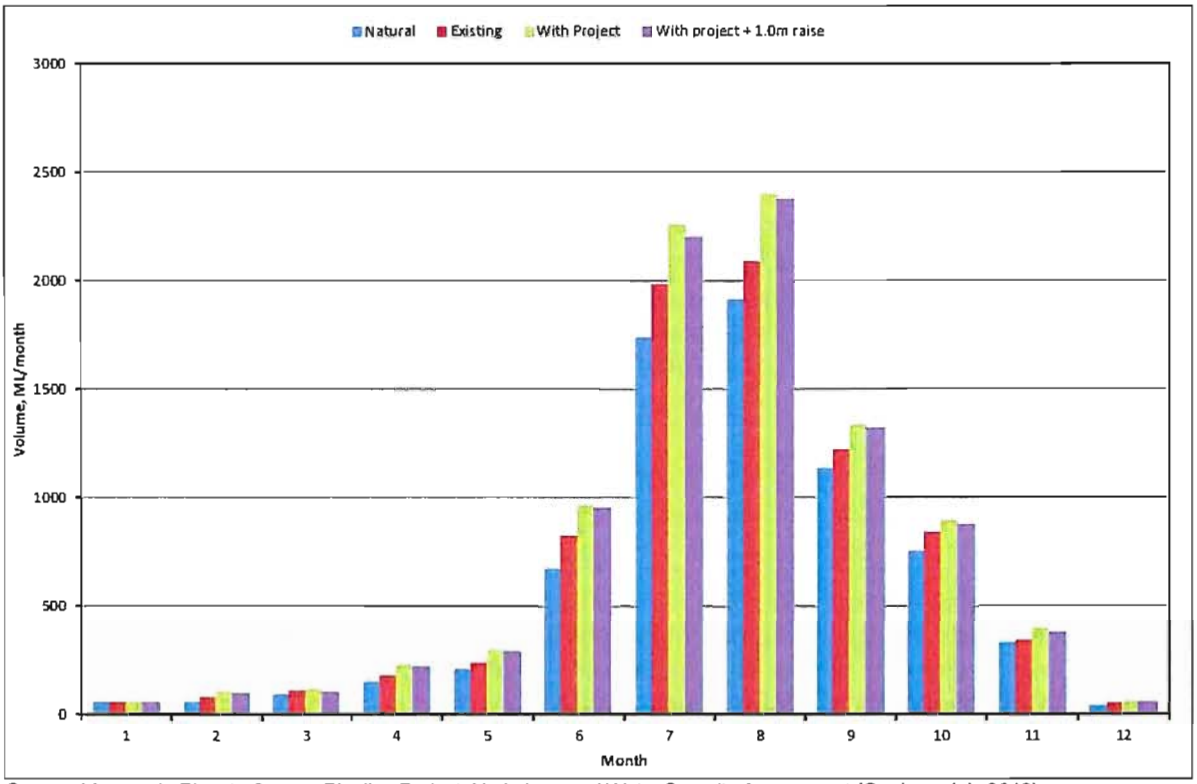
Summer Hill Creek

Larger creeks crossed by the construction of the pipeline may contain suitable habitat for Flathead Glaxias, Trout Cod, the Freshwater Catfish and the Southern Purple-Spotted Gudgeon. Suma Park Reservoir is also likely to contain suitable habitat for the Flathead Galaxias.

Operation of the pipeline is expected to increase the average annual flow, frequency, duration and volume in Summer Hill Creek as a result of increased spills from Suma Park Dam but not the monthly distribution of spills (refer to Figure 14). Water may also be released into Summer Hill Creek during maintenance and emergency works associated with the pipeline.

The increased flows are likely to result in small increases in available aquatic habitat and small improvements in the connectivity of aquatic habitats and biota along the creek and their connection with adjoining riparian and floodplain habitats. This is likely to benefit fish including Flathead Galaxias and Southern Purple-Spotted Gudgeon, platypus and turtle species and could potentially trigger spawning migrations and recruitment of native fish. Exotic fish (eastern Gambusia, carp and redfin perch) tend to prefer slow-flowing streams and may be disadvantaged by increased low flow volumes.

It is also possible that the increased volume of flow could improve water quality, dissolved oxygen levels, reduce temperature associated with smaller flows and further dilute effluent and runoff from agricultural land and may reduce die back of riparian vegetation and improve their reproductive success. Increased flows could, however, also enhance downstream transport of sediment through possible erosion and scouring, leaf litter, woody debris, rocks and plankton. Increased sediment transport may accumulate in riffles and pools to increase aquatic habitat or cause smothering or clogging of feeding and respiratory appendages of flora and fauna.



Source: Macquarie River to Orange Pipeline Project, Hydrology and Water Security Assessment (Geolyse, July 2012)
Figure 14. Average Suma Park Dam Spill volume per month

Macquarie Marshes

The Macquarie Marshes are home to a diverse range of flora and fauna. The dependency of ecological components of the Macquarie Marshes on the flow regime is not known, however, flow rate, timing and duration have been attributed to vegetation and colonial waterbirds breeding success. For example, waterbird breeding success has been linked to an inflow of around 250 GL to 300 GL over the three months preceding the breeding season.

The flows thought to maintain the condition of the main flood dependent vegetation include flows over successive months from June to April or May of:

- 100GL over five months to maintain semi-permanent wetlands and lower elevation vegetation including some river red gum forest occurring for 80 percent of the years;
- 250 GL over five months to inundate a larger areas including the majority of river red gum forest and wetland communities occurring for 40 percent of the years;
- 400 GL and 700 GL over periods of seven and eight months to inundate the broader Marshes and woodland communities occurring for 30 and 17 percent of the years respectively.

The Proponent provided additional information to illustrate that there would be no reduction in the number of occasions where the flows exceeded 100 GL, 250 GL, 400 GL or 700 GL over the months specified above at the Macquarie Marshes with the operation of the project. There was, however, a change in the average flow volume over those periods as shown in Table 15 but this did not impact the prescribed flows as defined above. The operation of the project is not considered to impact on the ecological processes of the Macquarie Marshes.

Table 15. Change in average flows to the Macquarie Marshes.

Ecological flows to the Macquarie Marshes	Existing Average volume (GL)	Post Project Average Volume (GL)	Difference (GL)
>100 GL over 5 months	257.13	257.01	-0.12
>250 GL over 5 months	449.47	449.58	0.10
>400 GL over 7 months	654.87	652.94	-1.93
>700 GL over 8 months	861.86	861.34	-0.52

The Proponent has also considered the monthly flows for the year with the largest extraction, see Table 12. This illustrates that water availability with and without the project would not meet the 100 GL mentioned above over the suggested monthly periods.

The Macquarie-Cudgegong Water Sharing Plan regulates water released from Burrendong Dam including to the Macquarie Marshes. The reduction in flow at Marebone Weir, as considered in Section 5.1, is expected to have a small effect on moderate to high flows and a negligible impact on the hydrological regime of the Macquarie Marshes.

The operation of the project is not expected to result in destruction or modification of wetland areas, adverse effects on habitats or lifecycles of native species, changes to the water quality of the wetland or the establishment of additional or increased spread of existing invasive species that are harmful to the ecological character of the wetland.

Migratory species that utilise the Macquarie Marshes are also unlikely to be significantly impacted by the project as changes to the hydrological regime of the Macquarie Marshes from the operation of the project are considered negligible as demonstrated above and in Section 5.1.

Construction Impacts

The construction of the offtake at Cobbs Hut Hole is considered to result in temporary impacts to aquatic species from habitat removal for coffer dam construction and general noise and vibration disturbances.

The construction width of the pipeline across Summer Hill Creek and other waterways would be constrained to six to 10 m where feasible, noting that trenching is proposed at all waterway crossings (refer to Section 5.5). Impacts during construction to aquatic flora and fauna, such as habitat modification, increased turbidity and water quality impacts, at waterway crossings are likely to be temporary and unlikely to result in unmanageable impacts to the listed threatened fauna as appropriate rehabilitation of both the riparian and aquatic habitat is proposed in areas where waterway crossings require the removal of vegetation to ensure the stability of the waterway. There is the potential for ongoing impacts to aquatic flora and fauna should the proposed rehabilitation not be appropriate or successful. In this regard the Department recommends that all watercourses disturbed during construction be rehabilitated to a standard equal or better than the existing condition, in consultation with the relevant landholder or agency, and has recommended a condition of approval to that effect. Further consideration of the construction impacts to waterways and geomorphological aspects of the water crossings are considered in Section 5.5.

