WESTERNPORT WATER™

URBAN WATER STRATEGY

Westernport Water

Urban Water Strategy 2017

May 2017

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1. Context

1.1 What is an Urban Water Strategy?

The purpose of Westernport Water's 2017 Urban Water Strategy (UWS) is to identify the optimum mix of supply options and demand reduction measures to maintain a balance between the demand for water and the water available for supply within Westernport Water's region now and into the future. The UWS has a 50 year outlook, forecasting potential demand and supply, from today until 2065, with uncertainty taken into account through the use of supply and demand scenarios. Also included is a strategy for the wastewater system to ensure the treatment plants and major infrastructure capacity can sustain the growth, and the planned upgrades accommodate future growth.

Water for Victoria identifies that our communities expect our cities and towns will be liveable and productive places that support vibrant communities. As a water services provider Westernport Water plays a vital role in ensuring that our region continues to be amongst the most liveable and productive regions of Victoria. This, our first, Urban Water Strategy sets out the key challenges facing our region over a 50 year outlook with consideration of climate and population projections based on the best available science and presents options and actions to preserve and enhance our communities.

1.2 2017 Urban Water Strategy development

The 2017 UWS builds upon the previous 2012 Water Supply Demand Strategy (WSDS) by updating demand and supply forecasts to the year 2065, using the most recent consumption and water resource information. The Department of Environment, Land, Water and Planning (DELWP) issued guidelines for the development of the 2017 UWS, to ensure a consistent and rigorous approach for strategy development. Westernport Water has applied these guidelines.

To date, development of the strategy has involved:

- Review of the water supply security of Westernport Water, including the level of service it will provide customers;
- Updating water demand forecasts based on current information about water consumption trends;
- Updating water supply forecasts (system yield) based on current and upgraded Westernport Water supply infrastructure, and updated climate information according to the Guidelines for Assessing the Impact of Climate Change on Water Supplies in Victoria;
- Consideration of demand management and additional supply options that will allow Westernport Water to meets its strategic objectives; and
- Consultation with the Westernport Water community via the 2016 annual customer satisfaction survey (by phone), pricing submission survey (online and face to face) and Customer Advisory Group (customer representative forum).

The final strategy incorporating feedback from DELWP and Westernport Water customers, is submitted to the Board for approval then, submitted to the Minister for Water by 31 March 2017.

Previous water strategies

Westernport Water's first WSDS was released March 2007. The 2007 strategy identified demand management actions and options for securing additional water in the context of the drought conditions at the time. Following the development of the 2007 strategy, a number of the identified options were implemented. This included the connection of new supplies from Bass

River and groundwater bores located in the Corinella Aquifer, as well as a range of water conservation actions.

The 2012 WSDS included two key supply upgrade commitments as first identified in the Central Region Sustainable Water Strategy in Table 4.30 through the Our Water Our Future Action Plan:

Candowie Reservoir upgrade

Westernport Water has completed an upgrade of Candowie Reservoir to increase the storage capacity of the reservoir to 4,463 ML. Associated with this upgrade would be an amendment to the bulk entitlement (BE) governing Westernport Water's diversion of water from Candowie Reservoir, the most significant change of which was the inclusion of environmental flow release requirements to mitigate the impact of raising Candowie Reservoir on the downstream environment. The project to upgrade Candowie Reservoir is now complete.

Melbourne Water Supply System

Westernport Water has been granted an entitlement allocation of up to 1,000 ML/yr under Bulk Entitlement (Melbourne Headworks System – Westernport Water) Order 2010 from Melbourne's Water Supply System. The Westernport Water system is now connected to the Melbourne Water Supply System by installation of DP6 on the desalination pipeline.

1.3 Overview of Westernport Water

Westernport Water provides water and wastewater services - wherever economically, environmentally and socially practicable - to properties and communities throughout its district. Westernport Water provides services to over 19,000 permanent customers (100,000 in peak holiday periods) in an area covering 300 square kilometres, encompassing Phillip Island and the district stretching from The Gurdies to Archies Creek, as shown in Figure 1.

Water supply system

Westernport Water has access to a diversified water supply. Water is sourced from various Westernport Water managed supplies including:

- The Tennent Creek catchment via Candowie Reservoir;
- Bass River; and
- Groundwater bores in the Corinella Aquifer (emergency supply only).

Water from all of these sources is stored in Candowie Reservoir (shown in Figure 1 & 2), before being treated at the Ian Bartlett Water Purification Plant. Following treatment, water is pumped to San Remo basin for distribution to Westernport Water customers.

In addition to these local sources, Westernport Water also has access to supply from Melbourne's Water Supply System. To facilitate the delivery of this water, Westernport Water has recently been connected to the Melbourne Water Supply System at a delivery point on the Desalination pipeline (DP6) as shown in Figure 3.

In addition to traditional water supply and wastewater services, Westernport Water also produces recycled water from its treatment plant at Cowes and has upgraded the plant to supply Class A recycled water for dual-pipe systems and other community and commercial uses.

In accordance with Section 3.4 of the UWS Guidelines, Westernport Water's system can be defined as "diversified". Further discussion is included in Section 2.2.

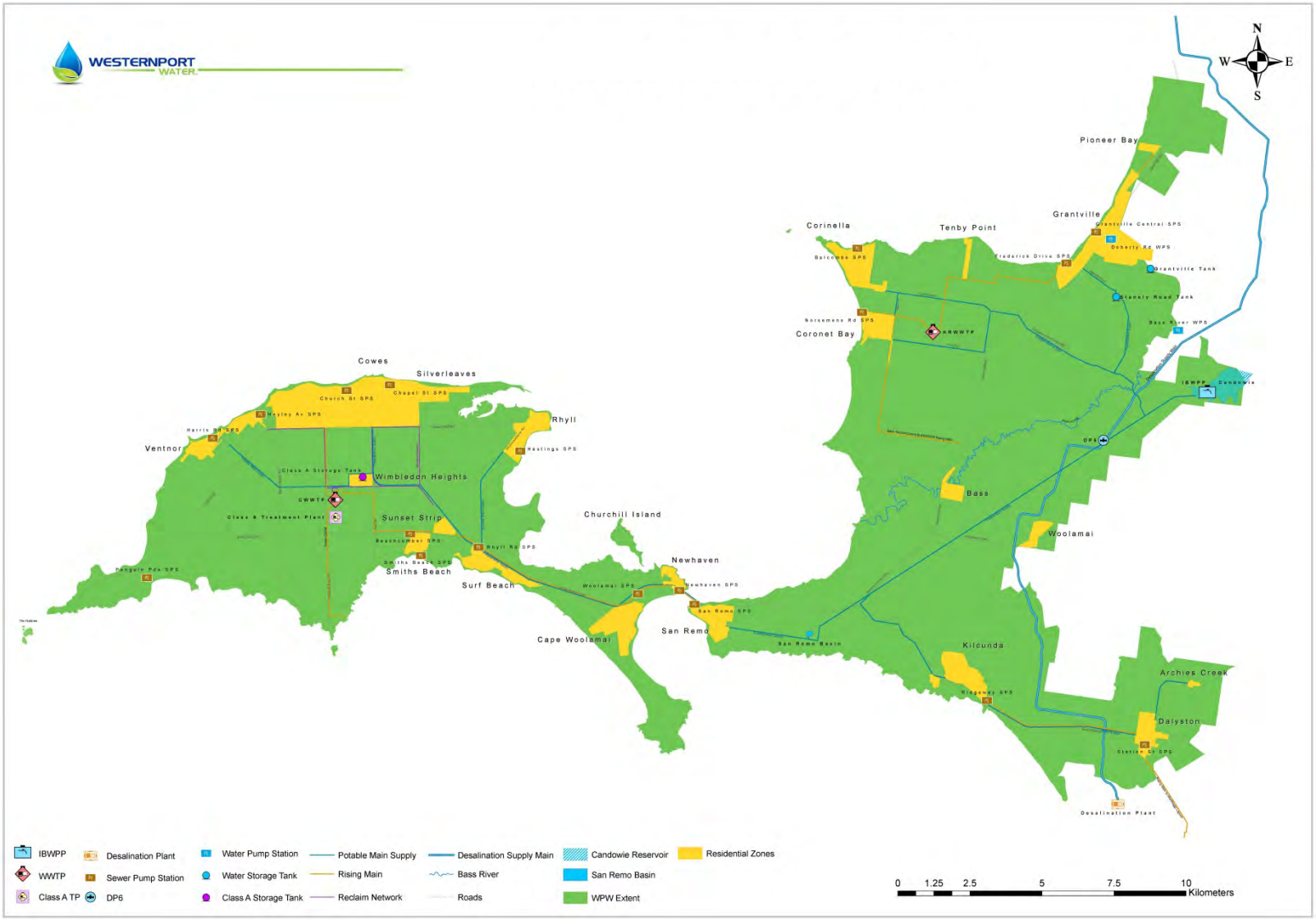


Figure 1 Westernport Water supply system

Figure 2 Candowie Reservoir

Figure 3 Westernport Water's desalination pipeline supply point (DP6)

Wastewater system

The wastewater system is divided into three catchments: Phillip Island (including San Remo), waterline townships -mainland north and Kilcunda/Dalyston. Westernport Water operates two treatment plants, the main Cowes Wastewater Treatment Plant (CWWTP) located in the middle of Phillip Island and the other King Road Wastewater Treatment Plant (KRWWTP) located at Coronet Bay. Under an agreement with South Gippsland Water, Kilcunda and Dalyston wastewater is transported and treated at the Wonthaggi Treatment Plant.

Disposal of the treated wastewater varies with the CWWTP operating an ocean outfall into Bass Strait at the southern tip of Phillip Island. KRWWTP irrigates all the treated wastewater on Westernport Water's own farmland at Coronet Bay or to surrounding farms.

Class A recycled water is produced at Cowes Wastewater Treatment Plant and reticulated around the reuse network across Phillip Island and to the residential area in Cowes and Ventnor. See Figure 7 for the extent of this network and the major properties and developments that currently use Class A recycled water.

Class C recycled water is produced at both Cowes and King Road to irrigate on site tree plantations and crops. Currently, it's also used to irrigate neighbouring farms and further irrigation customers are being sought to expand the system to provide appropriate uses for this water.

Class B is currently being investigated to supply recycled water from the CWWTP to customers for irrigation purposes.

1.4 Urban Water Strategy objectives

The strategic objectives of Westernport Water's UWS are to:

- Balance supply and demand at the lowest practical cost; and
- Provide Westernport Water customers with a reliable supply of water.

Balancing supply and demand at the lowest practical cost

Westernport Water has access to a range of water supply infrastructure to source water. Each of these water supplies has a different cost associated with it. The cost of water from the Melbourne's Water Supply System has now been set by Melbourne Water, and is similar to water sourced from local supplies managed by Westernport Water. To cost effectively balance supply and demand, Westernport Water intends to maximise the use of water available from catchment inflows to the upgraded Candowie Reservoir. When catchment inflows are not enough to meet system demand, Westernport Water will source water from the Melbourne water supply system (when the Victorian Desalination Plant is operating) or from the Bass River when available.

Westernport Water's aim is to provide the lowest practical cost of water to its customers, while ensuring a reliable water supply.

Providing Westernport Water customers with a reliable supply of water

Westernport Water understands that a key element of meeting the needs of its customers is to provide a reliable supply of water. A reliable supply is one where customers can be confident of accessing the volume of water they require. Westernport Water intends to maintain the supply demand balance at a level where the need to restrict access to water by implementing water restrictions is minimised to a customer agreed service level.

It is important to note that achieving a reliable water supply has cost implications. By spending more money, Westernport Water could increase its access to water, providing a more reliable, but expensive, water supply. Therefore, a balance between cost and reliability is required.

