4

4 The Strategy at a local level

Local actions for each sub–region will play a key role in achieving the objectives of the Central Region Sustainable Water Strategy. This chapter demonstrates what individuals, industries and the Government need to do in these areas to secure our water future together.

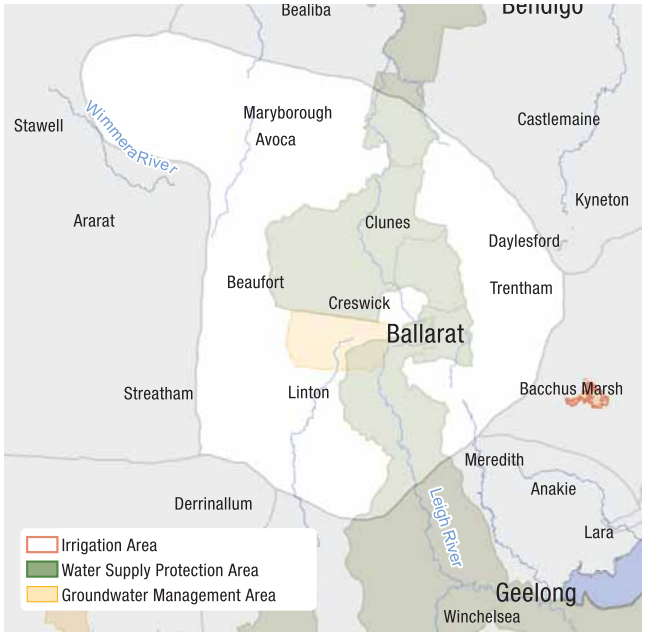
Greater Ballarat

The Ballarat and district supply system straddles the Great Dividing Range and includes towns in the Moorabool, Barwon, Corangamite, Loddon and Werribee river basins. Water is primarily sourced from the Moorabool River.

The system can currently supply 16,500 ML a year assuming long–term average inflows and 10,500 ML a year assuming continued low inflows. Current (unrestricted) demand is estimated to be 15,000 ML a year.

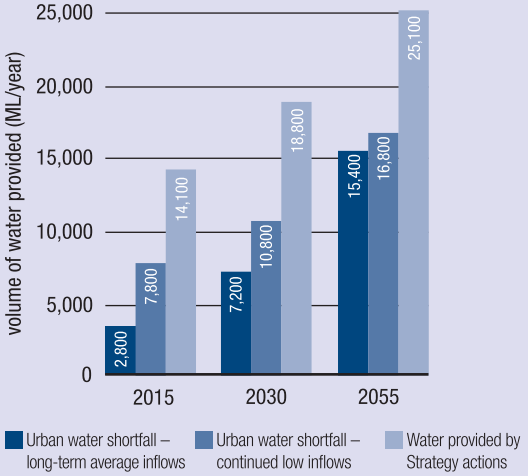
The population of Greater Ballarat is forecast to increase from its current level of 96,000 to 124,000 by 2030 and to 149,000 by 2055.

Figure 4.1 Map of Greater Ballarat



The challenges and solutions

The chart below shows the expected shortfalls in Ballarat's urban water supply and the water that will be provided by the actions in this Strategy. The dark blue bars show the shortfalls based on long–term averages of rainfall and inflows to reservoirs. The mid–blue bars show the shortfalls that might be expected if the low inflows of the past 10 years continue. The Strategy provides an action plan to secure water under both of these scenarios. The light blue bars show the water provided by the Strategy actions.



Immediate actions in response to low inflows (and volumes provided)

- Conservation and efficiency programs for homes and businesses to begin immediately (2,500 ML by 2015)
- Interconnect to Cosgrave Reservoir – already complete (450 ML in first year then 290 ML)
- Interconnect to Newlyn Reservoir by 2007 (520 ML in first year then 320 ML)
- Groundwater from Cardigan aquifer in 2007 (1,700 ML)
- Substitute river water with recycled water in Lake Wendouree and for industry by 2009 (800 ML)
- Interconnect to the Goulburn system by 2010 (10,000 ML as required)

What if inflows return to average conditions?

Conservation and recycling initiatives would continue. The volume provided by the Goulburn connection would be increased as required. Supplies from Cardigan aquifer would remain as future drought contingency supplies.

4

Planning using long–term averages

Estimates of Ballarat's future water supply and use are based on averages of the past 50–100 years of inflows to reservoirs, with population growth as outlined on the previous page. A gradual reduction in supply (over 50 years) is expected as a result of medium climate change. Under this scenario, the expected decline in inflows to Ballarat's reservoirs is 15 per cent by 2030 and approximately 30 per cent by 2055.