Consideration

The aquatic assessment is based on the model calculated low flow class of 22 ML/day as the 80th percentile flow (see Section 5.2). While, as noted in section 5.1, the 80th percentile flow class is likely to be higher than 22 ML/day, for the purposes of the aquatic assessment, the Department has considered the impacts of extraction resulting in a flow of 22 ML/day as a conservative assessment of the impacts (ie. a pumping trigger of 38 ML/day would result in residual flows at 22 ML/day, the 80th percentile flow). A pumping trigger greater than 38 ML/day is expected to result in

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reduced impacts to aquatic ecology, as more water would be available in the Macquarie River due to extraction of a smaller percentage of the river and a smaller reduction in pool water heights.

The Department notes that the Proponent has taken a conservative approach to the threatened species assessment by assuming the presence of all species previously recorded whether or not they were caught during field surveys. In doing, so the Department also notes that, the Proponent has consulted with the fishing groups and properties along the river. The Department considers that the assessment is consistent with the general approach adopted for ecological studies where potential habitat exists but surveys across all seasons and exhaustive geographical scope is not practical. This assumes a 'worst case scenario' and therefore the impact assessment would be considered conservative.

A large number of submissions raised concerns about the aquatic assessment misrepresenting the numbers and types of species present in the Macquarie River and support the assumption that threatened fish species are present in the Macquarie River and provided photographs and details of restocking events. The Department also received a copy of a subsequent survey commissioned by the Inland Rivers Network (Miles, N.G. (2013)) which recorded the Murray Cod and the Freshwater Catfish as being caught during the survey and provides reference to a Silver Perch caught outside of the survey and anecdotal records of a Trout Cod caught by the Bundi Fishing Club in May 2012.

The Department has considered the Proponents' aquatic ecology assessments and is satisfied that the level of assessment undertaken for the project is sufficient to enable the Department to form a view of the existing biodiversity values on site and likely extent and significance of impacts associated with these project elements. Even though most of the targeted species were not recorded during surveys, or in two cases presumed to be locally extinct, the assessment assumes that all species are present. In assessing the acceptability of the biodiversity impacts, the Department has considered whether the Proponent has demonstrated that impacts on biodiversity have been avoided wherever possible and impacts mitigated to acceptable levels.

The Proponent's assessment of impacts to aquatic ecology considers impacts from the construction and operation of the project including impacts resulting from changes to the hydrological regime on the species presumed to be present including during the most vulnerable lifecycle stages. These are discussed in more detail in the following sections.

Operating Rules

The Department considers that selecting an operating rule above the cease to pump rule of no visible flow, as defined in the water sharing plan is appropriate as the water sharing plan rules do not necessarily take into account impacts to aquatic ecology in the river. In considering whether commencing to pump at 38 ML/day is an appropriate flow to maintain aquatic life, the Department also notes that the flows in the Macquarie River are naturally variable. The natural variation recorded since Gauging Station 421192 was commissioned in June 2011 is shown in Figure 15 and include flows as low as 7 ML/day recorded on 15 January 2013. This figure also illustrates that the river was above the proposed trigger point of 38 ML/day for 97 percent of the time.

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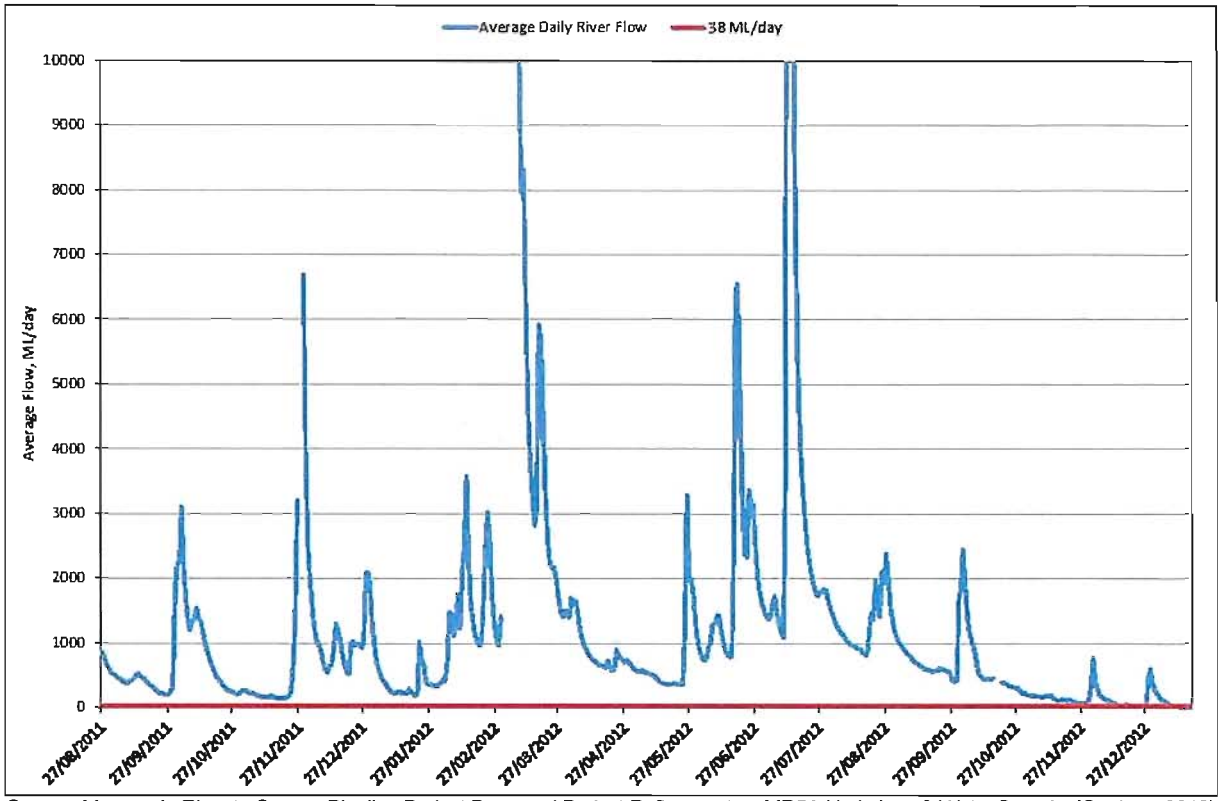

Source: Macquarie River to Orange Pipeline Project Proposed Project Refinements – MR5A Hydrology & Water Security (Geolyse, 2013)
Figure 15. Average daily flow at Gauging Station 421192 (27 August 2011 to 17 January 2013)

Extraction impacts at Cobbs Hut Hole

The Department considers that water extraction is unlikely to result in injury to juveniles or adult threatened species, including released fingerlings, due to their greater swimming ability than larvae, however, the operation of the project does have the potential to entrain and trap fauna with limited swimming ability that can not escape the currents caused by the pumps. The proposed air purge system, series of screens, slower start up velocities and pumping durations will limit the potential for entrainment and entrapment of species, however, there is still the potential for larvae of various species, floating eggs and other smaller and/or less mobile species to be injured, trapped or extracted from the River. The Department also notes that there is very little possibility of species that are extracted surviving the journey to Suma Park Reservoir due to the stresses involved in pumping water.

The Department, in considering the proposed mitigation measures and the modelled operation of the project, considers the risk of impact from entrainment and impingement of larvae and eggs to be acceptable as:

- fewer pumping days are modelled to occur during the spawning, hatching and larval stages than at other times of the year due to spring runoff into Suma Park Dam keeping water levels higher and reducing the need to pump during this time;
- the proposed operating rules propose to only pump up to 12 ML/day with no pumping resulting in flows less than 22.8 ML/day. This represents at worst 31.5 percent of the river flow but more typically between 0.11 and 2.4 percent of the river flows or between 0.2 to 0.6 percent of flows when considering the June to December period; and
- the intermittent operation of the pumps outside providing periods where no pumping occurs.

The Department notes that there is a risk that operation of the pumps, through extraction or disturbance, during certain periods could impact on the numbers of juveniles being recruited which could result in a localised reduction of species or populations. The Department also notes DPI's (NSW Fisheries) submission that considers the proposed pumping regime is unlikely to

result in a significant impact to threatened species or populations. The Department considers that species are likely to have a wide distribution in the Macquarie River and localised impacts to larvae and recruitment of juveniles would be minimised by the inherent operation of the project and mitigation measures proposed.

The Department has recommended a condition to confirm and monitor the predicted impacts during operation of the project and supports the DPI's (NSW Fisheries) recommendation for an adaptive management framework to manage the impacts to aquatic ecology in consultation with relevant agencies.