Westernport Water has adopted a supply demand balance target that ensures (on average) water restrictions are not required in 95 years out of 100.

Community consultation

Westernport Water has undertaken an extensive community consultation program over the last six months in association with the pricing submission regarding customer preferences, priorities, concerns and values. Since September, over 900 customers have taken the opportunity to provide detailed feedback to shape our future, representing over 4 per cent of Westernport Water's customer base. One percent of customers surveyed identified as Aboriginal or Torres Strait Islander.

In addition, Westernport Water's bimonthly Customer Advisory Group, which is a representative panel of our customers, has participated in UWS briefings and has provided comment on the appropriate supply demand balance from a community perspective.

The following key themes and preferences were identified through consultation with our community:

- 55 per cent of customers believe that they receive value for money for water and wastewater services
- 49 per cent of customers believe that Westernport Water needs to focus more effort towards reducing the cost of water and wastewater services as opposed to improving services or maintaining the existing balance
- 24 per cent of customers referenced affordability as a key expectation of their local water authority
- 54 per cent of customers stated that reducing the cost of services was within their three highest priorities for Westernport Water
- 37 per cent of customers stated that investing in measures to respond to climate change was within their three highest priorities for Westernport Water
- 92 per cent of customers stated that it was important to them that Westernport Water invests in environmental or sustainability initiatives
- 75 per cent of customers were satisfied with the current guaranteed service levels
- 80 per cent of customers stated that it was important that their water was supplied from a local source.

Westernport Water is committed to consulting with the traditional owners of our land and has commenced the development of a Reconciliation Action Plan, which will further strengthen its commitment to building strong partnerships with local Indigenous stakeholders, including the Bunurong Land Council and the Boon Wurrung Foundation.

2. Water supply and wastewater systems

2.1 Introduction

Westernport Water has historically relied on Tennent Creek inflows to Candowie Reservoir for its potable water supply. Following the severe drought conditions experienced in the Westernport region in 2006/07, Westernport Water augmented its supply system to include an additional surface water supply from Bass River, and a groundwater supply from Corinella Aquifer. More recently, Westernport Water has increased the storage capacity of Candowie Reservoir and connected its supply system to Melbourne's Water Supply System.

This section details the existing water supply wastewater systems, associated water entitlements, and identifies the potential for upgrades to the existing infrastructure.

2.2 Water supply sources

Candowie Reservoir

Candowie Reservoir is the primary source of supply for customers of Westernport Water. The reservoir is situated on Tennent Creek, a tributary of the Bass River about 8 km east of Grantville in the South Gippsland Basin. The reservoir previously had a capacity of approximately 2,263 ML, which was augmented in 2013 to 4,463 ML.

Westernport Water's use of water from Candowie Reservoir is governed by *Bulk Entitlement (Westernport) Conversion Order 1997 as at September 2015*, which allows diversions of:

- Up to 2,911 ML/yr from Candowie Reservoir;
- At a rate not exceeding 50 ML/day.

To mitigate the effect of increasing the storage capacity of Candowie Reservoir on the downstream environment, the following environmental releases are required from the reservoir. These are new environmental flows to improve the river health of Tennent Creek and the Bass River and reported to the waterway manager.

- During the period from May to November inclusive each year, the lesser of—
    - 5 ML/day; and
    - the inflow to Candowie Reservoir from Tennent Creek; and
- During the period from December to April inclusive each year, the lesser of—
    - 0.1 ML/day; and
    - the inflow to Candowie Reservoir from Tennent Creek; and
- During the period from May to November inclusive, eight winter freshes of 7.5 ML/day for at least one day, with at least seven days between each winter fresh;
- The environmental releases may be discontinued if the level in Candowie Reservoir falls below 850 ML, but must resume when the level reaches 2,000 ML.

The environmental flows released are based on the requirements of the flora and fauna as identified in a Bass River flow study undertaken as part of the bulk entitlement (BE) amendment.

Bass River

Westernport Water holds an entitlement to divert water from Bass River at a pump station located on the Grantville – Glen Alvie Road, with the water transferred to Candowie Reservoir. Westernport Water's diversion of water from Bass River is governed by Bulk Entitlement (Westernport – Bass River) Order 2009, which allows diversions of:

- Up to 3,000 ML/year;
- at a rate not exceeding 25 ML/d between the months of May to November inclusive, subject to passing flow requirements; and
- with no diversions between the months of December to April inclusive.

The current pump station and transfer pipeline limit the daily diversion to approximately 16 ML/d. Therefore, there is scope for Westernport Water to improve its utilisation of this resource by upgrading the pump station and transfer pipeline to allow diversions of up to 25 ML/d when the water is available. This option may increase greenhouse gas emissions but will be subject to environmental design considerations that would mitigate the increase. This increase is likely to be small compared to other options. Consideration as identified in the Guidelines for assessing the impact of climate change on water supplies will be assessed as in Water for Victoria Action 2.3.

Groundwater

Westernport Water holds a licence to extract water from the Corinella Aquifer, located within the Corinella Groundwater Management Area. Westernport Water has one deep production bore and three shallow bores (that require upgrading in order to be used) in the Corinella area that extracts water from the aquifer, and transfers the water to Candowie Reservoir.

The groundwater licence covering Westernport Water's extraction from Corinella Aquifer (Southern Rural Water, 2016 BEE050528) limits Westernport Water's extractions to:

- 490 ML/year; and
- at a rate not exceeding 3.65 ML/day, subject to specific pump operation rules.

The groundwater resource was developed as an emergency response to the critical water shortage experienced in the Westernport Water supply system during 2006/07. Since that time, the operation of the groundwater bores has been problematic, because:

- The operation of shallow bores are restricted by the characteristics of the aquifer and the effect on farmers stock bores.
- The deeper bore, while usable, has a high risk of seawater intrusion.

Based on these operating problems, Westernport Water has decided to only use the groundwater supply as an emergency supply, with the deeper bore used in priority to the shallow bores.

Melbourne water supply system

In 2012, Westernport Water was granted an entitlement to an annual allocation of up to 1,000 ML from Melbourne Water.

In 2014, new bulk water arrangements came into effect for the Melbourne water supply system as a consequence of the Melbourne system bulk entitlement reforms. The purpose of the reform was to disaggregate and clarify the Retail Corporations' (City West Water, South East Water and Yarra Valley Water) and Regional Urban Water Corporations' (Barwon Water, South Gippsland Water, Western Water and Westernport Water) access to Melbourne's water resources. As an outcome of the BE reforms, Westernport Water's entitlement was replaced with Bulk Entitlement (Greater Yarra System – Thomson River Pool – Westernport Water) Order 2014.

Under the new 2014 bulk entitlement, Westernport Water became a Primary Entitlement Holder of the Melbourne water supply system. This means Westernport Water has the right to a 1,000 ML entitlement share of the total resources available to the Greater Yarra System - Thomson River pool (the Pool - 624,310 ML). Water is made available to this entitlement by Melbourne Water through the seasonal determination process prescribed in the bulk entitlements.

The Westernport Water system has connected to the Melbourne water supply system at a delivery point on the Desalination pipeline (DP6), as shown in Figure 3, with a transfer capacity of around 14 ML/d. When the Desalination Plant is operating, Westernport Water is able to supply water directly into Westernport Water's reticulation system without treatment. When the plant is not operating, Westernport Water can also access its allocations stored in the Melbourne water supply system by gravitating water back from Cardinia Reservoir. However, there are water quality issues associated with this operating arrangement that may require the use of a temporary or permanent treatment plant.

2.3 Water treatment and distribution

The Ian Bartlett Water Purification Plant is located at Candowie Reservoir and treats all water supplied within the Westernport Water supply system, excluding supply from the Melbourne water supply system that does not require treatment. Due to recent upgrades and changes to treatment processes, the plant maximum output has reduced slightly to 22 ML/d.

Treated water from the plant is piped 37 km via a 650 mm diameter supply main to the main urban water demand centres in the region, with the capacity of the supply main being 45 ML/d. Offtake pipelines located along the main pipeline deliver water to other smaller urban areas on the mainland and to the rural areas west and south of Candowie Reservoir.

Table 1 summarises the major towns supplied through the Westernport Water supply system, together with population and connection information.

Table 1 Summary of Westernport region population and connections

Towns Supplied	Permanent Population (2011)[1]	Estimated Current Population (VIF pop forecast)[2]	Connections[3]		
			Residential	Non-Residential	Total
Grantville	738	791	14,916	1,056	15,972
Corinella / Coronet Bay	1,340	1,436			
San Remo	1,083	1,161			
Phillip Island	9,406	10,080			
Kilcunda	321	344			
Dalyston / Archies Creek	606	649			
Total System	**13,494**	**14,461**	**14,916**	**1,056**	**15,972**

1) Based on 2011 Census Data (www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat)
2) 2011 Census data multiplied by VIF population projection for Phillip Island VIFSA
3) 2015/16 Westernport Water Annual Report

2.4 Wastewater system

Cowes Wastewater Treatment Plant

The CWWTP has a maximum capacity of 7.7 ML/d with an average flow of less than 4 ML/d but the flow can have short peaks infrequently that overload the clarifiers. Short-term high flows are limited to 8.8 ML/d to the treatment process by bypassing the process to the effluent storage lagoon. This only occurs at exceptional high flows and at 1 in 10-20 years intervals. Cowes plant treated 1,148 ML sewerage, produced 359 tonnes of biosolids, reused 84 ML of Class A recycled water and 69 ML of Class C recycled water for the 2015-16 year.

The Master Plan for CWWTP shows that the short term planning to cater for increased flows due to population increase and to manage the peak high flows requires the following capital works implemented over the next 10 years.

- New clarifier to increase capacity to 14 ML/day
- Replace existing return activated sludge and waste activated sludge pump stations
- Outfall pump replacement to increase capacity to 150 L/s
- Effluent storage of 5ML in addition to existing 10ML storage (provides till 2046)
- Inflow first flush storage 2ML
- Additional 55kW aerator in tank BR2.

Long term planning from 2030 – 2046 projected capital works

- Third biological reactor to handle the expected peak flows
- Cover anaerobic digester to recover and burn ethane gas

Total estimated cost of the above program is $6,100,000.

King Road Wastewater Treatment Plant

The KRWWTP currently has a capacity of 940 kL/d and a future Stage 2 is planned to increase capacity to 1,875 kL/d. Current capacity is suitable for the current growth and new sewer areas until 2040. The current (2015) average dry weather flow is 550 kL/d with a peak dry weather day of 710 kL/d with a peak wet weather flow of 3,750 kL/d. The main aeration tanks can be run in overload conditions to an 85 ML lagoon during peak wet weather flow. The disposal of the effluent on our own land is stored in a 200 ML winter storage. KRWWTP plant treated 183 ML of sewerage, produced 14 tonnes of biosolids and 143 ML of Class C recycled water for the 2015-16 year.

The Master Plan for KRWWTP requires the following capital works in the short term from 2018 - 2025.

- Standby generator and spare larger 15 kW aerator
- Wet weather bypass for inflow to the 85 ML maturation lagoon
- Development of further irrigation land
- Winter storage lagoon additional 210 ML
- Storm retention bypass inflow basin at head of plant.

Other options for longer term planning for 2025-2030

- Inlet screen replacement and upgrade
- Replacement of aerators with 15 kW low speed units

Total estimated cost of all the above works is $4,100,000.

Major Transfer System

The major transfer system is the cross Phillip Island system that transfers the wastewater from San Remo to the CWWTP and consists of five major pump stations and 15 kilometres of large diameter rising pressure main. The pumping stations are upgraded as needed on a replacement schedule when the components are at the end of their useful life. The system in its current form can cater for the proposed increase in demand for wastewater for the next 15 – 20 years, This will be monitored to determine the actual peak flows enabling short term upgrades to system components.