Planning for continued low inflows

Over the past 10 years, inflows to Ballarat's reservoirs have been 35 per cent less than the long–term average. In the winter period of 2006, inflows to Ballarat's reservoirs were only about 300 ML, compared to normal inflows in this period of about 14,000 ML.

The reduced inflows mean that reliability of water supplies is reduced. Target reliability for Ballarat's water supplies is 95 per cent (ie. restrictions in place for about 5 per cent of the time). The modelling result in Table 4.1 shows that if low inflow conditions continue, restrictions could be necessary 74 per cent of the time. Stage 4 restrictions could be in place a third of the time. There could also be a one in 40 chance that Central Highlands Water would be unable to provide enough water to meet needs under Stage 4 restrictions.

Table 4.1 Time (as a percentage) Greater Ballarat would spend under restrictions under a continued low inflow scenario

Stage 1	Stage 2	Stage 3	Stage 4	TOTAL
13%	15%	13%	33%	74%

Shortfalls

In order to maintain reliability at 95 per cent with either average inflows or continued low inflows, it will be necessary to secure additional water. Table 4.2 shows the modelled volumes of water that could be needed (ie. the expected "shortfalls") for both long–term average conditions and continuing low inflow conditions. Immediate actions to address these shortfalls are described below.

Immediate actions in response to low inflows

As a result of low inflow conditions and associated low storage levels, severe restrictions have been in place for several years in Ballarat. If low inflows continue, an additional 4,500 ML of water would be required over the next two to three years, and almost 8,000 ML by 2015. In comparison, based on long–term average inflows, Ballarat currently has a surplus of water available for urban use and an extra 2,800 ML would be required by 2015.

A range of immediate contingency and ongoing actions are outlined below to provide almost 14,000 ML of water in 2015 – enough to meet the shortfalls forecast under either scenario and provide a buffer supply of water.

Cosgrave and Newlyn Reservoirs

Central Highlands Water has connected the White Swan Reservoir in Ballarat to Creswick's Cosgrave Reservoir. This will enable access to Central Highlands Water's currently unused entitlement in Cosgrave Reservoir, providing about 290 ML under low inflow conditions and 420 ML under long–term average inflows.

Central Highlands Water will also develop infrastructure to transfer the unused entitlement in Newlyn Reservoir directly into the White Swan Reservoir via the Cosgrave–White Swan pipeline. This will mean an extra 320 ML under low inflow conditions (500 ML under long–term average inflows).

Cardigan aquifer

The Cardigan aquifer is located on Ballarat's expanding western fringe. A trial has been conducted on the aquifer to test the volumes that can be sustainably extracted, and Central Highlands Water will be granted a licence for up to 1,700 ML of water per year. This will be available from mid 2007 to augment Ballarat's urban supplies during dry periods. Extraction of the groundwater by Central Highlands Water will be conditional upon the long–term sustainability of the aquifer and arrangements for Central Highlands Water to provide alternative water supply or provide other measures to other groundwater users that may be impacted by the extraction.

Table 4.2 Expected shortfalls for urban use in Ballarat

	Now	2015	2030	2055
Long–term average conditions: Long–term average streamflow and gradual medium climate change impacts. Includes population growth.	1,500 ML surplus	–2,800 ML	–7,200 ML	–15,400 ML
Continuing low inflow conditions: Last 10 years of streamflow with effective step change now, which is equivalent to medium to high climate change. Includes population growth.	–4,500 ML	–7,800 ML	–10,800 ML	–16,800 ML

Ballarat–Goulburn connection

Central Highlands Water will connect Ballarat's urban supply system to the Goulburn system. The pipeline will connect Ballarat's White Swan Reservoir to Bendigo's Lake Eppalock. Central Highlands Water will then be able to access water in the Waranga Channel (in the Goulburn–Murray Water supply system) via the recently announced Bendigo pipeline. The size of the Waranga Channel to Bendigo pipeline will be increased to provide for Ballarat's needs. This Ballarat-Goulburn connection will allow Central Highlands Water to access enough water to meet Ballarat's needs in the short term. The volume of water provided can be increased over time to ensure Ballarat's medium and long–term needs are also met.

The Goulburn-Murray supply system supplies about 1,000,000 ML of high reliability entitlements for irrigation and other uses. Connecting to Ballarat will not increase the amount of water taken from the Goulburn system. Instead, Central Highlands Water will purchase water from willing sellers in the Goulburn system. It is proposed that 8,000–10,000 ML would initially be purchased. However, with continued low inflows, the volume of water purchased through the Waranga connection could be increased as necessary (up to 18,000 ML) in order to maintain Ballarat's reliability at an acceptable level. This represents a small proportion of the water in the Goulburn system.

This connection will not adversely affect the health of the Goulburn River or the levels of service to irrigators.