The intermittent operation, and associated noise and vibration impacts, of the offtake at Cobs Hutt Hole is likely to cause disturbance to any fauna in the area including Trout Cod, Macquarie Perch and Murray Cod utilising the area or offtake as shelter. The impacts to Trout Cod and Macquarie Perch are considered to be less than that for the Murray Cod, as the Trout Cod and Macquarie Perch are more mobile species where as the Murray Cod is thought to be sedentary and territorial except during spawning migrations. The Department considers that the disturbance of any Murray Cod in the area could lead to greater competition and territorial disputes for suitable holes or snags elsewhere in the river.

Fauna passage across riffles

The Department has also considered impacts from the extraction of water on habitats downstream of the offtake (such as pools and riffles). Modelling shows that the water level is likely to reduce by 1 to 5 mm during moderate to high flows and 11 to 14 mm during low to moderate flows with the largest decrease in water level of 45 mm only predicted to occur on 17.5 days (0.11 percent of the total pumping days) out of the 118 years modelled. The typical reduction in water level as a result of pumping is unlikely to be differentiated from the natural effects of wind and water action.

The reduction in water level from extraction would result in greater and more rapid fluctuation in aquatic habitat than would occur through natural variation. The effects, however, would taper with distance downstream as they would be attenuated by pools and any tributary flows including increased inflows from Summer Hill Creek. This means that changes in water level would not be as distinct the further downstream you travel.

Larger mobile organisms that move through very shallow water covering riffles or rock bars are at risk of being stranded, physical exhaustion and stress and increased exposure to terrestrial predators during the operation of the project, particularly during extractions where the largest decrease in water level is a 45 mm reduction and is largely confined to low flows. The operation of the project could expose riffles and create isolated pools that would not have otherwise been there potentially trapping aquatic fauna, noting that reductions in water level, as a result of the project, are likely to be greater and more rapid than natural fluctuations. The likelihood of this depends on the minimum depth requirements, swimming ability, body size and shape of fauna and the level of extraction. Low water levels across riffles would hinder deep-bodied fish species and can limit the movement and foraging habitat of the platypus and turtles.

Notwithstanding, the movement of large-bodied fish species, platypus and turtles across riffles is likely to be constrained at times naturally, with narrow riffles likely to be constrained during low to medium flows naturally and wide riffles likely to be only passable during some medium to high flows.

The Department however, considers that impacts to aquatic fauna, as a result of the reduction in water level from the operation of the project, to be minor as natural fluctuations in water levels occur in the Macquarie River and the aquatic fauna is likely to be able accommodate irregular changes in water levels within the natural variability. The worst case reduction in water height (45 mm at Cobbs Hut Hole) is modelled to only occur for 17.5 days out of the 118 years modelled. The Department notes that pumping is proposed for 19 hours each day and that this could allow any fauna trapped by a reduced water level to escape during non-pumping hours for those 17 days.

Naturally there is less than 22 ML/day flow 20 percent of the time in the River, so while a reduction of 45 mm is a worst case scenario due to the operation of the project it is not in terms of flow experienced within the Macquarie River. Given this, the natural variability in water flows and levels, as well as external influences of wind and water action, it is considered that the potential impacts of the project are acceptable. Further, the worst case scenario is likely to occur infrequently and short term impacts to fauna needs to be balanced with the need to supply town water.

In specifically considering riffle and rock bar habitats, the Department notes the project has the potential to impact on flows through riffles downstream of the project until the upper reaches of Burrendong Dam and that the riffle habitats within the river systems are very complex with varying widths and composition. The Proponent's assessment models the depth of water over a nominal solid riffle section through a defined river cross section, where in reality these environments are much more complex. Water may pass over, under or through riffles and rockbar sections with varying widths, depths and velocity and would naturally change over time as passages may become blocked by silt, sand and debris or move altogether in response to flows and large debris limiting or creating fish passage. While the changes to river height from the project would occur more quickly than would naturally be experienced, the effects on fish passage as a result of the project, with a trigger level of 38 ML/day, would be unlikely to impact fauna such that they would not survive. Even so, the Department agrees with the DPI's (NSW Fisheries) recommendation to include riparian and aquatic habitat monitoring as part of the adaptive management framework in order to manage impacts from the operation of the project in consultation with the relevant agencies.

Summer Hill Creek

Increased spills from Suma Park Dam to Summer Hill Creek are expected to result in small changes in habitat and hydraulic characteristics of Summer Hill Creek. The Department acknowledges the uncertainty in the assessment as the increased flows may result in small positive or negative impacts (such as improved connectivity of aquatic habitats or increased sediment flow smothering or clogging feeding and respiratory appendages on flora and fauna) to habitat for aquatic fauna through increased area of habitat and increased sediment flow downstream. The Department considers that the impact to Summer Hill Creek is likely to be small and supports the DPI's recommendation for a riparian and aquatic habitat monitoring program to compare the predicted impacts with operation of the project and to manage impacts through an adaptive management framework.

Macquarie Marshes

The Department considers that the project is highly unlikely to impact on water availability for the Macquarie Marshes such that it would result in a detrimental effect to the ecological process of the Macquarie Marshes. In considering this, the Department notes that the ability to provide water from Lake Burrendong, as suggested by the Murray Darling Basin Authority, as being required to maintain ecological processes or to support waterbird breeding success, is not impacted by the operation of the project. Annual flows are expected to reduce by 1.6 percent during the year with the largest extraction (refer to Table 12, 1896/97) and by 4.7 percent during the month with the largest monthly extraction (June with reduction of 1,073 ML/month). The Department also notes both Bewsher Consulting and the DPI's (NOW) comments that the assessment of downstream impacts to water users is very conservative resulting in an overestimation of impacts as increased inflows from Summer Hill Creek were not considered, therefore the actual reduction in flows would be less than that stated.

5.4 Terrestrial Ecology

Fifteen vegetation types were identified within the pipeline corridor (ranging from six metres to 20 m wide) between Cobbs Hut Hole and Suma Park Reservoir. Three vegetation types meet the definition of an Endangered Ecological Community under either the *Threatened Species Conservation Act 1995* (TSC Act) and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- Blakely's Red Gum – Yellow Box Open Woodland of the Tablelands is listed as an Endangered Ecological Community (EEC) under the TSC Act;
- Shrubby White Box Woodland is listed as an EEC under the TSC Act; and
- Shrubby White Box Woodland a subset of Blakely's Red Gum – Yellow Box Open Woodland of the Tablelands is also listed as a Critically Endangered Ecological Community under the EPBC Act.

No threatened flora species were recorded, however, suitable habitat is present for three listed species. The assessment concluded that there is, however, no evidence of local populations of these species within the study area.

Twelve threatened fauna species were recorded during surveys for the Project and PPR, comprising birds and bats. Suitable habitat is present for an additional 23 listed threatened fauna species. Of these 11 have a high potential to occur, a further 11 have a moderate potential to occur and one, the Australian Painted Snipe *Rostratula australis*, a low likelihood of occurring in the area. One migratory species, the Rufous Fantail, was recorded during the field surveys and a further eight migratory species listed under the EPBC Act have the potential to occur in the locality. The assessment concludes that important habitat for the migratory species is not located within the project area and is therefore also considered unlikely to disrupt the lifecycle or significantly impact any of the migratory species considered.

The proposal is considered unlikely to result in a significant impact to flora or fauna, noting that impacts to the Superb Parrot were revised from a possible significant impact identified in the EA to no significant impact as a result of changes to the Project in the Preferred Project Report.

Impacts to vegetation were revised with further design investigation to approximately 35 hectares to be cleared for construction, as shown in Table 16. Of this, approximately 18 hectares would be permanently removed for water and electricity utility easements and 16.7 hectares would be temporarily impacted for access tracks, site compounds and stockpile sites cleared during construction but to be reinstated through progressive rehabilitation.

Table 16. Vegetation Types proposed to be cleared (permanent and temporary)

Vegetation Type	Status	Permanent Area (hectares)	Temporary Area (hectares)	Total
Box- Gum Woodland	• listed under TSC Act only	1.63	0.01	1.64
Box-Gum Woodland	• listed under EPBC Act and TSC Act	2.79	1.64	4.43
Native (Non-EEC)		7.9	6.14	14.04
Non-native vegetation		6.47	8.91	15.38
Total		**18.79**	**16.7**	**35.49**

Up to 128 hollow-bearing trees comprising species such as White Box (*Eucalyptus albens*), *Blakely's Red Gum (E. blakelyi*), Red Stringybark (*E macrorhyncha*), Yellow Box (*E melliodora*) and dead trees or stags would be removed which could directly or indirectly impact the threatened fauna. Down from 250 hollow-bearing trees on the original pipeline alignment.