There are three large pump stations in the Cowes reticulation system (Ventnor to Silverleaves - refer Figure 1) that have served the system well for the past 50 years but have restrictions on their augmentation due to their location within residential zoned neighbourhoods. The long term plan for this area is to construct a large regional outfall pump station in a low density area that will transfer all the wastewater from the central, east and west pump stations to the CWWTP. This is planned for implementation in the next 20 years but is dependent on the actual growth of residential or commercial tourist related developments or accommodation in the area. The first stage (which includes increasing sewer pressure main sizes) is scheduled to begin over the next 6 years as part of the capital works program.

3. Supply – demand balance

3.1 System demand forecast

Approach to demand forecasting

As part of the development of this UWS, Westernport Water reviewed its water demand forecast to 2065. Water demand is typically difficult to forecast because it varies depending on weather conditions, changing population and water use behaviour. The Westernport region has an additional level of complexity associated with the large peaks in (non-permanent) population in summer and large number of tourists that visit the region. To reflect the uncertainty in forecast demand, Westernport Water developed a baseline demand forecast with an upper and lower bound to reflect a probable range of demand growth. These forecasts are based on historic water consumption, population growth projections for the area and recent trends in water use. Due to the high degree of uncertainty, the long term climate change impact on demand have not been quantified in these demand projections. Westernport Water will continue to work and gain a better understanding of this as it implements this Urban Water Strategy.

Westernport region population growth forecast

Westernport Water collects and reports on residential and non-residential connection data, and bulk, residential, non-residential and non-revenue water consumption. Population and dwelling growth data is available from Victoria in Future (VIF) VIF2016. The Westernport Water and VIF2016 data has been used to develop new demand forecasts for the period 2015/16 to 2064/65, noting that there are still significant areas of uncertainty with demand forecasting in the Westernport region. This is particularly the case for the 2015/16 financial year, which saw a record high total water consumption of 2,193 ML, which for an equivalent population is almost 300 ML higher than total consumption in the previous year.

A key action of the 2017 UWS for Westernport Water is to gain a better understanding of water use behaviours in the region to allow for improved demand forecasts in the future.

Connection growth rates

Westernport Water's number of residential connections has been increasing at a rate of around 1.2 per cent in recent years. Residential connections in the Westernport region are increasing at a greater rate than the estimated increase in population. This reflects a forecast reduction in the number of people per household contained in the VIF population forecasts, and indicates that a proportion of the new residential connections have been holiday houses.

Growth in non-residential water connections is more difficult to determine due to changes in the way Westernport Water has accounted for non-residential connections in the past. Currently non-residential consumption constitutes approximately one third of total consumption and therefore changes to the number of non-residential connections may have a significant impact on water consumption in the region.

Recent trends in water consumption per connection

Analysis of recent Westernport Water consumption data undertaken for the 2012 WSDS indicated a substantial difference in the water consumption rates between new and old connections. On average, new residential connections use approximately half the water of existing connections. This analysis looked at the water consumption per year for connections that existed prior to 2008/09, and new connections since that time. This trend was evident over the full spectrum of water users, with the largest water users amongst the new connections still using less water than the largest water users amongst existing connections.

Assessment of recent consumption trends for non-residential connections is difficult due to changes in the accounting of non-residential connections in the past. Gaining better knowledge of non-residential consumption patterns in the region is an action of the 2017 UWS.

Baseline demand forecast

The baseline demand forecast used for the 2017 UWS has been developed with consideration of recent trends in water use, and the areas of uncertainty discussed above. To represent the uncertainty surrounding this forecast, upper and lower bands have been developed to represent a probable range of demand. The baseline demand forecast was developed on the following assumptions:

- Current annual unrestricted demand is 1,986 ML, based on the average demand over the past three years (2013/14 to 2015/16);
- 1.2 per cent per annum increase in residential connections, based on actual residential connection growth over the seven year period 2008/09 to 2015/16;
- 1 per cent per annum increase in non-residential demand;
- Annual residential water connections use 83 kL;
- Annual non-residential water connections use 548 kL, and
- 5 per cent non-revenue, based on combined residential and non-residential demand (i.e. operating losses).

Westernport Water has selected the baseline demand forecast, shown in Figure 4, as it is believed to represent more accurately the recent residential growth trends in the Westernport Water region. It is noted that the baseline forecast is slightly higher than the 1 per cent annual growth in water consumption previously adopted by Westernport Water for planning purposes.

Lower demand bound

A lower demand bound, shown in Figure 4, has been developed based on the following assumptions:

- Current annual unrestricted demand is 1,986 ML; and
- 1 per cent per annum increase in demand, as used in previous Westernport Water planning.

Upper demand bound

An upper demand bound, shown in Figure 4, has been developed based on the following assumptions:

- Current annual unrestricted demand is 1,986 ML; and
- Increase in residential demand based on VIF2016 dwelling projections for Phillip Island VIFSA (ranging from 1.4 per cent to 2.2 per cent).

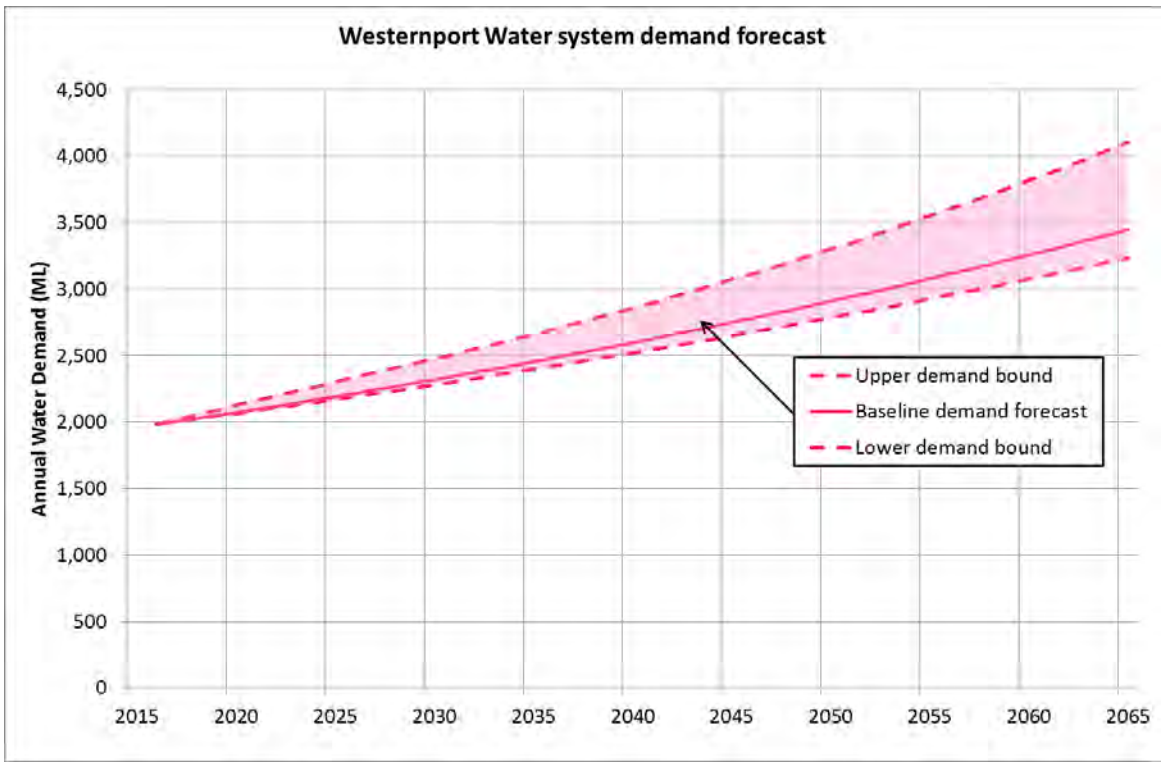


Figure 4 Westernport Water 2017 UWS demand forecast

Uncertainty surrounding future water use behaviour

Recent trends in water use help develop a picture of future water use, however large uncertainties remain. There are some areas of uncertainty that Westernport Water will not be able to predict or manage, such as the impact of climate on water consumption, or future government water conservation policy. There is however scope for Westernport Water to improve its demand forecasts through better understanding consumer behaviour.

Areas where uncertainty in forecasting demand could be reduced include:

- differences in water consumption habits between permanent residents of the region and non-permanent (holiday) residents;
- the potential of water tariff increases to reduce water consumption; and
- the scope for supplementing potable supply with alternative recycled water sources.

Westernport Water will engage with its customers to improve its knowledge of consumer habits and attitudes to water as an action of the 2017 UWS.

3.2 System supply forecast

System yield: how available water is described

For the Westernport region water supply system, yield is the average volume of water that can be extracted from the system on an annual basis without the imposition of restrictions more frequently than agreed (Westernport Water has adopted a level of service of 95 per cent annual reliability for its water supply). System yield is a function of system inflows, storage capacity and demand. Yield generally reflects the amount of supply available to meet demand in drier years. In average and wet years, more water will be available, while in very dry years (with restrictions) less water will be available.

Approach to supply forecasting

The yield of the Westernport Water supply system has been updated as part of the development of the 2017 UWS. The major influence on water availability is climate, although other factors including water infrastructure capacity and system operating rules (for example the provision of environmental flows in rivers), can also affect the availability of water.

For the purposes of the 2017 UWS, the Westernport Water supply system has been modelled to include all available supply sources, with the exception of the groundwater supply that Westernport Water has decided will only be used as an emergency water source. The details of the major supply infrastructure included in the yield assessment are contained in Table 2.

Table 2 Supply infrastructure adopted for supply forecast

Infrastructure	Status	Details
Candowie Reservoir (Tennent Creek)	Current	Storage: 4,463 ML Annual Entitlement: 2,911 ML Max diversion: 50 ML/d Treatment plant capacity: 22 ML/d
Bass River	Current	Annual Entitlement: 3,000 ML Max diversion: 15.6 ML/d
Melbourne water supply system	Current	A 1,000 ML entitlement share of the total resources available to the Pool subject to seasonal water allocation, and carryover.

Yield scenarios

Uncertainty relating to climate change has been incorporated into the yield assessment process by examining eight climate scenarios. These eight scenarios have been researched and recommended in the Guidelines for assessing the impact of climate change on water supplies in Victoria by DELWP to represent a band of possible future supply:

1. a *Current Climate Baseline* scenario based on historical inflows and climate conditions for the period from July 1975 to current, with the earlier period scaled down to match the post 1997 period
2. a *Step Climate Change* scenario based on historical inflows and climate conditions for the period from July 1997 to current, with the earlier period scaled down to match the post-1997 period
3. *Low*, *Medium* and *High Climate Change* scenarios at 2040 and 2065, based on the Current Climate Baseline (six scenarios).

Yield modelling results

Figure 5 shows the supply forecast for the Low, Medium and High Climate Change scenarios, which all commence at the Current Climate Baseline yield. The figure also shows the Step Climate Change supply forecast. While there is no 'most likely' scenario, the Medium Climate Change supply forecast has been adopted for the 2017 UWS as a plausible scenario, with the Low Climate Change scenario representing the upper bound of the supply forecast, and the Step Climate Change and High Climate Change scenarios representing the lower bound.

It is noted that all supply forecasts are lower than the 2012 WSDS due to the exclusion of the groundwater supply source, and changes to the way that water is allocated from the Melbourne water supply system.