This connection will provide long-term water security for Ballarat and in turn secure regional investment. Several public submissions received in response to the Draft Strategy highlighted concerns regarding the Ballarat-Cairn Curran connection originally proposed. In response to these concerns, the Ballarat-Goulburn connection has been identified as the better alternative because it provides improved water reliability and water quality compared with Cairn Curran.

The connection between Ballarat and the Goulburn system also means that the current agreement between Geelong and Ballarat to share water from the Lal Lal Reservoir can continue. The proposal to transfer Geelong's share of Lal Lal to Ballarat does not provide sufficient water to meet Ballarat's short, medium or long-term needs. After 10 years of low inflows, Geelong has less than 1,000 ML of water in Lal Lal. Even if inflows returned to long-term average levels, only 5,000 ML would be available for Ballarat because of the need to provide some environmental flows in the Moorabool. This is insufficient for Ballarat's future requirements. The proposal to transfer Geelong's share of Lal Lal to Ballarat could not have been implemented within five years because it was dependent on Geelong's ability to secure replacement supplies first. These replacement supplies would not be available until 2011. Therefore, this option will not be further pursued.

Figure 4.2 Connection from the Goulburn system to Ballarat

4

Conservation and efficiency

Central Highlands Water will introduce a number of conservation and efficiency measures in order to achieve its new conservation targets.

Action 4.1

The Government requires Central Highlands Water to work with its customers to achieve a 25 per cent reduction in total per capita water use for Ballarat by 2015, increasing to 30 per cent by 2020. The basis of comparision is the 1990's average water use.

These targets mean total water use will need to be reduced from 501 litres of water per person per day (1990's use) to 376 litres by 2015 and 351 litres by 2020. This reduction will likely result in water savings of about 2,500 ML per year by 2015. It is expected that the reduction in residential water use (ie. in and around the home) will match the reduction in total water use.

As outlined in Chapter 3 (Action 3.13), the metropolitan Pathways to Sustainability program will be expanded to target all commercial and industrial customers in the Central Region that use more than 10 ML a year. This program encourages these users to develop plans and voluntarily reduce their water use.

Reuse and recycling

An upgrade to the Ballarat North Treatment Plant will provide highly treated recycled water for supply to Lake Wendouree, with additional water for use by industry and for the irrigation of community spaces throughout Ballarat. The lake will also be supplied with stormwater from Paul's Wetland. This project will free up about 800 ML a year by 2010 increasing to 1,000 ML by 2015 and at least 2,000 ML by 2030. Central Highlands Water will also seek other opportunities for reuse of recycled water in Ballarat. This will include industrial, third pipe residential and use on parks and gardens.

What if inflows return to average conditions?

Annual reviews of water availability and actual use compared to the forecasts will be undertaken. If the reviews show that inflows have returned to more average conditions, the timing and volumes of actions will be reconsidered.

The amount of water supplied from the Goulburn system will be varied as required over the next 50 years in response to Ballarat's growth in demand for water (resulting from population growth) and any reduction in supplies (due to medium climate change).

Conservation and recycling measures will continue to be progressively pursued into the medium and long–term.

Table 4.3 Immediate actions to address the urban water needs of Greater Ballarat

Feasibility/Planning | Construction/Implementation | Water Available

	Timing of implementation and volume of water provided (ML/year)										
Conservation and efficiency	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.2 Central Highlands Water will implement a range of conservation and efficiency measures within the residential sector (homes) and non–residential sector in order to meet its new conservation targets.*	300	600	800	1,100	1,400	1,700	1,900	2,200	**2,500**	**4,200**	**4,500**
Alternative supplies	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.3 Central Highlands Water will substitute potable water with recycled water in Lake Wendouree and for use by industry.			800	800	800	800	800	800	**1,000**	**2,000**	**2,000**
Interconnections	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.4 Central Highlands Water will connect Cosgrave Reservoir to White Swan Reservoir to allow access to Central Highlands Water's currently unused entitlement. If inflows return to average conditions, this supply may be used only as an emergency drought response.	290	290	290	290	290	290	290	290	**290**	**290**	**290**
Action 4.5 Central Highlands Water will develop infrastructure to transfer unused entitlement in Newlyn Reservoir directly into the White Swan Reservoir via the Cosgrave–White Swan pipeline. If inflows return to average conditions, this supply may be used only as an emergency drought response.	320	320	320	320	320	320	320	320	**320**	**320**	**320**
Action 4.6 Central Highlands Water will interconnect to the Goulburn system (White Swan Reservoir to Lake Eppalock) to allow access to water from the Waranga Channel. The volume of water purchased through this connection could be increased as necessary (up to 18,000 ML) if low inflow conditions continue.				10,000	10,000	10,000	10,000	10,000	**10,000**	**12,000**	**18,000**
Augmentations	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.7 Central Highlands Water will develop infrastructure to supply water from Cardigan aquifer to the Ballarat urban water supply system during dry periods.	1,700	1,700	1,700	n/a	n/a	n/a	n/a	n/a	**n/a**	**n/a**	**n/a**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Total Volume provided by options (ML/year)	2,600	2,900	3,900	12,500	12,800	13,100	13,300	13,600	**14,100**	**18,800**	**25,100**

* If population growth is different from what has been assumed, the volumes of water savings resulting from meeting Central Highlands Water's conservation targets will differ.