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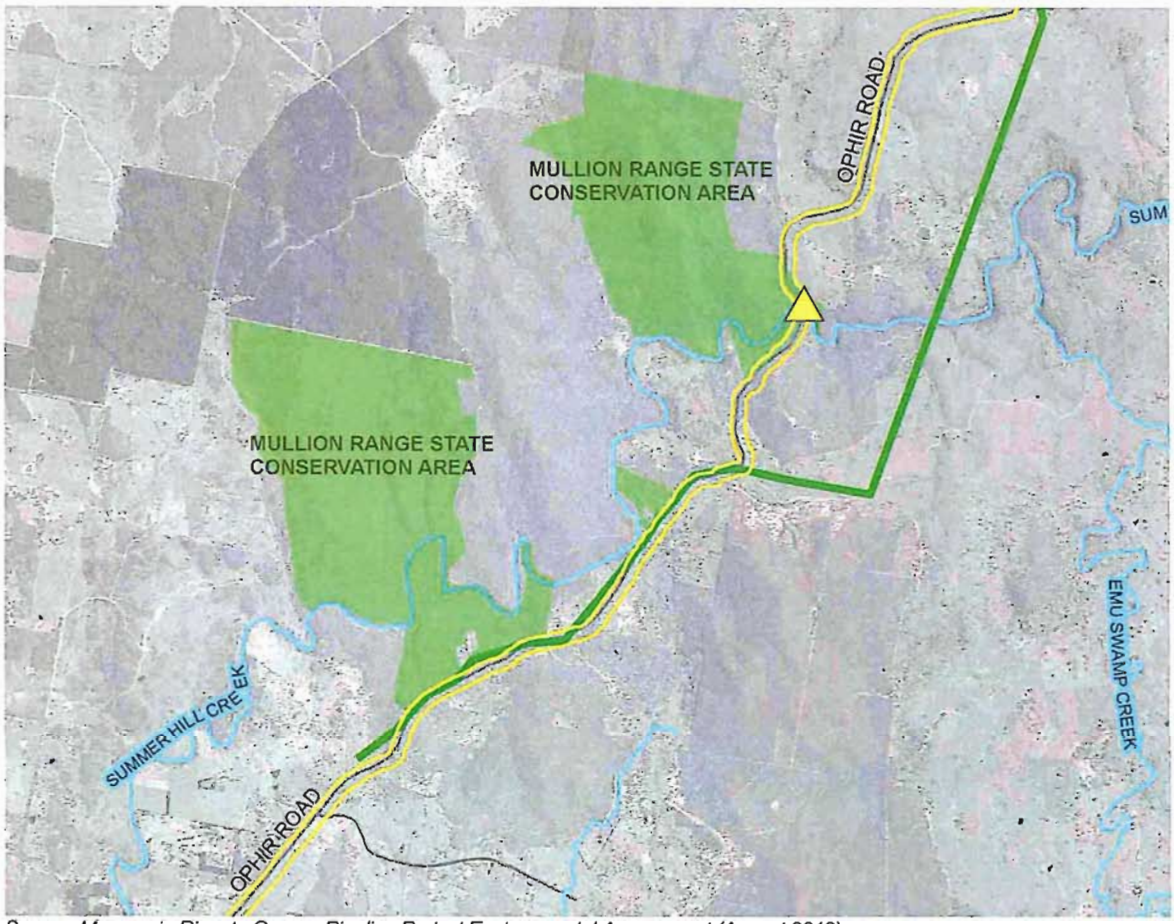
Conservation Areas

The project passes along the south-eastern boundary of three sections of Mullion Range State Conservation Area as shown in Figure 16. The proposed pipeline route was chosen to maximise the use of existing cleared land located along the verge of Ophir Road.



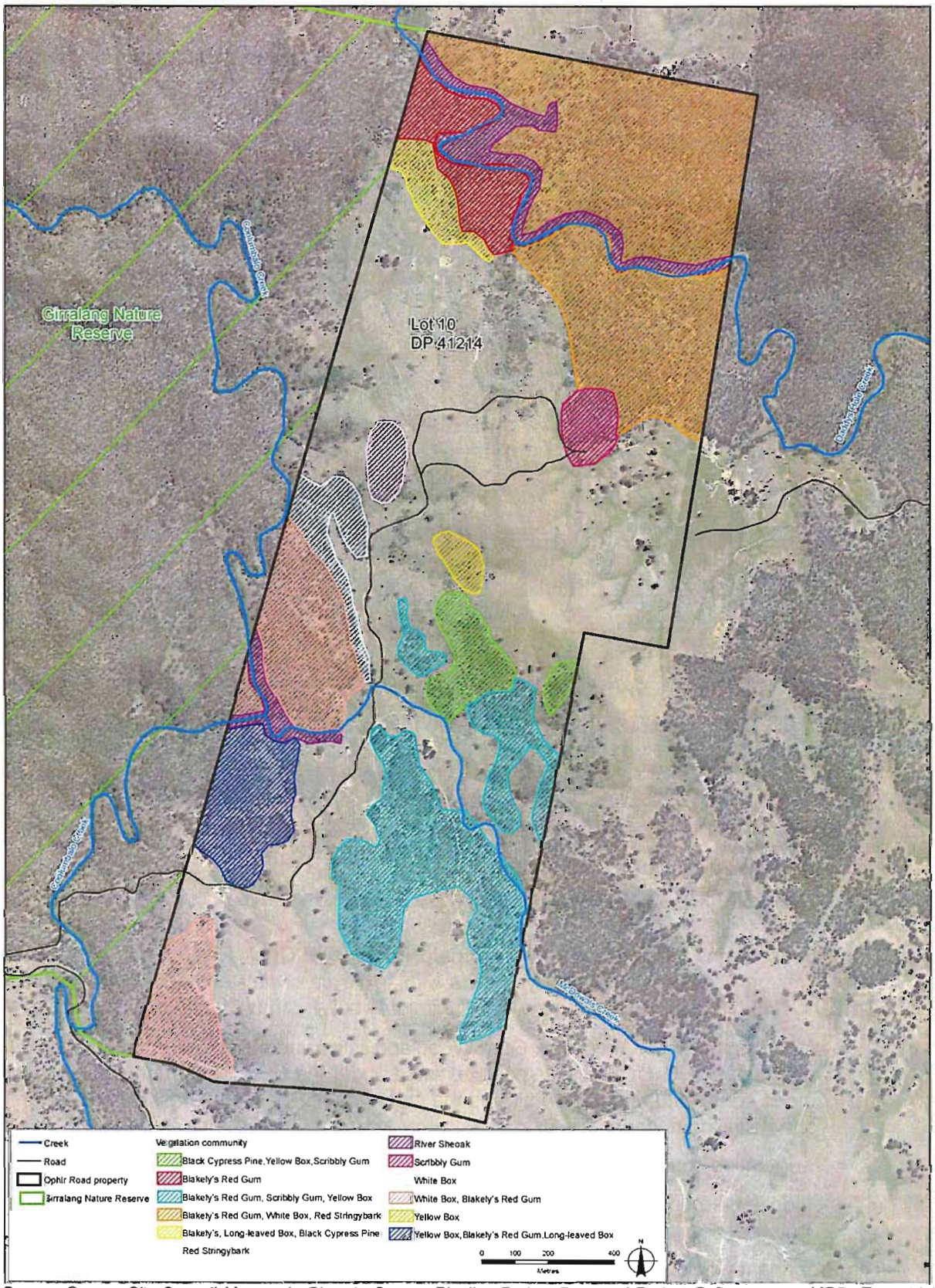
Source: Macquarie River to Orange Pipeline Project Environmental Assessment (August 2012)
Figure 16. Mullion Range State Conservation Area

Offset

The Proponent has taken out an option to purchase Lot 10 Ophir Road, Ophir as a biodiversity offset. This property is approximately 332 ha with 166.9 ha of native vegetation and borders the Girralang Nature Reserve (see Figure 17). Preliminary surveys have found that it includes:

- approximately 136 ha of Box Gum Woodland listed under the TSC Act and approximately 96 ha of Box Gum Grassy Woodland listed under the EPBC Act (further survey work has been completed and has confirmed the presence of Box Gum Grassy Woodland meeting the definition under the EPBC Act);
- vegetation communities and types similar to those impacted; and
- woodland habitats including approximately 187 hollow bearing trees and 159 ha of potential habitat for the Superb Parrot.

The Proponent would prefer to secure the property in perpetuity by dedicating the property under the *National Parks Act 1974* or through the establishment of a Biobanking Agreement under the TSC Act.