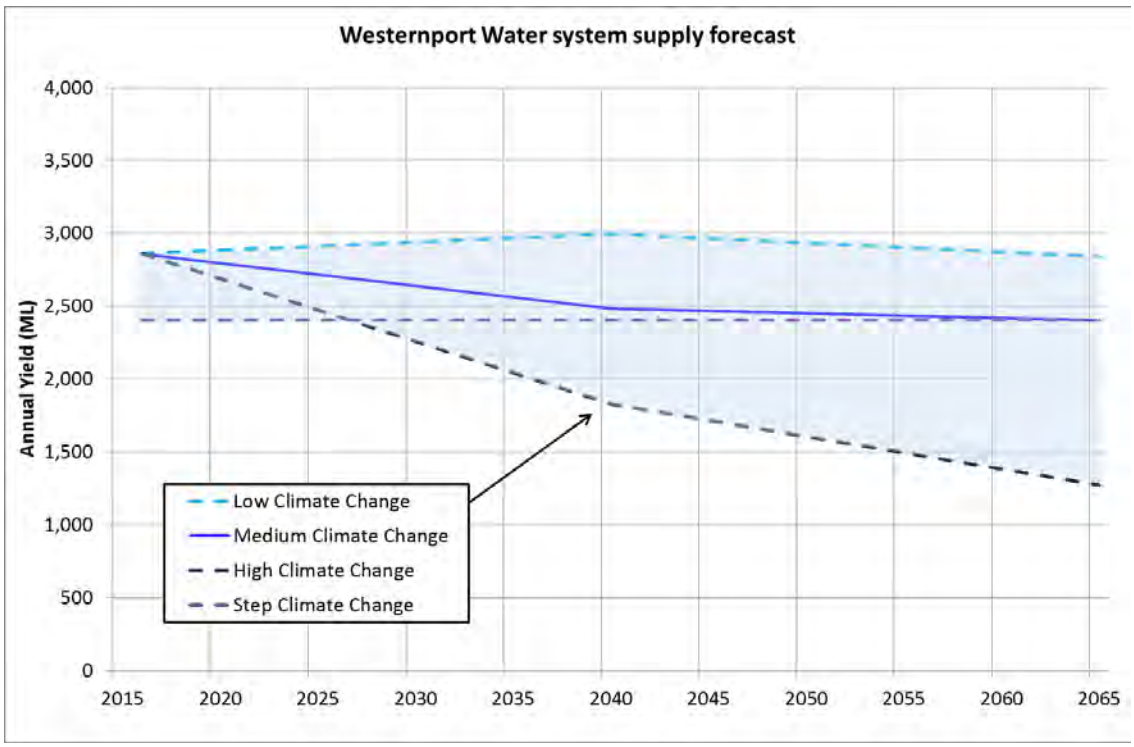


Figure 5 Westernport Water System yield forecast

3.3 Current supply - demand balance

The current supply-demand balance for the Westernport Water system (based around baseline demand and a Medium Climate Change scenario) is shown in Figure 6. This scenario provides a conservative estimate of system yield and would allow a repeat of events that led to the implementation of Stage 4 restrictions in December 2006 to be managed. The maximum level of restrictions that would be required under the Medium Climate Change scenario is Stage 2.

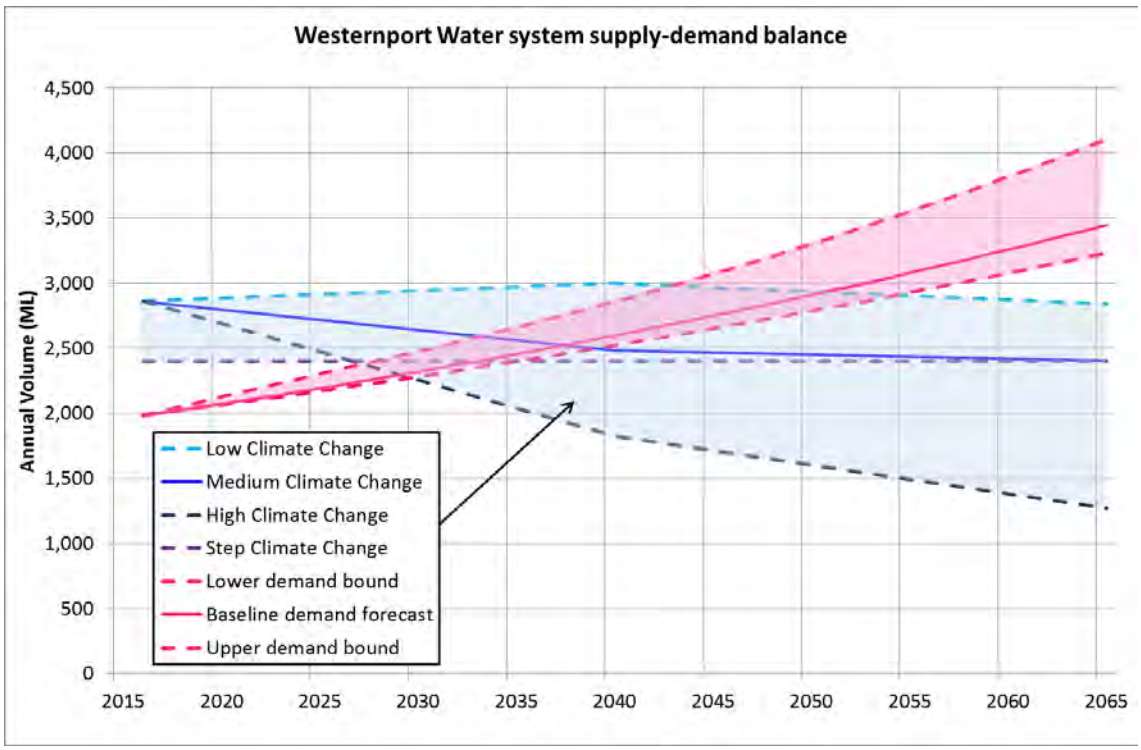


Figure 6 Baseline supply demand forecast

3.4 Augmentation due to supply and demand

In Figure 6, there is a range for the expected demand due to the uncertainty in accurately forecasting future trends. The demand has been determined according to the Guidelines but as the model used was not a climate dependent demand model, no climate change adjustment has been made according to recommendation No. 9 in the DELWP strategy guidelines.

2028 is the year when the first augmentation is needed if both the highest demand was maintained for the next 10 years and climate change reduced the available supply by almost 20 per cent over this same 10 year period.

2038 is the year when the augmentation is needed based on the baseline demand forecast and the medium climate change in supply that is used as the most likely scenario in the urban water strategy.

2055 is the latest year needed for the augmentation to the water supply based on the lowest forecast demand and the least impact on the water supply due to climate change.

Table 3 Year of Augmentation for demand supply options

Scenario	Year	Demand Options	Supply Options
1	2028	Provide education and public awareness of usage. Promoting water efficiency in and around the home, in industrial and commercial ventures.	Increase use of Melbourne water supply system. Increase the use of the current allocated Bass River entitlement.
2	2038	Provide education and public awareness of usage. Promoting water efficiency in and around the home, in industrial and commercial ventures.	Increase use of Melbourne water supply system. Increase the use of the current allocated Bass River entitlement.
3	2055	Provide education and public awareness of usage. Promoting water efficiency in and around the home, in industrial and commercial ventures.	Increase use of Melbourne water supply system. Increase the use of the current allocated Bass River entitlement.

4. Management of risk and uncertainty

4.1 Introduction

There are a number of risks associated with water service provision for the Westernport Water System (Candowie Reservoir), some of which are reflected in the supply-demand balance presented in the previous section, and some of which are shorter term in nature and associated with extreme events. It is important to recognise that some of these events, such as water quality problems caused by bushfire or blue green algal blooms, may result in a reduced level of service for the supply system, particularly where the operational management response to the events involves the introduction of water restrictions or other emergency supply measures. Using the water source from the Melbourne Water Supply System may be an alternative.

This section identifies and assesses at a high level some of the key risks associated with the supply of water from the Westernport Water System.

4.2 Qualitative risk assessment

The key longer term risks and uncertainties associated with supply and demand in the Westernport Water system were incorporated in the baseline supply and demand forecasts presented in the previous section. The key uncertainty for supply (yield) is the potential impact of future climate change and variability, while the key uncertainties associated with demand are the rate of population growth in the region and long term water consumption trends. These uncertainties were addressed by presenting the forecasts as envelopes representing the plausible range of future supply and demand.

As part of the development of the 2017 UWS, a high level qualitative risk assessment has been undertaken for the Westernport Water supply system, identifying the key risks that may affect supply security in the short to medium term. The results of this high level risk assessment are presented in Table 2.

4.3 Discussion of risk results

The risk assessment identified 13 individual risks within four risk categories:

- catchment yield
- groundwater yield
- water quality, and
- supply security.

For each of the defined risks, a risk level was assessed based on the likelihood and consequence of a given risk occurring. The assessed risk level also took into account the reliance of the supply system on a particular water source, and was adjusted for secondary or emergency supply sources. The supply security category considered the risk of short term failure of key infrastructure assets within the Westernport Water supply system, with short term failure taken to be a failure that can be repaired within two months, and can be managed in the interim through supplementary supply such as water carting.

For most of the defined risks, the risk level was assessed as being ‘low’. The exceptions to this were the supply security risks associated with the short term failure of Candowie Reservoir, the Ian Bartlett Water Purification Plant (IBWPP) and the Candowie transfer pipeline, which together comprise the primary water source for the Westernport Water supply system. The risk level for these primary supply assets were assessed as being ‘moderate’ due to the reliance of the system on the assets.

Table 4 Key risks associated with water supply system

Risk category	Risk description	Detailed description	Assessed risk[1][2]	Rationale / comment
Catchment yield	Impact of bushfires	Impact of bushfires in Candowie Reservoir catchment on system yield.	Low	Catchment largely comprises farmland
	Land use change	Impact of land use change (eg. plantations) in catchment on system yield.	Low	Major land use change in catchment unlikely
	Farm dam impacts	Impact of farm dam development in catchment on system yield.	Low	New farm dams will require approval from WPW
Groundwater yield	Seawater intrusion (deep bore)	Impact of seawater intrusion on deep bore.	Moderate Adj: Low	Only used as emergency supply
	Aquifer characteristics (shallow bores)	Impact of aquifer characteristics (including from surrounding users) on shallow bores.	High Adj: Low	Only used as emergency supply
Water quality	Impact of bushfires	Impact of bushfires in Candowie Reservoir catchment on water quality.	Low	Catchment largely comprises farmland
	Blue Green Algae	Impact of blue green algae in Candowie Reservoir on water quality.	Low	Previous BGA blooms managed through standard procedures
Supply security[3]	Candowie Reservoir	Supply security impact from short term failure of Candowie Reservoir.	Moderate	Reliant on reservoir as primary water source
	Water purification plant	Supply security impact from short term failure of IBWPP.	Moderate	Reliant on plant for primary water source
	Transfer pipeline	Supply security impact from short term failure of Candowie transfer pipeline.	Moderate	Reliant on pipeline for primary water source
	Bass River Pump Station	Supply security impact from short term failure of Bass River Pump Station.	Moderate Adj: Low	Short term as all components can be replaced
	Bass River Transfer Pipeline	Supply security impact from short term failure of Bass River transfer pipeline.	Low Adj: Low	Secondary supply source
	Melbourne system connection	Supply security impact from short term failure of Melbourne system connection.	Low Adj: Low	Secondary supply source

Notes:

(1) Assessed risk is high level and is based on the likelihood and consequence of a given risk occurring.
(2) Assessed risk also takes into account reliance of the supply system on a particular water source, with the risk adjusted where the supply source is secondary or emergency.
(3) Short term failure is taken to be a failure that can be repaired within two months, and can be managed in the interim through supplementary supply such as water carting.