The water supplied by many of the conservation and efficiency actions increases from the short term to the long–term as more of the measures are taken up over time. In contrast, the actions that rely on water from rivers and aquifers are affected by climate change.

These volumes are assumed to gradually decline over time under the long–term average scenario and are assumed to have already declined under the low inflows scenario.

4

Protecting the environment

Moorabool River

The Moorabool River supplies water to Geelong and Ballarat. It is Victoria's most flow–stressed river and currently receives less than half its annual natural flow, and even less in drought years. However, the river still retains some environmental values, particularly in the mid to lower reaches around the She Oaks Weir. These values include native fish of high conservation value, such as blackfish, and areas of significant remnant native vegetation.

The key environmental objectives identified in the Moorabool River are to:

- improve water quality and protect pool habitats during times of low flow
- maintain the relatively intact native vegetation of the river in the mid to lower reaches
- protect multiple threatened plant and animal species (including Australian grayling)

It is estimated that environmental flows would need to be enhanced by about 20,000 ML to meet the scientific environmental flow recommendations. The Moorabool River is highly modified so the management response focuses initially on providing a moderate increase to the environmental flow regime and continuing to invest in complementary habitat works identified in the Regional River Health Strategy. The Government's commitment to enhance environmental flows by 6,000 ML will provide for summer low flows and freshes which are the critical flow components required to achieve the key environmental objectives.

Action 4.8

The Government commits to enhancing environmental flows in the Moorabool River by 6,000 ML by 2015. The benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required.

Table 4.4 Immediate actions to address the environmental water needs of the Moorabool River

Feasibility/Planning | Construction/Implementation | Water Available

	Timing of implementation and volume of water provided (ML/year)										
Interconnections	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.8a The Corangamite Catchment Management Authority will work with the EPA, Southern Rural Water and quarry managers to change the licence discharge conditions for the Fyansford quarry so that the treated groundwater discharge is redirected to the lower Moorabool River.	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	**3,000**	**2,800**	**2,300**
Action 4.8b Following the completion of major augmentation options for Geelong and Ballarat, the Government will transfer part of the water authorities' water entitlements in the west and lower Moorabool catchments to the environment.				1,000	1,000	1,000	1,000	1,000	**2,500**	**2,300**	**1,900**
Action 4.8c The Department of Sustainability and Environment and Corangamite Catchment Management Authority will implement a voluntary buy–back scheme for unregulated surface water diversion licences in selected areas of the Moorabool catchment to retire the licences and transfer the water to the environment.				500	500	500	500	500	**500**	**500**	**500**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
	3,000	3,000	3,000	4,500	4,500	4,500	4,500	4,500	**6,000**	**5,600**	**4,700**

To provide the full 20,000 ML would require consumptive use to be reduced by about one third. This reduction could not be achieved without severely compromising urban supplies to Geelong and Ballarat and downstream farmers who extract water directly from the river.

Several water recovery options could be implemented in the medium to long–term to provide additional environmental flows for the Moorabool River. These options (outlined in Table 4.5) will be further investigated in the Strategy review.

Table 4.5 Potential future options to provide additional water for the Moorabool River

Future water recovery options	Volume
Further transfer to the environment of part of the entitlements of Barwon Water and/or Central Highlands Water in the west and lower Moorabool catchments (assumes Geelong and/or Ballarat have suitable replacement supplies, for example from the Newlingrook or Waranga connections)	5,000 ML
Transfer to the environment of part of Barwon Water's entitlement in the west and lower Moorabool catchments (assumes Geelong has suitable replacement supplies via augmentation of supply from Jan Juc aquifer)	2,500 ML
Transfer to the environment of part of Central Highlands Water's entitlement in the west and lower Moorabool catchments (assumes Ballarat has suitable replacement supplies due to the substitution of potable water with treated recycled water from Ballarat South Treatment Plant)	4,500 ML
Transfer part of Barwon Water's water entitlement in the west and lower Moorabool catchments to the environment (assumes Geelong has suitable replacement supplies due to the substitution of potable water with treated recycled water from Black Rock Treatment Plant)	2,000 ML

Goulburn River

The Goulburn River, associated with the Waranga Channel, is also a flow–stressed river system. The interconnection from the Goulburn system to Ballarat will not aggravate the stress on this river system. No additional water will be taken from the Goulburn River's environmental flows as a result of this interconnection.
Central Highlands Water will purchase water from willing sellers which is already allocated. Potential water recovery options for environmental flows in the Goulburn River system will be considered in the Northern Region Sustainable Water Strategy.