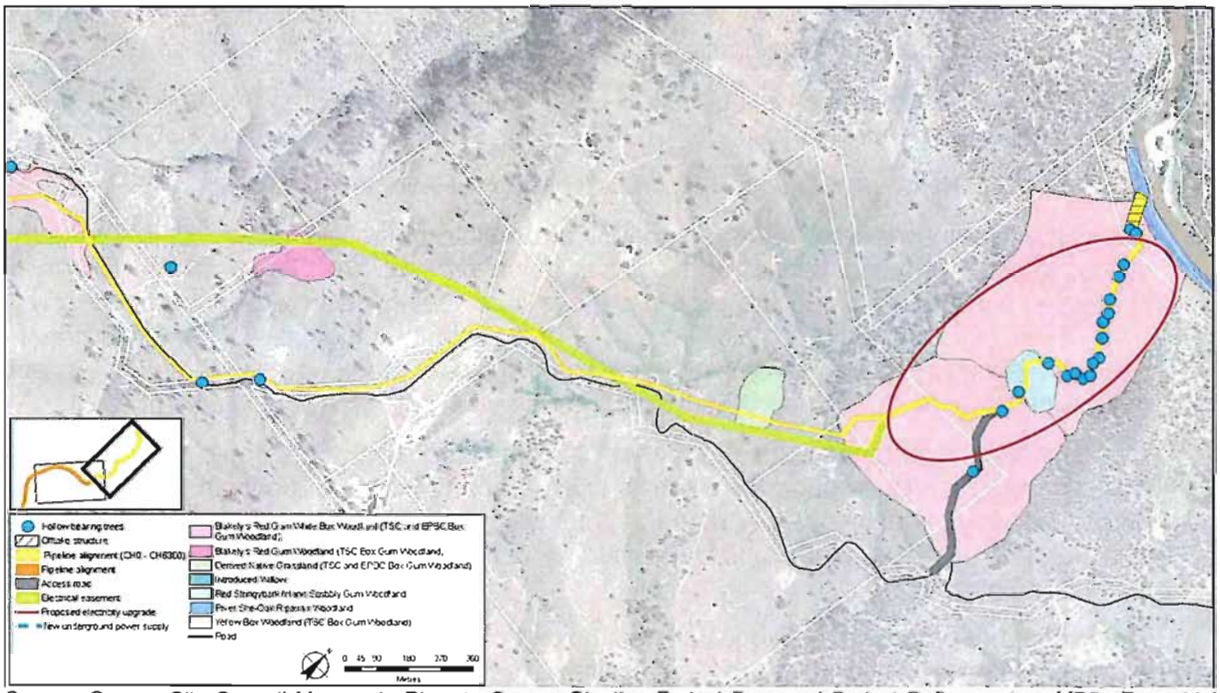
Source: Orange City Council Macquarie River to Orange Pipeline Project Proposed Project Refinements – MR5a Terrestrial Ecology Assessment (GHD, 2013)

Figure 17. Proposed Offset Site Lot 10 Ophir Road, Ophir

Consideration

The Department has considered the Proponents' terrestrial ecology assessment and is satisfied that the level of assessment undertaken for the project is sufficient to enable the Department to form a view of the existing biodiversity values on site and likely extent and significance of impacts associated with these project elements. In assessing the acceptability of the biodiversity impacts, the Department has considered whether the Proponent has demonstrated that impacts on biodiversity have been avoided wherever possible and, where unavoidable, whether viable options exist to mitigate or offset the impacts of the project consistent with maintain and improve principles.

The Proponent seeks approval for a pipeline route alignment within a variable six to 10 m wide corridor where feasible, in areas of native vegetation, and up to 20 m wide in cleared areas or areas containing non-native vegetation. A cleared overhead power line supply easement of 20 m is required for 3.1 km of the new overhead power line. A further 1.2 km of power line would be installed underground within the pipeline trench to minimise impacts to Box Gum Woodland listed under the TSC Act and the EPBC Act as shown in Figure 18. In this regard, the Department is supportive of the project design, management and mitigation measures that would reduce the impacts to threatened flora and fauna and endangered ecological communities.



Source: Orange City Council Macquarie River to Orange Pipeline Project Proposed Project Refinements – MR5a Terrestrial Ecology Assessment (GHD, 2013)

Figure 18. Vegetation impacts avoided by underground power line. ***(note the underground section of the power line follows the pipeline alignment within the red oval.)***

The Department notes the reduction in impacts to flora and fauna (15.5 ha of vegetation) from the revised proposal compared to that presented in the EA and the PPR, as documented in the letter - *Macquarie River to Orange Pipeline Project – Clarification of Calculations of Permanent and Temporary Vegetation Impacts* (Orange City Council, 12 March 2013), noting this is predominantly due to design refinements including the use of existing cleared areas and tracks and the avoidance of steep areas requiring larger areas to be cleared.

The Proponent has designed the project to avoid impacts to native vegetation, including the avoidance of individual and stands of trees by using a meandering and variable width pipeline corridor to utilise existing cleared land where possible. Further reductions in impacts are proposed by limiting the construction impacts to a six to 10 m wide corridor where feasible.

The Proponent has committed to the preparation of a Flora and Fauna Management Sub-Plan to detail pre-clearing surveys, measures to manage direct and indirect impacts to threatened species and endangered communities, rehabilitation and ongoing monitoring.

Areas to be disturbed by construction are proposed to be rehabilitated in accordance with rehabilitation objectives agreed with the landowner or relevant agency and detailed in the individual Property Management Plans prepared prior to construction. These plans would include strategies for the management of vegetation, weeds, soil erosion, bio-security and proposed short and long term revegetation and rehabilitation objectives. Residual impacts to vegetation would be offset in consultation with OEH and SEWPaC.

The Department notes that the Proponent has adopted standard techniques to avoid, manage and mitigate impacts and recommends a condition of approval to ensure rehabilitation measures are implemented to avoid ongoing impacts from erosion and sedimentation.

Impacts to the Superb Parrot were revised from a possible significant impact identified in the EA to no significant impact as a result of changes to the Project. The Proponent's justification for revising the level of impact on the Superb Parrot includes:

- the Superb Parrot was not observed during any field surveys;
- the Atlas of NSW Wildlife records the Superb Parrot three kilometres to the west of the project route with no records within the study area or west of the study area;
- the reduction in numbers of hollow-bearing trees and foraging habitat to be removed by the revised project; and
- the locality does not support an important population of the species.

The Department considers that the Superb Parrot could potentially occur within the study area due to suitable foraging habitat and hollows being present and other records identifying the species in close proximity to the project despite it not being observed during field surveys nor recorded in the Atlas of NSW Wildlife as occurring within the study area. The Department does, however, recognise that a reduction in impacts to hollow-bearing trees and foraging habitat would reduce the impacts to the Superb Parrot compared to that in the EA should it be present.

The Department supports the Proponent's commitment to prepare a Flora and Fauna Management Plan to manage the impacts to flora and fauna during construction with a view to further reducing impacts to vegetation and committing to progressive rehabilitation in accordance with Property Management Plans developed in consultation with the relevant property owner, agency or Council.

The Proponent proposes to also install nest boxes to provide short term habitat in areas where a large percentage of hollow-bearing trees are removed in the immediate construction corridor. Both OEH and SEWPaC question the effectiveness of providing nest boxes as replacement habitat for specific threatened species such as the Superb Parrot. The Department notes that the nest boxes are not proposed to be counted towards reducing an offset for residual impacts from the project and that while they may not be suitable for specific threatened species could provide short term habitat that may be acceptable to other native species. The Department does, however, consider that the loss of potential Superb Parrot habitat should be considered as part of the offset package required under the EPBC Act and understands that the Proponent is continuing to consult with SEWPaC in this regard.

The Department supports the Proponent's proposed rapid reinstatement and long term restoration strategy and has recommended a condition of approval to ensure the objectives, principles and standards of the rehabilitation stages are clear and met.

Biodiversity Offsets

The Department considers that a suitable offset is required to ensure that residual impacts to vegetation and habitat are adequately compensated for, consistent with the principles of "maintain or improve".

The Proponent is committed to the preparation of a Biodiversity Offset Strategy in consultation with OEH and SEWPaC prior to the commencement of construction. The offset strategy is proposed to address residual impacts from the project considered to be permanent including:

- removal or disturbance of 20.11 ha of native vegetation including:
    - removal of 6.07 ha of Box-Gum Woodland listed under the TSC Act;
    - removal of 4.43 ha of Box-Gum Grassy Woodland listed under the EPBC Act (this is a subset of the 6.07 ha of TSC Act listed Box-Gum Woodland); and
- removal of 128 hollow bearing trees.