5. Actions to maintain the supply – demand balance

5.1 Why action is required

The demand and supply balance shown in the previous section shows that Westernport Water has sufficient water to meet demand for the short to medium term. However, the balance presented above is a forecast only, and the actual supply and demand balance will shift every year depending on climate, population growth and water consumption habits. Westernport Water will therefore need to ensure it is continually monitoring the supply and demand balance, and undertaking actions to help manage this balance.

5.2 Demand-side actions

Water conservation

Westernport Water actively pursues water conservation to encourage our customers to monitor and reduce the use of water and to seek alternative water when suitable to reduce the dependence on potable water.

Demand management is continually pursued by Westernport Water through water conservation initiatives such as:

- Improved system efficiency through leakage detection;
- Education and public awareness;
- Initiatives that promote water efficiency at home such as promotion of water efficient appliances, exchange programs; and
- Improved commercial and industrial water use initiatives.

To assist with the development of demand management initiatives, Westernport Water intends to improve the organisation's understanding of customer water use behaviour and the uptake of the initiatives that have been run by Westernport Water and the State Government in recent years.

Westernport Water will actively pursue water conservation measures, including leakage detection, education and community awareness, as well as implementing water efficiency programs.

Substitution of potable supply with recycled water

Westernport Water supplies a number of its residential, commercial and agricultural customers with Class A recycled water, as shown in Figure 7. Class A recycled water provides an alternative, reliable and fit-for-purpose water source that can be used for non-drinking purposes such as toilet flushing, garden use and irrigation. On Phillip Island, recycled water also provides commercial customers with a guaranteed water supply that is not subject to permanent water saving rules or any restriction on use due to rainfall. Increasing recycled water use has the added benefit of minimising nutrient loads on the receiving environment. The community assets that are currently irrigated include Phillip Island Golf Club, football ground, Newhaven College School grounds and Phillip Island Nature Park grounds. Ongoing discussion with the community and Bass Coast Shire Council to identify additional community assets to benefit from recycled water or additional water allocation.

As an additional measure to reduce treated wastewater discharge volumes, the Corporation has constructed irrigation infrastructure at the CWWTP to supply recycled water to a eucalyptus plantation consisting of 14,000 Sugar Gums (Eucalyptus cladocalyx). In 2015-16, approximately 72 ML of recycled water irrigated the woodlot instead of discharging to the ocean outfall.

Westernport Water will continue to seek new customers for its Class A recycled water supply, relieving pressure on the potable supply and reducing outfalls to the ocean.

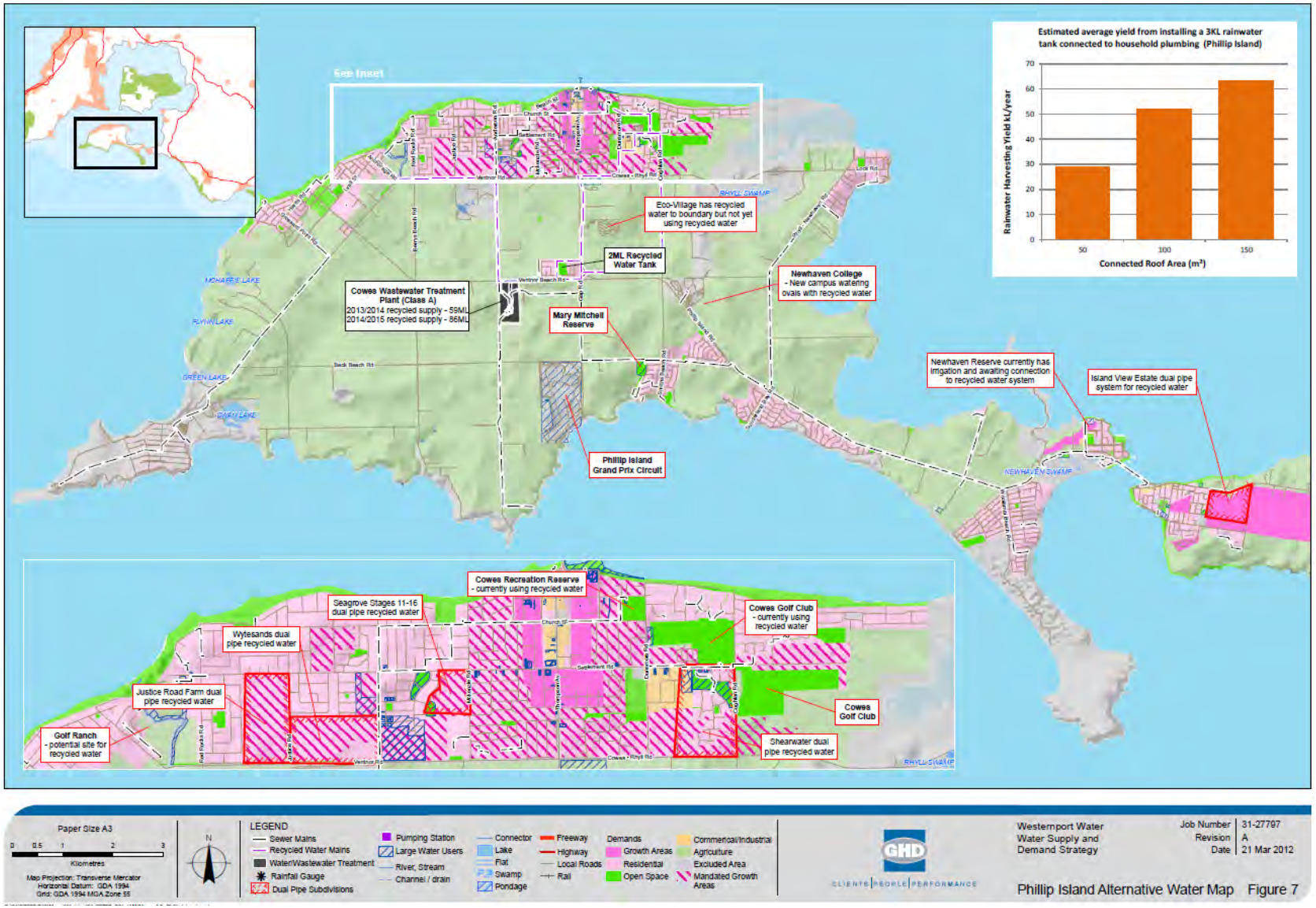


Figure 7 Phillip Island alternative water map

5.3 Supply-side actions

Since the severe drought conditions of 2006/07, Westernport Water has considered various supply augmentation and demand management options, with the major projects completed to date detailed in earlier sections. To improve the reliability of supply into the future, the following options are being considered for implementation as part of the 2017 UWS:

Source additional supply from the Melbourne water supply system

Future imbalances in supply and demand could be managed through an increased entitlement from the Melbourne water supply system. Under the current BE arrangements, Westernport Water would need to acquire an additional share from the system, with a corresponding increase in the Melbourne Water annual water charge and/or consumption charge.

Westernport Water's current entitlement volume of 1,000 ML represents a share of an overall entitlement volume from the Melbourne water supply system of 624,310 ML. Westernport Water would need to acquire an additional share from one of the other Primary Entitlement Holders, either on a temporary or permanent basis. The water would be obtained by a water trade which may also require an amendment to the bulk entitlement.

Bass River pump station infrastructure improvements

The current Bass River diversion pump station and transfer pipeline do not have the capacity to harvest the maximum daily entitlement of 25 ML/d. The current capacity of the pump station is limited to 15.6 ML/d, and therefore Westernport Water cannot maximise the use of this resource. By increasing the transfer capacity, Westernport Water could potentially harvest additional water during higher flow events in Bass River and store it in Candowie Reservoir. While the operating costs for this supply source are relatively high, this project is still considered a viable option for improving supply in the future. Previous modelling indicates that the upgrade of the existing Bass River Pump Station to allow the daily entitlement of up to 25 ML/d to be harvested would increase the yield of the system by approximately 450 ML/yr under the Step Climate Change inflow scenario.

The Bass River environment is not effected by the additional flows to Candowie Reservoir as the river produces peak flows up to 5,000 ML/d. The 25 ML/d flow extracted would have minimal effect as no outlet flows occur under 50 ML/d and the flow stops when the river flow falls below 40 ML/d. The procedure allows one day's bypass flow once 50 ML/d is exceeded.

Alternative water sources

An assessment of alternative water sources available to Westernport Water was completed as part of the 2012 WSDS. Westernport Water manages a Class A recycled water plant that can produce up to 1.3 ML/d from the Cowes Wastewater Treatment Plant.

The market for alternative sources of water is still being developed in the Westernport region, however it is expected to grow through the development of third pipe schemes, extension to new developments in the Cowes area, and new irrigation customers. In the immediate future, alternative water sources are most likely to reduce consumption by substituting current potable water demand. Community assets that are irrigated by the Class A recycled water include the Cowes Recreation Reserve, Phillip Island Golf Course, school ovals, community run garden for growing fruit and vegetables, nature parks and reserves in local neighbourhoods. This ensures that access to community assets is available even when the potable water supply is restricted during periods of drought.

In recent years, Westernport Water has also carried out a feasibility study utilising the principles of integrated water management to assess a range of options to service the new developments in San Remo and potential commercial sites in Newhaven. Considering the costs and benefits

of all the schemes the recommendation was to utilise stormwater reuse. The study found that it was not financially viable to incorporate stormwater reuse into new developments, or retrofit stormwater reuse to existing residential areas. The ongoing assessment and uptake of alternative water supplies will continue to assist Westernport Water to manage peak demand of the potable water system by supplementing with a weather independent alternative water source where appropriate.

5.4 Option evaluation

Two options have been identified for the long term augmentation of the water supply system. Option one is to increase the water available from the Melbourne water supply system, either by a temporary allocation water trade or a permanent entitlement trade, which would increasing the current entitlement share and require an amendment to the bulk entitlement. The second option is to increase the usage of the Bass River entitlement up to 3,000 ML per year (the existing entitlement) current usage is only 300-800 ML per year. Both options would with a medium climate change and baseline demand, provide enough water through to 2065. Both options are feasible but due to the long lead times before they are required (10 - 20 years) factors may change and multi-criteria assessment is not warranted at this time. Currently additional supply from the Melbourne water supply system is the most cost efficient option but this may change over time, so both options to be assessed on significant parameters when the demand exceeds the yield.

As required to meet future demand increases, Westernport Water will seek to acquire an additional share from the Melbourne water supply system, currently the most cost-effective water source, or implement Stage 2 for Bass River pump station.

5.5 UWS monitoring and reporting

Westernport Water will actively monitor the supply demand balance as part of the implementation of this strategy. This monitoring will focus on comparing elements of supply and demand that may indicate if action is required to maintain the supply – demand balance, with measures summarised in Table 5.

The results of this report will be used to determine which, if any actions from the UWS or the Drought Preparedness Plans are required. This reporting will also form the basis of Westernport Water's Annual Water Security Outlook.

Table 5 Measures for monitoring the supply and demand balance

Measure	What this may indicate
Actual demand compared to forecast demand.	That demand is exceeding the forecast Demand tracking lower, baseline or upper.
Actual Candowie Reservoir inflows compared to modelled inflow scenario.	That available supply may be less than required.
Annual use of water from Melbourne Water Supply System and Bass River.	Increased use may indicate supply from Tennent Creek is not sufficient to meet demand.
Volume of water stored in Candowie Reservoir.	Indication of the volume currently available to meet supply in the short term (1 – 2 years).

Westernport Water will report against the assumptions that underpin the UWS annually to monitor deviation from the demand and supply balance forecasts.

5.6 Updating this strategy

As required Westernport Water under its Statement of Obligations, Westernport Water will update the 2017 UWS within five years of its submission.