4

Greater Geelong

Water for Geelong comes from the East and West Moorabool rivers, the Barwon River and the Barwon Downs groundwater system.

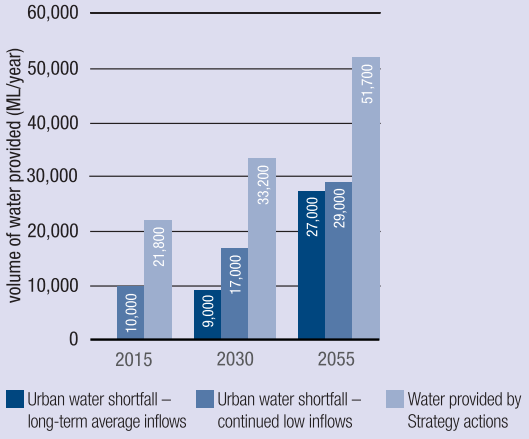
The system can currently supply 43,000 ML a year assuming long–term average inflows and 29,000 ML a year assuming continued low inflows. Current (unrestricted) demand is estimated to be 37,000 ML a year.

The population of Greater Geelong is forecast to increase from its current level of 246,000 to 314,000 by 2030 and to 371,000 by 2055.

Figure 4.3 Map of Greater Geelong

The challenges and solutions

The chart below shows the expected shortfalls in Geelong's urban water supply and the water that will be provided by the actions in this Strategy. The dark blue bars show the shortfalls based on long–term averages of rainfall and inflows to reservoirs. The mid–blue bars show the shortfalls that might be expected if the low inflows of the past 10 years continue. The Strategy provides an action plan to secure water under both of these scenarios. The light blue bars show the water provided by the Strategy actions.



Immediate actions in response to low inflows (and volumes provided)

- Conservation and efficiency programs for homes, industry and the water distribution system to begin immediately (~7,000ML by 2015)
- Bring forward the upgrade on the Barwon Downs bore fields to provide 2,000 ML by mid 2007 and a further 8,000 by mid 2008 consistent with the existing groundwater licence to boost drought contingency supplies.
- Recycled water for use at the Shell refinery by 2010 (2,000 ML)
- Groundwater from Jan Juc deep aquifer available by 2011 (7,000 ML)
- Reinstatement of Dewing Creek connection to be completed by 2012 (700 ML)
- Feasibility study of Newlingrook aquifer and Melbourne interconnection to allow decision and construction by 2015 (5,000 ML initially).

What if inflows return to average conditions?

Conservation and recycling initiatives would continue. The volume accessed from the Jan Juc deep aquifer could be varied as required. Construction of the Newlingrook aquifer or Melbourne connection could be deferred until required.

Planning using long–term averages

Estimates of Geelong's future water supply and use are based on averages of the past 50–100 years of inflows to reservoirs, with population growth as outlined on the opposite page. A gradual reduction in supply (over 50 years) is expected as a result of medium climate change. Under this scenario, the expected decline in inflows to Geelong's reservoirs is 13 per cent by 2030 and approximately 28 per cent by 2055.

Planning for continued low inflows

However, over the past 10 years, inflows to Geelong's reservoirs have been 33 per cent less than the long–term average.

The reduced inflows mean that reliability of water supplies is reduced. Target reliability for Geelong's supplies is 95 per cent (ie. restrictions in place no more than five per cent of the time). The modelling results in Table 4.6 show that if low inflows continue, restrictions could be necessary 25 per cent of the time, sometimes at Stage 3 and 4 level.

Table 4.6 Time (as a percentage) Greater Geelong would spend under restrictions under a continued low inflow scenario

Stage 1	Stage 2	Stage 3	Stage 4	TOTAL
10%	7%	3%	5%	25%

Shortfalls

In order to maintain reliability at 95 per cent with either average inflows or continued low inflows, it will be necessary to secure additional water. Table 4.7 shows the modelled volumes of water that could be needed (ie. the expected "shortfalls") for both long–term average conditions and continuing low inflow conditions. Immediate actions to address these shortfalls are described below.

Immediate actions in response to low inflows

As a result of low inflow conditions and associated low storage levels, restrictions have been in place on and off over the past several years in Geelong. If low inflows continue, an additional 4,500 ML of water would be required over the next two to three years, increasing to 10,000 ML by 2015.