The Proponent is not proposing to offset impacts considered to be temporary or to non-native vegetation including:

- removal of derived native grasslands where the areas of grassland are to be rehabilitated by direct seeding, salvaging and replacement of turf and natural regeneration (areas considered to be permanently removed are, however, included in the area to be offset);
- disturbance to native ground layer vegetation disturbed or removed for use in constructing access tracks, temporary site compounds, stockpile and other construction uses;
- removal of 1.65 ha of Box-Gum Woodland listed under the TSC Act and 1.64 ha Box-Gum Grassy Woodland listed under the EPBC Act; and
- exotic pasture grass, plantations and other exotic vegetation permanently or temporarily removed.

The Department has considered the Proponent's proposal to only consider biodiversity offsets for areas to be permanently removed on the basis that temporary impact areas are proposed to be rehabilitated. The Department is not convinced that successful rehabilitation of areas temporarily disturbed for the construction of the project could, in all cases, be guaranteed and that there is some uncertainty about whether the success of the rehabilitation could be measured in this timeframe. The Department is concerned that revegetation may only be able to reflect key elements of naturally occurring vegetation and could not achieve the complexities of even a small scale ecosystem in the short to medium term.

Nevertheless, the Department does accept that some impacted areas could recover naturally, for example native grassland areas traversed for short periods of time by few vehicles or used for short term storage of pipes and equipment. A similar view is held by OEH, where the offset could be revised following consideration of the impacts to areas affected following the completion of construction.

Whilst the Department accepts that the biodiversity impacts of the pipeline route could in principle be offset consistent with the principles of "maintain or improve", the preferred offset location (Lot 10 Ophir Road, Ophir), while likely to contain the required vegetation and habitat types, requires further investigation to determine its suitability and to finalise the offset package in consultation with OEH and SEWPaC. Further investigations and assessment have identified that this property does contain appropriate vegetation and habitat types to meet the offset requirements under the TSC Act and EPBC Act, including preliminary assessment against SEWPaC's *Environmental Offset Guide*. The Proponent currently has an option to purchase this site and has continued to investigate this location and develop an offset package in consultation with OEH and SEWPaC. The Department notes that both OEH and SEWPaC support the proposed offset site, subject to confirming its suitability. The Department has therefore recommended a condition to ensure that the offset is in place prior to the commencement of construction in consultation with OEH and SEWPaC.

The Proponent's preferred offset location adjoins Girralang Nature Reserve and should it be demonstrated that the property can satisfactorily address the principles of "maintain or improve" in relation to the subject communities, species and habitat type required, the Department considers that this site would be a suitable offset location as it would add to an existing nature reserve. The

Department is also supportive of the Proponent's commitment to secure the offset in perpetuity by dedicating the property under the *National Parks Act 1974* or through the establishment of a Biobanking Agreement under the TSC Act in consultation with OEH and SEWPaC.

Conservation Areas

The Department considers that, while there are impacts to the Mullion Range State Conservation Area (reserved under the *National Parks and Wildlife Act 1974*) impacts to vegetation within these areas will be minimised by locating the pipeline route within cleared areas, where possible and would not result in increased fragmentation of the Conservation Area. It is also noted that the mapped boundary of the road alignment is outside the constructed road reserve and within the mapped boundary of the conservation area in places resulting in approximately 3,740 m of the mapped conservation area land being impacted by the project. A section of the transmission line to be upgraded also passes within the mapped south-eastern boundary of the conservation area for approximately 743 m. While some vegetation would be removed from the edges of the corridor the majority of the pipeline route makes use of existing cleared areas. The Department supports the Proponent's commitment to continue discussions with OEH and DPI (Crown Lands) regarding the requirements for approval of any easements through State Conservation Areas or Crown land.

The Department also received correspondence regarding potential impacts to Long Point Reserve, Crown land reserved under the *Crown Lands Act 1989*. DPI (Crown Lands) has confirmed that the proposed offtake location will not impact on Long Point Reserve.

5.5 Other Issues

The Department's consideration of other issues identified in the assessment is presented in Table 17 below.

Table 17. Department's Consideration of Other Issues

Issue	Department's Consideration
Geomorphology and Watercourse Impacts	***Construction Impacts*** ***Watercourse crossings*** The proposed offtake is located at Cobbs Hut Hole on the Macquarie River and the proposed pipeline route crosses more than 30 waterways (based on a desktop study of catchment delineation). Seventeen watercourses crossings (including the offtake location) were considered in the EA and PPR. Of these waterways: • seven are classified as being stable or very stable (including the offtake location); • nine are classified as sensitive or prone to erode if the channel surface is disturbed; and • one is classified as unstable. The majority of the waterway crossings appeared to have intermittent flow and due to the geology of the area, medium to high strength volcanic bedrock exists at the natural surface of the creek or at some depth below the natural surface with some layer of overlying silt/clay soil. The pipeline would be installed by trenching at a depth of 1 – 2 m within a construction corridor limited to six to 10 m where feasible. Trenching is proposed for all crossings except where the pipeline may be attached to a culvert or traverses along the bank of a waterway. Trenching was considered to be an appropriate construction technique as the flows observed would allow for flow diversion techniques to be used during construction with specific erosion and sediment control measures to be implemented to minimise the risk of erosion. Where applicable all waterway crossings would be completed in accordance with the *NSW Office of Water Guidelines for Controlled Activities on Waterfront Land* and managed in accordance with standard mitigation measures, such as the use of coffer dams and

other erosion and sediment controls in accordance with the *Managing Urban Stormwater - Soils and Construction Vols 1* (Landcom, 2004).

Impacts to the geomorphology of the watercourses may occur for those watercourses predominantly dominated by silts, gravels and clay. These include Summer Hill Creek, Cow Creek and Oaky Creek classified as sensitive and prone to erode if disturbed. These creeks are, however, considered less likely to be exposed to erosion or changes to river morphology because of the medium to high strength bedrock. The Proponent proposes to rehabilitate all waterway crossings and return them to a stable state.

Offtake

The offtake would be constructed in an area of the Macquarie River with lower velocity flows and within high strength rock with minimal protrusions into the fluvial zone of the river. Impacts from the construction of the offtake structure to the stability of the river are unlikely due to high strength rock of the riverbed and bank. Minor turbulence and scouring does, however, have the potential to impact on areas disturbed as part of the construction. The Proponent has committed to scour protection in order to minimise erosion at the offtake location.

Discharge Outlet

Potential scour and erosion related impacts are proposed to be reduced at the discharge outlet to Suma Park Dam by locating the structure above the dam's top water level, a sufficient distance away from the dam's spillway, with rip rap to prevent erosion.

Construction Monitoring

The Proponent also commits to preparing and implementing a surface water quality monitoring framework during construction to monitor any potential impacts on water courses and to determine the effectiveness of erosion and sediment control and flow diversion measures in place.

Groundwater

Construction is not expected to impact on groundwater resources as trenching would be relatively shallow compared to the likely depth of the water table and is not anticipated to intercept groundwater aquifers or their flow systems. Therefore impact on groundwater dependent ecosystems and users is expected to be negligible.

Operation and Maintenance of the Pipeline

Water flow through the pipeline can be stopped and released to the environment during commissioning, maintenance or for emergency repairs via scour valves. Water is planned to be released from scour valves into scour pits where it would either be discharged from the pits to the closest watercourse, if it meets the required water quality levels with erosion and sediment control measures, or transferred from the pits via a suction tanker truck to the stormwater holding pond associated with the stormwater harvesting scheme or to Council's sewage treatment plant.

Consideration

The Department considers that there is the potential for ongoing impacts to waterways if these impacts are not adequately managed during construction and rehabilitated. Proposed mitigation measures, including backfilling trenches with graded rip rap and local soil prior to revegetation, would limit ongoing impacts to the waterways classified as prone to erode or unstable if appropriately implemented and monitored.

Impacts from the construction of the offtake and discharge outlet are unlikely to result in unmanageable impacts with the implementation of standard erosion and sediment controls. Noting that the offtake structure, to be constructed within a coffer dam, is located in an area of high strength rock.

The Department is supportive of the Proponent's measures to manage scour water and to prepare a Scour Water Management Plan.