Westernport Water will update the 2017 UWS within five years of the submission of the strategy.

5.7 Consolidated strategic actions

The actions that result from this UWS are highlighted in the boxes in the body of the report and are reproduced below in Table 6, for a consolidated list for easy reference over the life of the strategy. Adaptive Management will be used to update the actions from this strategy as required.

Table 6 Strategic actions for the UWS

Action	Description
1	Westernport Water's aim is to provide the lowest practical cost of water to its customers while ensuring a reliable water supply.
2	Westernport Water has adopted a service level that water restrictions are not required in 95 years out of 100 to maintain a supply demand balance.
3	Westernport Water will actively pursue water conservation measures, including leakage detection, education and public awareness and implementing water efficiency programs.
4	Westernport Water will continue to seek new customers for its Class A recycled water supply, relieving pressure on the potable supply and reducing outfalls to the ocean.
5	As required to meet future demand increases, Westernport Water will seek to acquire an additional share from the Melbourne water supply system, currently the most cost-effective water source, or implement Stage 2 for Bass River Pump Station.
6	Westernport Water will report against the assumptions that underpin the UWS annually to monitor deviation from the demand and supply balance forecasts.
7	Westernport Water will update this UWS within five years of the submission of the strategy.

Appendix A – Drought Preparedness Plan

1. Introduction

About this document

This is the 2017 update of Westernport Water's *Drought Preparedness Plan* (that includes the Drought Response Plan). It is included as an appendix to Westernport Water's *2017 Urban Water Strategy*, with duplicate information removed. The *Drought Preparedness Plan* meets the requirements of the *Statement of Obligations* and the *Water Restriction By-Law*.

Context

Westernport Water was constituted on 22 December 1994 under the *Water Act 1989*. Westernport Water operates under the Statement of Obligations issued under Section 4(i) of the *Water Industry Act 1994*. The purpose of the Statement of Obligations is to clarify the obligations of Westernport Water, including the requirement in item 6-4 (Drought Response Plans for Urban Systems):

- To develop and implement a drought response plan for each water supply system operated.
- Make its drought response plans available to the public, and
- Review and if necessary amend the drought response plans at an interval of no more than five years or within 12 months of lifting water restrictions or any major change to water supply arrangements.

Drought Preparedness Plan scope

This Drought Preparedness Plan has been developed in parallel to Westernport Water's *2017 Urban Water Strategy*. It is intended to be used by Westernport Water to guide the organisation in making decisions about appropriate actions to manage potential water shortages. As all water shortage situations are different, this DPP should be used as a guide only, and adjustments should be made based on the specifics of each water shortage event.

The DPP has been developed based on the current Westernport Water supply system using the information available at the time of its development. This DPP should be reviewed and updated following any significant changes to the Westernport Water supply system or demand and supply information, with no system augmentations planned in the short to medium term.

Westernport Water's previous *Drought Response Plan* (DRP) was developed in 2012. The 2017 DPP has incorporated the objectives of the previous DRP and includes the new DRP, as well as any actions that are still relevant to the current Westernport system.

Drought Preparedness Plan purpose and objectives

The purpose of a DPP is to detail management actions to meet critical human needs during the following events:

- An extreme dry period; or
- A water quality event of an intensity, magnitude and duration that is sufficient to render water acutely toxic or unusable for established local uses and values.

A set of objectives is required for a DPP to enable it to have purpose and direction, and to allow for measurement of its effectiveness, with the strategic objective of this DPP to:

"Ensure timely warning of any water shortages which might occur as a result of future drought or water quality events and to be prepared to deal with such shortages when they occur".

This strategic objective will be met whilst also meeting specific planning and operational objectives, as detailed in Table 3.

Table 3 Planning and operational objectives

Planning objectives
Identify all necessary steps that need to be taken throughout a drought or water quality event, including clear triggers that instigate certain actions.
Create a framework for regular review, as the supply system alters or as more information becomes available, both prior to and following a drought or water quality event.
Establish methods for reviewing the plan both during and following the implementation of drought preparedness plan actions, and making adjustments where required.
Operational objectives
Ensure that a minimum supply of at least 60 litres/person/day (around 0.8 ML/d) is provided.
Ensure the most efficient use is made of water resources during periods of water shortage.
Ensure minimum flows are maintained to meet any downstream operational commitments or environmental requirements or community assets.
Provide clear indicators to ensure a reliable assessment of drought status can be made by Westernport Water.

2. Lessons learnt from managing previous droughts

The 1982/83 drought had major impacts throughout Victoria and it was necessary for Westernport Water to impose water restrictions. These restrictions were partially due to capacity constraints in the main supply pipeline, which has since been upgraded.

Through the early stage of the Millennium Drought (1997 – 2009), Westernport Water was able to avoid prolonged implementation of water restrictions, with storage levels in Candowie Reservoir dropping in summer but recovering each winter. There were two periods where Stage 1 water restrictions were introduced:

- December 1997 for five months; and
- August 2003 for two months.

The severe period of low inflows in 2006/07 required Westernport Water to impose Stage 4 water restrictions and bring forward long term system augmentations. These augmentations included:

- Diverting water from Bass River to Candowie Reservoir; and
- Establishment of a groundwater supply from Corinella Aquifer.

The water restrictions that were implemented during this period were lifted in August 2008. During this time, Westernport Water staff resources were stretched trying to enforce restrictions.

Westernport Water also ran a campaign to educate the public regarding water restrictions,

Historically, Westernport Water had an agreement with South Gippsland Water to receive a supply from Lance Creek Reservoir. As this reservoir is also impacted by low inflows, Westernport Water no longer has access to this as a supply source.

3. Knowledge gaps

The process of updating this DPP has highlighted a number of knowledge gaps that have limited the evaluation of the impacts of the drought response actions. Table 4 lists the knowledge gaps that should be addressed by Westernport Water to enable further refinement of this plan.

Table 4 Knowledge gaps related to drought response actions

Knowledge Gap	Details
Scope for voluntary demand reduction	Westernport Water will canvass customers on the uptake of water efficient technologies, or behavioural change particularly in the region. As such, the scope for further voluntary demand reduction is uncertain.
Understanding of the extent of demand reduction achieved by water restrictions	Westernport Water will research the extent of demand reduction due to the stages of restrictions. This will require using other systems information and adapting this data to local conditions.
Understanding of water savings during summer period	Peak summer demands (and the level of demand reduction achieved by water savings) are a function of holiday visitor numbers.

4. Legal and institutional context

Water Entitlements

Westernport Water supplies water from its various sources under the provisions of the *Water Act* 1989. The quantity of water harvested, and the rate at which it may be taken, are governed by:

- Bulk entitlements governing surface water resources, and
- Groundwater licences governing groundwater resources.

The details of the bulk entitlements and groundwater licences held by Westernport Water are contained in Section 2.2 of the *2017 Urban Water Strategy*.

Permanent Water Savings Rules

Westernport Water introduced new Permanent Water Savings Rules (PWSR) in its Permanent Water Savings Plan in December 2011. PWSR were legislated under the *Water Act* 1989. The revised PWSR consist of five simple and easy-to remember rules, which ensure the efficient use of water and avoid water wastage on a permanent, ongoing basis. A summary of the PWSR is presented in Table 5.

As Westernport Water has already implemented PWSR, they are not an option for further demand management as part of this DPP.

Table 5 Permanent Water Savings Rules summary

	Hand held hoses - A hand held hose MUST be fitted with a trigger nozzle and be leak free. It can be used to wash your car and water your gardens and lawns at any time
	Residential or Commercial gardens and lawns – A residential or commercial garden or lawn can be watered with a hand held hose at any time, or by means of a watering system between the hours of 6pm and 10am on any day.
	Public gardens, lawns and playing surfaces – A public garden or lawn area or a playing surface can be watered with a hand held hose at any time, or by means of a watering system (fitted with a rain/soil moisture sensor) between the hours of 6pm and 10am on any day. Public gardens, lawns and playing surfaces can also be watered in accordance with an approved Water Use Plan.
	Fountains and water features – Water cannot be used in a fountain or water feature unless the fountain or water feature recirculates the water.
	Cleaning hard surfaces – Water cannot be used to clean hard surfaces (including driveways, paths, concrete, tiles, timber decking) except where cleaning is required as a result of a hazard or accident, or in the course of construction/renovation. Hard surfaces can be washed if staining to the surface has developed, but only once per season.

Water Restriction By-Laws

Mandatory water restrictions are an effective tool to manage water demand during periods of water shortages. Westernport Water currently has a four stage water restriction policy that is designed to restrict non-essential water uses such as garden watering and car washing. This policy is given legal effect under Model Water Restriction By-law No. 105, issued by the Minister for Water on 22 February 2012 under the *Water Act* 1989. This By-law is available on Westernport Water's website.

The current restriction policy defines four stages of water use restrictions with increasing severity. Under each stage of water restrictions, various non-essential uses of water are restricted or banned. As the water restrictions levels increases so do the limits on non-essential water use. The limitations that Westernport Water may implement under each stage of water restrictions are detailed in Model Water Restriction By-law No. 105.

5. Drought response options

Introduction

Drought response options can be classified into two broad categories of demand management and supply enhancement. In this section of the DPP, short term demand management and supply enhancement options will be considered.

Demand management

Demand management involves reducing the demand for water in the system and can be undertaken during general operations and more intensively during periods of water shortage.

Voluntary water conservation measures

Voluntary water conservation measures could be the first step in demand management. These consist of media releases to encourage users to conserve water and written approaches to the major water consumers to reduce water usage. The importance of public awareness, understanding and involvement is crucial to achieving voluntary water conservation.

As part of the update of its *UWS 2017* and *DPP*, Westernport Water has updated its Annual Water Outlook to communicate the current water supply situation with customers, and educate them of the need for action.

The effectiveness of voluntary water restrictions is uncertain; while customer water use behaviour is believed to have altered significantly as a result of the Millennium Drought, it is not clear whether or how long this will continue.

Mandatory restrictions

Water restrictions are the next step in demand management during periods of water shortages. Westernport Water currently has a four stage restriction policy, and a set of drought response triggers to guide the timing of their implementation.

The implementation of water restrictions is based on Drought Response Levels (refer Section 7) that relate to the volume of water stored in Candowie Reservoir. When the storage volume falls below the drought response trigger points, Westernport Water may choose to implement water restrictions.

While future use under restrictions is difficult to estimate, the demand reduction detailed in Table 6 provides some guidance of potential savings, with estimates based on recorded demand data. The effectiveness of water restrictions can be increased through active and well publicised enforcement of restrictions. Westernport Water could direct additional resources to monitoring and enforcing water restrictions to improve their effectiveness during periods of extended implementation.

Table 6 Water restriction demand reduction estimate

Water restriction level	Annual demand reduction (%)	Estimation basis
Stage 1	3%	Interpolated between unrestricted demand and Stage 2
Stage 2	6%	Based on Sept 2007/Aug 2008 recorded consumption (12 months of Stage 2 restrictions), as a proportion of Sept 2008/Aug 2009 recorded consumption.
Stage 3	15%	Interpolated between Stage 2 and Stage 4
Stage 4	24%	Based on Sept 2006/Aug 2007 recorded consumption (10 months of Stage 4 restrictions), as a proportion of Sept 2008/ Aug 2009 recorded consumption.

Community education programs

Westernport Water can increase public awareness of the scope for reducing water use through the implementation of a community education program that links in with water efficiency initiatives being run by the state government. Westernport Water currently publicises government rebate programs and publications that assist customers in reducing residential water use. Increased publicity of these programs and publications can be used during a drought to help reduce water demand.