In comparison, based on long–term averages of inflows, Geelong has a surplus of water available for urban use until about 2015. These shortfalls have been calculated on the basis that Geelong retains its share of Lal Lal Reservoir rather than it being transferred to Ballarat. This is possible because the immediate actions for Ballarat will secure sufficient supplies for its needs.

A range of immediate and contingency actions will provide almost 22,000 ML by 2015 in order to meet these shortfalls and provide a buffer supply of water.

Augmenting supplies

Barwon Water operates the Barwon Downs bore field which has not been developed to its full potenital under the groundwater licence issued to it in 2004. The licence allows Barwon Water to take up to 55 ML a day and 80,000 ML over 10 years. The works currently in place can provide about 35 ML a day. Works will start immediately to develop the bore field to its full potential. This involves upgrading pipeworks by mid 2007 to increase the daily extraction rate to about 40 ML a day and then adding two extra bores to provide for the full 55 ML a day extraction rate. These works will increase supplies from the bore field during dry conditions by 2,000 ML a year by mid 2007 and 8,000 ML a year by mid 2008.

The Government will grant Barwon Water an entitlement for the Jan Juc deep aquifer, subject to a feasibility study and business case. This option was scoped in some detail in the mid 1990s but did not proceed due to storage levels improving. The Jan Juc aquifer is relatively close to Geelong and easements exist for a connection. There is potentially up to 7,000 ML available, and confidence in these volumes is high as the aquifer has very little interaction with surface water systems. A feasibility study and bore trial will be conducted over the next two years and pending this outcome, a business case will be completed. Construction would take about two years, with water available for Geelong from summer 2010/2011.

Increased supply from the Gellibrand River is not a preferred option due to the associated environmental impacts. The Jan Juc aquifer has been assessed as a better option because it has less environmental impact. It also has the advantage that it provides additional storage capacity as well as additional water supplies.

In addition to the Jan Juc deep aquifer, the reinstatement of the Dewing Creek diversion by 2012 will increase Geelong's supplies by about 700 ML.

Table 4.7 Expected shortfalls for urban use in Geelong

	Now	2015	2030	2055
Long–term average conditions: Long–term average streamflow and gradual medium climate change impacts. Includes population growth.	9,500 ML surplus	1,000 ML surplus	–9,000 ML	–27,000 ML
Continuing low inflow conditions: Last 10 years of streamflow with effective step change now, which is equivalent to medium to high climate change. Includes population growth.	–4,500 ML	–10,000 ML	–17,000 ML	–29,000 ML

4

Newlingrook aquifer or a Melbourne connection

It would be prudent to implement a large-scale augmentation option for Geelong by 2015. There are two potential options for this: groundwater from Newlingrook aquifer or a connection to Melbourne's supply system.

A detailed feasibility study needs to be carried out on sourcing groundwater from the Newlingrook aquifer. Wannon Water, which supplies water to towns in the South West region, has an existing entitlement of 2,500 ML in Newlingrook aquifer, which is used for drought contingency. Depending on the amount of water available from the aquifer, it may be possible to augment Barwon Water's supplies and also further supplement supplies to towns in the South West region.

The Newlingrook aquifer is thought to provide flows to the Gellibrand River. The feasibility study will need to determine the sustainable yield of the aquifer and how to avoid unacceptable impacts on the Gellibrand River. It will also need to examine the various environmental issues associated with accessing the water and piping it to Barwon Water's storages.

Scientific tests need to be carried out on the availability of water in the Newlingrook aquifer for extraction and the effect of extraction on surface water, including the Gellibrand River. It is expected that two years would be needed to carry out these tests properly. At the completion of these tests and after completing a feasibility study, a decision to proceed with the Newlingrook aquifer could be made in 2009. Water could potentially be supplied by 2015. As the Newlingrook aquifer is potentially a new source of water, the Government would prefer this to a Melbourne connection that would place additional pressure on the Yarra and Thomson supplies. However, if the Newlingrook aquifer is unable to viably provide the additional water, then it would be necessary to link Geelong to Melbourne's system.

The Government commits to work with Barwon Water to immediately begin further work on the Newlingrook aquifer and Melbourne connection options, so that a decision on the most cost–effective and appropriate option can by made by 2009. This will ensure water is available by 2015. A Melbourne connection could be constructed by 2012 if necessary.

If desalination is selected as a large–scale augmentation solution for Melbourne and the desalination plant is located to the west of Melbourne, this could also be considered as an alternative water supply for Geelong.

Conservation and efficiency

Conservation and efficiency actions remain an important focus for Greater Geelong. Barwon Water will implement a range of conservation and efficiency programs in order to meet its new targets.

These targets mean total water use will need to be reduced from 394 litres of water per person per day (current use) to 348 litres by 2015 and 325 litres by 2020. This reduction will likely result in water savings of about 7,000 ML per year by 2015.