	As also supported by DPI (NOW and NSW Fisheries), the Department considers that progressive rehabilitation of watercourses following construction will reduce the likelihood of ongoing erosion from construction particularly for watercourses classified as sensitive or unstable. The Department supports the Proponent's commitment to prepare Construction and Operational Environmental Management Plans to outline specific management actions to minimise impacts in consultation with relevant agencies. The Department has also recommended a condition for the preparation of a Rehabilitation and Landscape Plan to manage rehabilitation of areas experiencing erosion or waterways classified as sensitive or prone to erode.
Water Quality	Poor quality water in the Macquarie River could degrade town water supplies if it is not appropriately managed and treated. Various blending scenarios were modelled for Suma Park Reservoir. The results indicate that turbidity, true colour, *E. coli*, *S. coliphages*, *C. perfringens*, total aluminium, total iron and total manganese in the raw water would exceed the Australian Drinking Water Guidelines for at least one scenario considered.
	Water extracted from the Macquarie River is, however, unlikely to be in sufficient volumes to impact the water quality in Suma Park Reservoir such that it would affect the operation of the Icely Road Water Treatment Plant. Modelling undertaken concludes that water from the discharge outlet is unlikely to travel directly to the reservoir offtake location without first mixing with the reservoir water. Notwithstanding the Icely Road Water Treatment Plant is capable of treating all raw water quality parameters for the proposed new water supply and additional monitoring and testing would be undertaken to verify the levels of key parameters in the reservoir. Real time monitoring is also proposed to detect any deterioration in water quality of the Macquarie River. In addition to the parameters considered by the Australian Drinking Water Guidelines, bromide is also a key parameter of concern and is proposed to be monitored along with turbidity in the Macquarie River. Levels of bromide in the raw water are only of importance to the treatment process with respect to the ozonisation of bromide to form bromate which is toxic and a suspected carcinogen. While the treatment plant should be able to withstand small increases in bromide including the small modelled increase of 0.02 mg/L (a modelled level of 0.08 mg/L at the reservoir offtake), for concentrations higher than 0.1 mg/L a bromide process optimisation strategy would be implemented to manage any elevated levels through the operation of Orange's water supply system to limit the formation of bromate as a by-product of the ozonation process. Continued water quality sampling of key raw water parameters, in the reservoir and the Macquarie River, is proposed to ensure relationships identified remain consistent and that the adopted statistical parameters are accurate. The operating rules are proposed to be refined in order to specify the pumping protocols to ensure that large quantities of poor quality raw water are not pumped into Suma Park Reservoir. ***Consideration*** The Department considers that water quality impacts can be appropriately managed through the use of real time monitoring, periodic sampling of water quality parameters within the Macquarie River and in Suma Park Reservoir and the implementation of a bromide process optimisation strategy. As the Icely Road Water Treatment Plant is capable of treating the identified raw water quality parameters the Department considers that there would be no unmanageable public health risks emanating from the Orange drinking water supply system. A condition is recommended to require the raw water quality parameters or triggers to be defined in the Orange Water Supply System Decision Support Tool.
Heritage: **Aboriginal Heritage**	The proposed pipeline route and offtake structure has the potential to directly impact: • eight artefact scatters or isolated finds with associated potential archaeological deposit (five of moderate, two of moderate to high and one of high scientific significance) and one potential archaeological deposit of low to moderate scientific significance;

	• five isolated finds, two of moderate to low and three of low scientific significance; • two artefact scatters of low scientific significance; and • five potential archaeologically sensitive areas of moderate to high scientific significance. A scarred tree and two artefact scatters, one with an associated potential archaeological deposit, also occur in close proximity to the proposal. The Department considers that the Aboriginal cultural heritage assessment has been completed in line with the Draft Guidelines for *Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005). The Department supports the Proponent's management commitments including: • salvage of artefacts and a program of archaeological subsurface testing where sites and associated potential archaeological deposits could not be avoided; • a program of archaeological subsurface testing of impacted areas identified as potential archaeological sensitive areas to determine if salvage excavations are required; • the management of salvaged artefacts under a care and control permit issued under section 85A(1)(c) of the *National Parks and Wildlife Act 1974*; and • general mitigation measures including fencing of sites that will not be impacted and the development of an unanticipated discovery protocol to manage unexpected finds. The Department also reiterates the need to consult with the registered Aboriginal stakeholders throughout the development of the subsurface excavations and/or salvage methodology and the ongoing management of any salvaged artefacts.
Non-Aboriginal Heritage	The proposed pipeline corridor will directly impact on the curtilage of two items listed on the Orange Local Environment Plan 2011 (Orange LEP); 'Rosedale' Homestead and 'Narrambla' Templar's Mill ruins including the Banjo Paterson memorial but will not impact the items directly. The heritage values associated with these items are the physical features of the homestead, ruins and memorial which will not be directly or indirectly impacted as they are between 100 and 250 m west of the proposed pipeline route. The pipeline would be located below ground within the road reserve within two metres of the 'Narrambla' Templers Mill property curtilage and located within the Rosedale property parallel with the farm fence crossing into the road reserve to avoid impacts to the gateway entrance to the property. A further three items were identified as potentially impacted by the project. Two are associated with historical mining in the area (area of ground sluicing and a possible costean) and the other the Old Ophir Road alignment. Suma Park Homestead, also listed on the Orange LEP, was identified as being located approximately 500m south of the corridor but would not be impacted by the proposal. The Department is supportive of the Proponent's proposed management measures for non-Aboriginal heritage including further historical research into the area of ground sluicing and the Old Ophir Road alignment; and the preparation of a heritage management sub-plan; and an unanticipated discovery protocol in consultation with relevant agencies.

Recreational Fishing	Submissions received raised concerns about the impact to fish within the Macquarie River and on recreational fishing. The impacts on fish are inextricably linked to operational and hydrological impacts, all of which are considered in Sections 5.2 and 5.3. Legal public access to the Macquarie River near the offtake site for recreational fishing purposes is possible by river craft or from Long Point Reserve located on the opposite side of the Macquarie River. Long Point Reserve, however, contains only a few minor tracks and access to the bank directly opposite the offtake would be difficult by vehicle. Long Point, approximately 3.5 km upstream from the offtake site, is readily accessible by vehicle and a popular fishing location. The Project would not reduce access to the Macquarie River for recreational fishing purposes as the offtake is located on private property. The project has the potential to impact fish in the vicinity of the offtake through noise and vibration disturbances when the pumps are operating, this may result in fishing within Cobbs Hutt Hole being less successful. Further, as also noted in Section 5.3, the operation of the project may impact on recruitment or spawning where this coincides with water extraction, however, modelling suggests that the operating rules would be less likely to be met during the spawning period of known species of interest. Notwithstanding, and depending on the species, the offtake structure may be attractive to fish resulting in greater catch opportunities. During construction there is the potential for disturbance of fish from noise, vibration and erosion and sediment impacts along the river bank. The Department considers any impacts from construction to be short term and manageable. The Department considers that the impacts to recreational fishing in the Macquarie River, from the operation of the project, are minimal, given the relatively small area of impact compared to the potential area available for fishing. The Department also notes that due to the difficulty in gaining direct and easy access to Cobbs Hut Hole, the numbers of recreational fishers affected would be minimal.

6 CONCLUSION

The Department considers that the Macquarie River to Orange Pipeline Project would provide significant benefits to the Orange community by diversifying and securing the water supply to cater for existing and future residents and businesses of the local government area. The Department is also satisfied that Orange City Council has completed a robust consideration of alternatives to arrive at the preferred project.

Key environmental impacts associated with the proposal relate to the extraction of water from the Macquarie River, resultant impacts to aquatic ecology and flora and fauna impacts from clearing for construction of the project.

Public submissions on the proposal focused on impacts to flora and fauna, downstream water users including the Macquarie Marshes, project justification and altematives considered, impacts to recreational fishing and sustainability of the project.

The Department has assessed the Proponents' Environmental Assessment, Preferred Project Report and Statement of Commitments as well as the submissions received from agencies and the public on the proposal. The Department also considered the findings of an independent report from Bewsher Consulting commissioned by the Department to independently review the hydrological aspects of the project. Based on its assessment, the Department is satisfied that sufficient justification exists for the project and that the Proponent has, for the most part, undertaken a conservative assessment of the impacts of the proposal and that the impacts of the proposal can be managed and/or mitigated to an acceptable level.

In considering the assessment the Department supports the adoption of the 80th percentile flow for determining the pumping trigger and the recommendation from the independent review by Bewsher Consulting to adopt an interim pumping trigger of 108 ML/day, instead of the proposed

38 ML/day, based on the limitations of the models use by Council. Notwithstanding those limitations, the Department accepts that further refinement of the model is likely to provide more certainty regarding the 80th percentile flows and that the cease to pump threshold could be reduced to a level less than the interim 108 ML/day, but no lower than the 38 ML/day considered in the EA and PPR. The Department, however, considers that the impacts to aquatic ecology and hydrology from the operation of the project at 38 ML/day, as presented, are acceptable.