Supply enhancement

The purpose of supply enhancement options is to supplement existing headworks capacity during a drought situation when demand management options have proven to be inadequate. The supply enhancement options considered in this DPP are aimed at short term supply augmentation to compensate for low inflows, rather than permanent supply augmentations required to redress an imbalance between supply and demand. In past droughts additional groundwater bores (aquifers other than Corinella) have been used and additional water from South Gippsland Water storages via a connected pipeline.

Leakage prevention and reduction

Unaccounted for water has varied considerably in recent years from around 4 per cent in the recent three year period 2012/13 to 2014/15, to 31 per cent in 2008/09. There are a number of factors that could be involved: an example of which is mains flushing or illegal use of water, which would not generally be measured. There may be properties that are not metered or have illegal connections and others where the meters are not operating correctly. Westernport Water's ongoing meter replacement program is expected to reduce the metering component of unaccounted for water.

Leakage from pipes would only account for a proportion of the unaccounted for water volume. However, given the substantial volume, an investigation of leakage losses in the system does have the potential to increase supply security. An efficient response to burst mains can also minimise water losses and suitable procedures should be in place to respond to burst mains, especially during droughts.

Use of Corinella Aquifer groundwater resource

Westernport Water holds a licence to extract 491 ML/yr from the Corinella Aquifer, located within the Corinella Groundwater Management Area. In the event of a water shortage, Westernport Water could use groundwater from the deep production bore in the short term, subject to ongoing assessment of seawater intrusion. Should the supply of water from the deep production bore prove insufficient or the quality decline, upgrade works could be undertaken on the three shallow bores to enable their use. The three shallow bores are impacted by private bores in the surrounding area, so Westernport Water will need to work closely with Southern Rural Water to implement this supply action.

Temporary trading from Melbourne Water Supply System

The Westernport Water system is now connected to the Melbourne Water Supply System at delivery point six on the Desalination pipeline. As a Primary Entitlement Holder of the system, Westernport Water receives a monthly allocation against its entitlement share (1,000 ML). During times of drought, it may be possible for Westernport Water to purchase additional allocation (short term measure) or entitlement (long term measure) from the Melbourne system on a temporary basis from other Primary Entitlement Holders. It is noted that this option is likely to be relatively expensive, as the other Primary Entitlement Holders would most likely be experiencing supply shortfalls themselves.

Increase pumping capacity from Bass River

Westernport Water is entitled to divert up to 25 ML/day of water from the Bass River. The existing pump station and transfer pipeline limit the daily diversion capacity to approximately 15 ML/d. Increasing the capacity of the Bass River transfer infrastructure would allow Westernport Water to harvest more water on the days where greater than 15 ML/d is available to be diverted. The benefit of this option is dependent on available streamflow, which will be reduced during a

drought. The benefit will be realised during short high flow events that may occur during the drought and be a temporary short term augmentation.

This option is currently contained in Westernport Water's *2017 Urban Water Strategy* as a potential system augmentation to accommodate future demand growth. Planning for this augmentation could be bought forward in the event of an extended drought period.

Emergency supply measures

In the event that Westernport Water cannot obtain sufficient water to meet demand during a drought, emergency supply measures will be required. This would include water carting or bottled water to some areas of the system and the distribution of potable water supplies to the community from a source outside of the Westernport Water system.

Comparison of drought response options

Each drought response option has different benefits and impacts associated with it. Table 7 provides a high level evaluation of each option; noting that Westernport Water should evaluate each option prior to its implementation to assess whether the impact associated with the option is appropriate for the level of benefit that can be expected.

Table 7 Comparison of drought response options

Option	Available supply / demand saving	Infrastr-ucture require ments	Cost to Western-port Water	Social Impact	Environ-mental Impact	Comment
Voluntary water conservation	✓	✓✓	✓	-	✓	Volume of demand reduction unknown. Low cost option.
Mandatory water restrictions	✓✓	✓✓	✗	✗✗	✓✓	Impact to community will vary with restriction level.
Community education	✓	✓✓	✓	✓	✓	Volume of demand reduction unknown. Low cost option.
Leakage prevention and reduction	?	✓	✗	✓✓	✓✓	Volume of water savings unknown. May be insignificant.
Use of groundwater resource	✓	✓	✗	-	✗	Requires monitoring of seawater intrusion.
Temporary trading from Melbourne supply	✓	✓✓	✗	✓	-	Infrastructure in place. Cost may be high.

system						
Increased Bass River pump capacity	✓	×	×	-	×	Requires upgraded infrastructure Environmental impact on Bass R.
Emergency measures	✓	✓✓	××	×	-	Not suitable for supplying large volumes of water.

Key: ✓✓ Positive impact / requires no additional investment
✓ Slight positive impact / requires minimal additional investment
- Neutral
× Slight negative impact / requires additional investment
×× Negative impact / requires significant additional investment
? Unknown impact

6. Pre-drought management actions

Westernport Water will consult with their customers and the Bass Coast Shire Council to reduce the demand for water and designate what community assets are important to the community at this time to allow exemptions to any water restrictions. These would be community not currently identified and not currently serviced by alternative water supplies.

Communication strategy will be implemented to reinforce the PWSR and to reduce demand to a targeted use in litres per person. Water conservation officers activated to advise customers how they can reduce their water use or use alternative water, where appropriate, where reuse water is available or to extend the reuse water system to the end user.

7. Drought response plan

Drought response action implementation

The drought response plan outlines actions that Westernport Water will take to monitor and respond to potential water shortages. The action plan is split into two operating modes:

Mode 1: Normal Operation, and

Mode 2: Drought Response.

The implementation of these modes is guided by the storage level in Candowie Reservoir. When the storage volume in Candowie Reservoir falls below *Drought Response Level A*, Westernport Water will commence the actions outlined in the Drought Response phase. When the volume stored in Candowie Reservoir is above this level, Westernport Water will implement actions under the Normal Operation mode.

Drought Response Level A is based on Westernport Water's current system operations, and represents the storage volume that Westernport Water aims to maintain Candowie Reservoir at or above. The Drought Response levels are detailed in Table 8 and shown in Figure 8.

Table 8 Drought response levels based on Candowie Reservoir level (ML)

Trigger	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Full Supply Level	4,463	4,463	4,463	4,463	4,463	4,463	4,463	4,463	4,463	4,463	4,463	4,463
Drought Response Level A	2,900	2,750	2,550	2,400	2,300	2,100	2,200	2,400	2,650	2,800	2,900	3,000
Drought Response Level B	2,650	2,500	2,300	2,150	2,050	2,000	2,100	2,300	2,550	2,700	2,800	2,750
Drought Response Level C	2,150	2,000	1,800	1,650	1,550	1,500	1,600	1,800	2,050	2,200	2,300	2,250
Drought Response Level D	1,650	1,500	1,300	1,150	1,050	1,000	1,100	1,300	1,550	1,700	1,800	1,750
Drought Response Level E	1,150	1,000	800	650	550	500	600	800	1,050	1,200	1,300	1,250

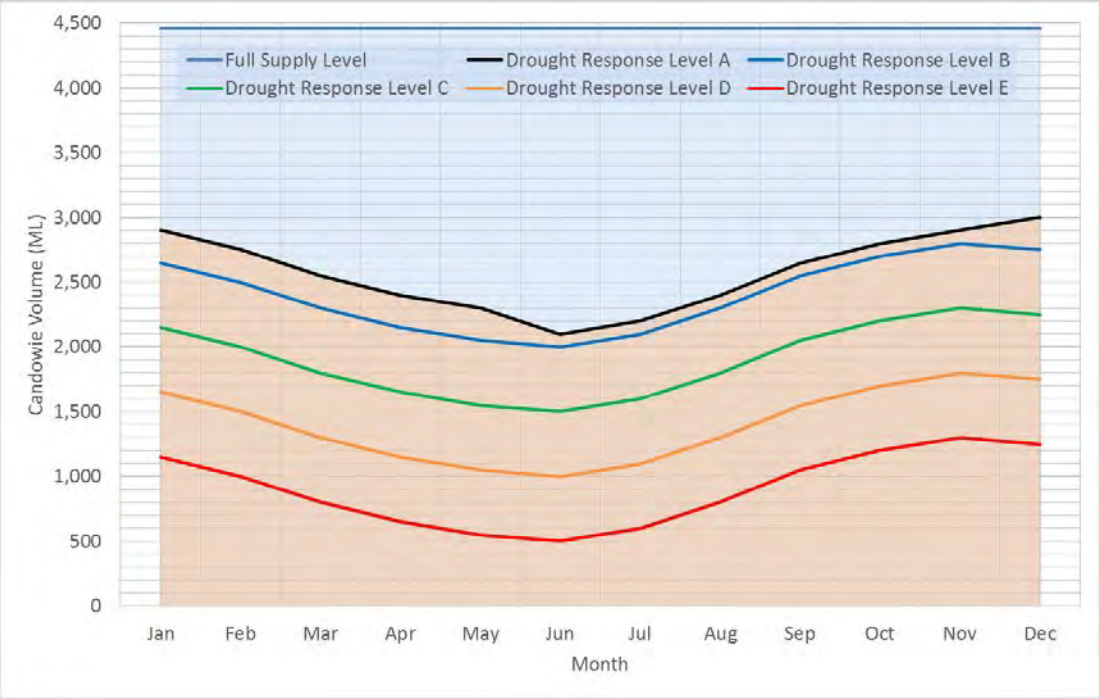


Figure 8 Drought response levels based on Candowie Reservoir level

Mode 1: Normal Operation

Implementation of Mode 1 (Normal Operation), when the storage volume is above *Drought Response Trigger A*, indicates that Westernport Water is not anticipating a drought event in the short term that will threaten the security of the region's water supply. In this mode Westernport Water will continue to monitor the following aspects of system security:

- Storage volume in Candowie Reservoir
- Inflows to Candowie Reservoir
- Climatic trends and seasonal outlooks published by the Bureau of Meteorology, and
- Water consumption and trends in water consumption behaviour.

Under this mode, the system status is updated on a monthly basis, and a report supplied to the General Manager – Assets and Operations.

Monitoring of the system status will also occur on an annual basis (in November) using Westernport Water's *Annual Water Security Outlook* (refer Appendix B). The *Annual Water Security Outlook* comprises a short term forecast and monitoring of supply and demand measures to identify departures from longer term supply and demand forecasts included in the Corporation's *2017 Urban Water Strategy*.

Mode 2: Drought Response

Implementation of Mode 2 (Drought Response) indicates that Westernport Water considers it possible that a drought event may occur that could lead to a water shortage. The purpose of this mode is to allow Westernport Water adequate time to prepare for supply enhancement options and commence demand management actions in order to avoid further action.

Westernport Water will continue to monitor system security as detailed in Mode 1, however system status reports will be updated and provided to the General Manager – Assets and Operations on a weekly basis. Actions to be undertaken during Mode 2 are listed in Table 9. Any implementation or change of restrictions will consider the time of year, the expected weather and any reduction in demand. (In winter/spring no demand reductions for stage 1 or 2)

Table 9 Drought Preparedness Plan actions: Mode 2

Action	Trigger	Response
1	Candowie Reservoir storage volume at or below *Drought Response Level A*	• Convene drought response team comprising Westernport Water management and staff. • Provide weekly updates of system status to General Manager – Assets and Operations. • Commence community education campaign. • Promote voluntary water conservation measures. • Increase surveillance of water leaks and pipe burst within the system.
2	Candowie Reservoir storage volume at or below *Drought Response Level A* and supplementary water supply (Melbourne system and Bass River) increasing	• Promote voluntary water conservation measures and alert public to potential need for mandatory water restrictions. • Preliminary discussions with Melbourne Water and DELWP for potential temporary trade from Melbourne water supply system.
3	Candowie Reservoir storage volume at or below *Drought Response Level B*	• Consider implementation of Stage 1 water restrictions. • Increase community education programs. • Open water restriction advisory hotline.