Action 4.9

The Government requires Barwon Water to work with its customers to achieve a 25 per cent reduction in total per capita water use for Geelong by 2015, increasing to 30 per cent by 2020. The basis of comparision is the 1990's average water use.

It is expected that the reduction in residential water use (ie. in and around the home) will match the reduction in total water use.

To help meet the target to reduce total per capita water use, the metropolitan Pathways to Sustainability program will be expanded to target all commercial and industrial customers in the Central Region that use more than 10 ML a year (see Action 3.13 in Chapter 3). This program encourages these users to develop plans to voluntarily reduce their water use.

In addition, the Wurdee Buloc Inlet Channel and the Ballan Channel will be lined to reduce system losses. Covering some of the reservoirs service basins will reduce evaporation and also improve the quality of drinking water, providing public health benefits.

Reuse and recycling initiatives

Barwon Water will continue to work with Shell Australia to develop a Northern Water Reclamation Plant in Geelong to enable recycled water to be supplied to the Shell Refinery. This option would free up about 2,000 ML per year of drinking water by 2010. Further expansion of the plant in the medium term could free up additional drinking water for northern Geelong.

In addition, Barwon Water will also pursue aquifer storage and recovery as a method for recharging groundwater aquifers with recycled water from the Black Rock treatment plant for later extraction and use. An initial trial in the upper Jan Juc aquifer will be in operation by 2012, provided all technical and regulatory issues have been addressed. If the trial is successful, an initial volume of 2,700 ML could be used by 2030 for substitution of river water by industry. This could be increased as required to 12,500 ML per year or more.

What if inflows return to average condition?

Annual reviews of water availability and actual use compared to the forecasts will be undertaken. If the reviews show that inflows have returned to more average conditions, the timing and volumes of actions will be reconsidered.

This may include decreasing the volume of water extracted from the Jan Juc deep aquifer and deferring the implementation of the Newlingrook aquifer or Melbourne connection until required.

Major augmentation options for Geelong may also need to be reviewed in the event that a desalination plant is built for Melbourne to the west of the city, as this source could also potentially be utilised by Barwon Water customers.

Table 4.8 Immediate actions to address the urban water needs of Greater Geelong

Feasibility/Planning | Construction/Implementation | Water Available

Timing of implementation and volume of water provided (ML/year)											
Conservation and efficiency	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.10 Barwon Water will implement a range of conservation and efficiency measures within the residential sector (homes) and non–residential sector in order to meet its new conservation targets.*	800	1,600	2,300	3,100	3,900	4,700	5,500	6,200	**7,000**	**10,700**	**13,400**
Action 4.11 Barwon Water will line the Wurdee Boluc Inlet Channel and Ballan Channel.	100	100	100	100	100	100	100	100	**100**	**100**	**100**
Alternative supplies	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.12 Barwon Water will work with Shell Australia to substitute river water with recycled water at its Geelong refinery for use on–site.				2,000	2,000	2,000	2,000	2,000	**2,000**	**2,000**	**2,000**
Action 4.13 Barwon Water and Southern Rural Water will conduct an initial trial of aquifer storage and recovery. The trial will begin in 2012. If successful, water will be available for substitution of river water by industry in the medium term. The amount of treated recycled water injected into the aquifer will be increased over time.										**2,700**	**12,500**
Interconnections	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.14 Barwon Water will undertake a detailed feasibility and design study of accessing a new groundwater source at Newlingrook aquifer and the possible connection from Melbourne to Geelong. A decision will be made by 2009 to ensure water is available by 2015. If inflows return to average conditions, this could be deferred until the medium term.									**5,000**	**10,000**	**16,000**
Augmentations	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.15 The Government will grant Barwon Water an entitlement for the use of the Jan Juc deep aquifer, subject to a feasibility study and business case. If inflows return to average conditions, the volume extracted can be varied as necessary.					7,000	7,000	7,000	7,000	**7,000**	**7,000**	**7,000**
Action 4.16 Barwon Water will reinstate the Dewing Creek diversion into the Wurdee Boluc Inlet Channel.					700	700	700	700	**700**	**700**	**700**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Total Volume provided by options	900	1,700	2,400	5,200	13,700	14,500	15,300	16,000	**21,800**	**33,200**	**51,700**

* If population growth is different from what has been assumed, the volumes of water savings resulting from meeting Barwon Water's conservation targets will differ.

Note: Bringing forward the full development of the Barwon Downs bore field was included in the baseline and therefore is not included above.

The water supplied by many of the conservation and efficiency actions increases as more of the measures are taken up over time. In contrast, the actions that rely on water from rivers and aquifers are affected by climate change. These volumes are assumed to gradually decline over time under the long–term average and are assumed to have already declined under the low inflows scenario.