The Department notes that the project will assist in achieving the aims of Government initiatives, policies and plans including those supporting the growth of Orange, the National Water Commission's *National Water Initiative*, Australian Government's *Water for the Future*, DPI's (NOW) *Country Towns Water Supply and Sewerage Program*, Council's *Comprehensive Water Supply Management Strategy*, Council's Draft *Integrated Water Cycle Management Evaluation Study* and Council's policy of providing sufficient secure yield to meet water demand in 10 years time while considering water supply management over a 50 year planning horizon by improving the security of water supply for Orange.

In order to manage potential impacts resulting from the proposal, a range of conditions of approval are recommended. The Department consulted with key government agencies, Cabonne Council and the Proponent in preparing the recommended conditions of approval. Comments raised by Council and the agencies, where considered appropriate, have been addressed in the recommended conditions of approval in Appendix H. These conditions will also ensure that commitments made in the Environmental Assessment and Preferred Project Report are implemented as well as strengthening the management and mitigation of identified impacts where the Department, other government agencies, landholders and the general public have raised these.

The Department therefore recommends that this project be approved subject to the recommended conditions of approval.

7 RECOMMENDATION

With regard to the Macquarie River to Orange Pipeline project application, it is RECOMMENDED that the Planning Assessment Commission:

- consider the findings and recommendations of this report;
- approve the project application under Part 3A of the EP&A Act; and
- sign the attached instrument of approval (tagged B).

7.5.13

Prepared by
Senior Planning Officer

L Mitchell 7.5.13

Manager Water Projects

7.5.13

Executive Director
Development Assessment Systems and Approvals

APPENDIX A ENVIRONMENTAL ASSESSMENT

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4475

APPENDIX B SUBMISSIONS

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=list_submissions&job_id=4475

APPENDIX C PROPONENT'S RESPONSE TO SUBMISSIONS

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4475

APPENDIX D SUMMARY OF CHANGES TO ENVIRONMENTAL IMPACT

Table 18. Comparison of key impacts from the Preferred Project and the exhibited Environmental Assessment

Preferred Project (MR5a)	Environmental Assessment as exhibited

Flora and Fauna Impacts
Reduction in vegetation impacts including:
• 128 hollow bearing trees
• Permanent removal of 18.79 ha of vegetation
  o 4.21 ha of Box Gum Woodland (TSC Act)
  o 2.79 ha Box Gum Grassy Woodland (EPBC Act)
• Temporary disturbance of 16.7 ha of vegetation
  o 1.65 ha of Box Gum Woodland (TSC Act)
  o 1.64 ha Box Gum Grassy Woodland (EPBC Act)
• No significant impact to the Superb Parrot
	
	• 250 hollow bearing trees
	• Permanent removal 21.6 ha of vegetation
	  o 7.8ha of Box Gum Woodland (TSC Act)
	  o 5.4 ha Box Gum Grassy Woodland (EPBC Act)
	• Temporary disturbance of 53.4 ha of vegetation including approximately 32 ha of native vegetation.
	
	• Significant impact to the Superb Parrot likely

Aquatic Ecology Impact Potential for greater impacts to aquatic ecology during construction as Cobbs Hut Hole: • has a greater variety of aquatic habitat that (by extrapolation) is likely to support more diverse biota; • exhibits slightly greater erosion and depositional processes which, if inadequately mitigated, could result in potentially greater impacts to aquatic biota through changes to water quality (such as increased turbidity). Operational impacts • Potential for greater impacts to fish passage during operation at Cobbs Hut Hole due to greater water level reductions during extraction than Gardiners Hole, also considered in Hydrology Impacts below.	
Hydrology Impacts An increase in water level reduction due to extraction including: • 45 mm reduction in water level during maximum extraction occurring when 12 ML/day is extracted when the river flow is 38 ML/day at Cobbs Hut Hole. This is predicted to occur on 0.11% of pumping days over the 118 years modelled (approximately 17.5 days out of 15,905 pump days). • an average 1 to 5 mm reduction during river flows in the moderate to high flows • an average 11 to 14 mm during flows in the low to moderate flows.	 • 23 mm reduction in water level during maximum extraction occurring when 12 ML/day is extracted when the river flow is 38 ML/day at Gardiners Hole. This is predicted to occur on 0.11% of pumping days over the 118 years modelled (approximately 17.5 days out of 15,905 pump days). • an average 1 to 4 mm reduction during moderate to high flows • an average 6 to 9 mm reduction during low to moderate flows

Preferred Project (MR5a)	Environmental Assessment as exhibited
Water Quality (surface and groundwater), watercourses 17 waterway crossings: • seven stable or very stable; • nine sensitive or prone to erode if disturbed; and • one unstable waterway.	14 waterway crossings: • six stable or very stable; • seven sensitive or prone to erode if disturbed; and • one unstable waterway
Heritage A reduced number of sites and Potential Archaeological Deposits (PAD) impacted: • eight artefact scatters with associated PAD • five isolated finds and one with an associated PAD • one PAD and five potentially archaeological sensitive areas • The route assessed to have a moderate to low archaeological potential.	 • 10 artefact scatters with associated PAD; • Four isolated finds and two with an associated PAD; • Five potentially archaeological sensitive areas; • The route assessed to have a moderate to high archaeological potential
Noise and Vibration Construction noise impacts are likely to be experienced at approximately 100 noise sensitive receivers: • Six additional receivers in the re-aligned section were not previously impacted by the EA. Operational noise impacts are predicted to be below 20 dBA at the closest receivers and likely to be inaudible.	 • Three receivers identified in the EA are not impacted by the revised project.
Contamination, Soils and Erosion The revised route is generally less steep and requires less excavation than the original route proposed in the EA. The risk of landslip is also reduced.	Traversed steep topography near the offtake location in Gardiners Hole (chainage 00 to 400) requiring clearing of up to 60m wide to accommodate an access road switchback.
Traffic Impacts The revised route travels further along Long Point Road than the original route and follows existing access tracks where possible. A 1.4km access track through private property to the offtake is now proposed.	The proposed route traversed part of Long Point Road with a 4km access track from Long Point Road to the offtake location through private and Crown land.
Visual Assessment Slightly greater visual impact, during construction, due to an additional three residential receptors located approximately 500m from the pipeline route. The revised section is predicted to have a similar impact to the EA of: • Low to Moderate/high during construction; and • low to moderate/low during operation.	Thirty three residential receptors have the potential to be impacted by the project. One of these receivers is no longer impacted by the revised proposal. Overall significance of impact: • Low to moderate to high during construction; and • Low to moderate during operation.
Land use, socio-economic issues, infrastructure and waste More acquisition of private land for the pipeline easement due to increased length, however, the owners are more open to acquisition.	Less acquisition of private property, however, owners objected to property acquisition.

APPENDIX E OTHER RELEVANT REPORTS OR DOCUMENTS

Independent expert review of the hydrological model:

- *Macquarie River to Orange Pipeline Project Independent Review of Hydrological Modelling* (Bewsher, 2013)

Other relevant reports or documents considered:

- *National Water Initiative* (Australian Government, http://nwc.gov.au/nwi).
- *Water for the Future* (Australian Government, http://www.environment.gov.au/water/australia/index.html).
- *Murray-Darling Basin Sustainable Yields Project* (CSIRO, http://www.csiro.au/en/Organisation-Structure/Flagships/Water-for-a-Healthy-Country-Flagship/Sustainable-Yields-Projects/MDBSY.aspx).
- *CENTROC Water Security Study* (CENTROC, 2009).
- *Central West Catchment Action Plan 2011-2021* (http://cw.cma.nsw.gov.au/AboutUs/2011capconsultation.html).
- *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source* (2003).
- *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources* (2012).
- *Orange Sustainable Settlement Strategy and Local Environmental Study* (Orange City Council, 2004).
- *Sub-Regional Rural and Industrial Land Use Strategy* (Blayney, Cabonne and Orange City Councils, 2008).
- *Draft Integrated Water Cycle Management Concept Study* (MWH Australia, 2007),
- *Comprehensive Water Supply Management Strategy* (Orange City Council, 2009),
- *Orange Emergency Water Supply Further Feasibility Assessment* (Orange City Council, 2010).
- *Orange Drought Relief Connection Concept Investigation Report* (Orange City Council, 2011).

APPENDIX F PLANNING ASSESSMENT COMMISSION REPORT

See the Planning Assessment Commission's website at specific web page address

APPENDIX G POLITICAL DONATION DISCLOSURES

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4475

APPENDIX H RECOMMENDED CONDITIONS OF APPROVAL