Action	Trigger	Response
		• Commence monthly storage level forecasting. • Weekly monitoring of Candowie Reservoir storage level. • Monitor water quality at Candowie Reservoir to ensure safety of the water supply during drought periods or low water level. • Commence monitoring of social, economic and environmental impacts of drought response measures. • Commence monitoring of effectiveness of water restrictions.
4	Candowie Reservoir storage volume at or below *Drought Response Level C*	• Consider implementation of Stage 2 water restrictions. • Increase resourcing of water restriction enforcement. • Discussions with Melbourne Water and DELWP to implement temporary trade from Melbourne water supply system. • Commence planning for Bass River pump station and pipeline capacity upgrade. • Continue community education programs. • Continue monthly storage level forecasting. • Weekly monitoring of Candowie Reservoir storage level.
5	Candowie Reservoir storage volume at or below *Drought Response Level D*	• Consider implementation of Stage 3 water restrictions. • Commence use of groundwater from deep production bore, with assessment of water quality should this proceed. • If feasible, complete temporary trade from Melbourne supply system. • If feasible, commence upgrade of Bass River pump station and pipeline capacity. • Identify and plan upgrades for shallow groundwater bores. • Identify and plan for implementation of emergency measures. • Increase community education programs. • Continued enforcement of water restrictions. • Continue monthly storage level forecasting. • Daily monitoring of Candowie Reservoir storage level.
6	Candowie Reservoir storage volume at or below *Drought Response Level E*	• Consider implementation of Stage 4 water restrictions. • Consider use of shallow groundwater bores if supply of water from the deep production bore

Action	Trigger	Response
		proves insufficient or the quality declines. • Increase community education programs. • Daily monitoring of Candowie Reservoir storage level. • Plan for emergency management measures.
7	Emergency supply required	• Commence emergency management measures.

8. Post drought assessment

Drought Preparedness Plan evaluation

Following the cessation of Drought Response operation, it is important to review the effectiveness of this DPP. The first part of the review should be to assess the suitability of the plan's objectives. Review each objective to determine whether they were appropriate and achievable. If they were not, new objectives should be set and the strategy reviewed to align with them.

Document the results of all monitoring undertaken during the drought, actions taken and the results of these actions. Comments from staff members, consumers and key stakeholders should be sought to help inform the review of the strategy.

Specific items that should be considered are detailed in Table 10.

Table 10 Post drought evaluation items to be reviewed

Implemented actions
Were actions effective?
Were actions implemented in a timely manner?
Was appropriate time to make decisions regarding actions allowed in the plan?
Were there any water quality problems associate with the drought response actions?
Water restrictions
Were the drought water response plans adequate?
Did consumers respond to requests for voluntary water conservation?
Were the target water consumption levels achieved for each level of response implemented?
What problems were experienced with drought response policies?
Was the enforcement of drought responses satisfactory?
What were the impacts on consumers, the corporation and the environment of these responses?
Monitoring
Was the information available adequate to plan an effective response?
What additional information would have assisted in refining the drought response actions?

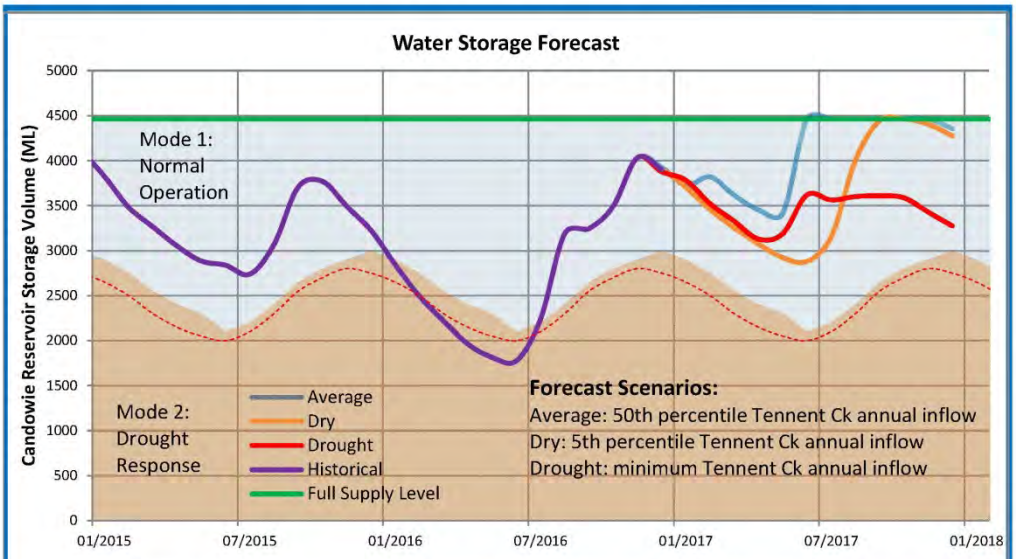
Drought Preparedness Plan review

DPPs are dynamic in nature and will only be appropriate for a particular system for a short period of time. Increased demand for water or a significant system augmentation will make this existing plan obsolete. DPPs need constant revision to keep them up to date. At a minimum the DPP will be reviewed:

- Following the implementation of the plan
- Following a significant change in the supply system
- Following a significant change in the supply or demand forecast for the system, or
- At a minimum every five years.

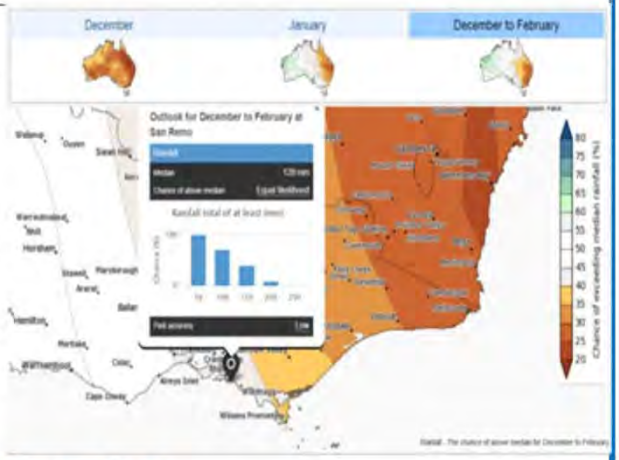
Appendix B - Annual Water Security Outlook

Westernport Water Annual Water Outlook (Prepared: 28 November 2016)



Seasonal Climate Outlook:
The chance of above median rainfall for December to February (128mm) is around 50% (equal likelihood), while the chance of exceeding the median maximum temperature is likely.

BOM advises December to February rainfall is likely to be below average for much of the country. The current outlook reflects a weakening negative Indian Ocean Dipole and an ENSO-neutral tropical Pacific. A strong climate influence is likely to be a shift north in the position of westerly winds (the "Southern Annular Mode") that affect southern Australia.



Current Status: Permanent Water Savings Rules

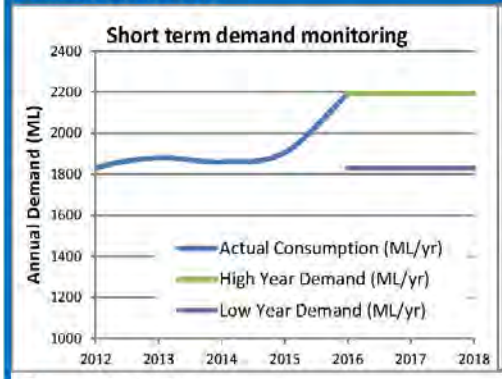
Likely Status July 2017: Permanent Water Savings Rules
Likely Status Dec 2017: Permanent Water Savings Rules

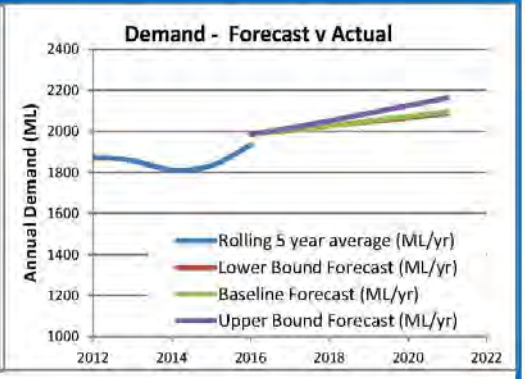
Based on current reservoir conditions (87% full at 28 Nov 2016) and BOM forecasts for just below average rainfall over the 3 month outlook period, Candowie Reservoir storage levels are expected to remain within the normal operating zone for the next year, based on inflows from Tennent Creek. The Bureau of Meteorology is forecasting just below average inflows to the Candowie system. By this time next year, the water level in Candowie Reservoir is expected to increase under the average and dry scenarios, and would only decrease under the drought scenario.

This outlook indicates that the system will not enter the Drought Response Mode under any scenario. If it does, Westernport Water will institute weekly monitoring of the storage level in Candowie Reservoir to monitor the situation, activate the Drought Management Team and commence community education and

Westernport Water Annual Water Outlook (Prepared: 28 November 2016)

Demand Indicators





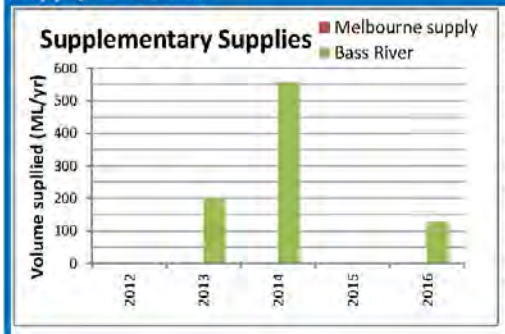
Demand Indicators:

Short term: Actual water consumption is tracking at the upper end of the high annual and low annual five year demand levels. Demand in the past year is significantly higher than in previous years and Westernport Water is endeavouring to determine the reasons for this trend, and whether is is likely to continue.

Long term: The rolling 5 year average demand indicates that demand is trending upwards and is likely to follow the demand forecast envelope. Demand should continue to be monitored.

Environmental Flow Releases: The upgrade of Candowie Reservoir provided for environmental flow releases downstream of the dam to improve river health. Flow released to Tennent Creek in the period July 2015 - June 2016 was 420 ML, with no water spilling from the reservoir.

Supply Indicators



Supply indicators:

128 ML was pumped from the Bass River pump station in the 2016/17 year to commssion the pump station, while the Melbourne System supply only came on-line later in the 2015/16 year, and has not yet been used. The Corinella borefield is used as emergency supply only.

The inflow from the catchment of Tennent Creek enabled the reservoir to be refilled to the level of 4,033 ML (90% of the storage volume of 4,463 ML), the highest volume recorded for the past year (Dec 2015 - Nov 2016) current level 87% 3,900ML.

Actions and Responsibilities

Urban Water Strategy Actions:

Ongoing monitoring of the implementation of the UWS and review after initial supply of water from Melbourne water supply system: *General Manager - Assets & Operations*

- Continuation of community consultation to better understand water use behaviours within the region: *General Manger - Customer & Community*
- Ongoing monitoring and assessment of system operating rules: *General Manager - Assets & Operations*
- Ongoing monitoring & investigation of short term demand; *General Manager - Assets & Operations*

Drought Preparedness Plan Actions:

Ongoing monitoring as detailed in Drought Preparedness Plan under Mode 2 - Drought Operation; weekly updates to Drought Management Team and demand management: *General Manager - Assets & Operations*

- Monitoring of weekly storage levels, daily demand, Melbourne supply system and Bass River supply to ensure the water volume in Candowie Reservoir is maintained at maximum levels
- Review Drought Preparedness Plan following as part of preparation of Urban Water Strategy: *General Manager - Assets & Operations*