4

Protecting the environment

The major rivers in the Barwon area are the Barwon/Leigh, the Moorabool and the Gellibrand.

Barwon River

The Barwon River is in primarily moderate condition. The key environmental objectives that have been identified for the Barwon River are:

- improvement of water quality and instream habitat
- protection of Lake Connewarre
- protection of Australian grayling, dwarf galaxias and Yarra pygmy perch
- achieve diverse plant communities (river red gums to salt marsh communities)
- achieve intact riparian zone through Leigh Gorge, billabongs on mid Barwon and lower Leigh Rivers.

The Government commits to providing the full 4,700 ML of environmental flows required to meet the scientific recommendations for the Barwon River. These additional flows will provide the critical flow components required to sustain key environmental values in the river. This includes winter low flows below the West Barwon Reservoir to provide habitat for small threatened native fish, and summer low flows in the lower Barwon River to improve water quality.

Action 4.17

The Government commits to enhancing environmental flows in the Barwon River by 4,700 ML by 2015 to meet the scientific flow recommendations. The benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required.

As the environmental flow recommendations will be met by the above actions, additional options for further increasing the environmental flows are not considered at this time. However, the benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required.

Moorabool River

Commitments to enhancing the environmental flow regime of the Moorabool River are described in the Greater Ballarat section of the Strategy.

Tablw 4.9 Immediate actions to address the environmental water needs of the Barwon River

Feasibility/Planning | Construction/Implementation | Water Available

Interconnections	Timing of implementation and volume of water provided (ML/year)										
	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.17a Corangamite CMA and Central Highlands Water will work together to ensure that part of the discharge from the South Ballarat Treatment Plant continues to be released for environmental flows in the Leigh/Barwon rivers.	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	**2,000**	**2,000**	**2,000**
Action 4.17b Following the completion of major augmentation options for Geelong, the Government will transfer part of Barwon Water's water entitlements in the West Barwon Reservoir to the environment.									**1,000**	**900**	**800**
Conferred benefits from Action 3.9 Benefits to Barwon River (that are not double counted with Moorabool River) from changing the licence discharge conditions for the Fyansford quarry so that the treated groundwater discharge is redirected to enter in the lower Moorabool River.	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	**1,700**	**1,600**	**1,300**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	**4,700**	**4,500**	**4,100**

Gellibrand River

The Gellibrand River is in good condition in the upper reaches but its condition is poorer in lower reaches. The management response for the Gellibrand River is to protect the current flow regime and environmental health given it is already in good condition.

The Government will protect the ecological integrity of the Gellibrand River by ensuring that any development that occurs is consistent with environmental needs.

4

Inner West

The Inner West gets most of its water from the Werribee and Maribyrnong river basins and also the Thomson and Yarra Rivers via a connection to the Melbourne water supply system.

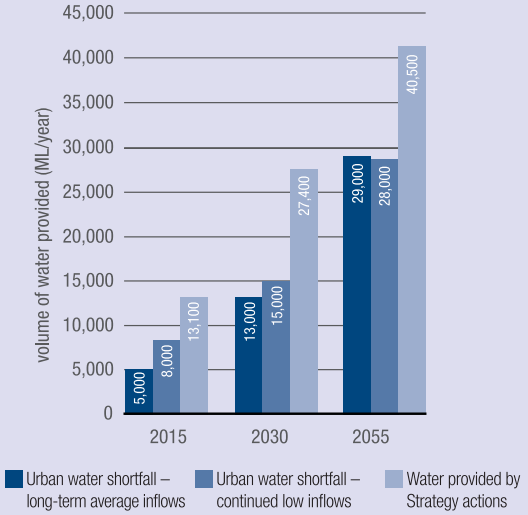
The system can currently supply 17,000 ML a year assuming long–term average inflows and 13,000 ML a year assuming continued low inflows. Current (unrestricted) demand is estimated to be 14,000 ML a year.

The population of the Inner West is forecast to increase from its current level of 124,000 to 226,000 by 2030 and to 336,000 by 2055.

Figure 4.4 Map of Inner West

The challenges and solutions

The chart below shows the expected shortfalls in the Inner West's urban water supply and the water that will be provided by the actions in this Strategy. The dark blue bars show the shortfalls based on long–term averages of rainfall and inflows to reservoirs.



The mid–blue bars show the shortfalls that might be expected if the low inflows of the past 10 years continue. The Strategy provides an action plan to secure water under both of these scenarios. The light blue bars show the water provided by the Strategy actions.

Immediate actions in response to low inflows (and volumes provided)

- Conservation and efficiency programs for homes, businesses and within the distribution system to start immediately (3,500 ML by 2015)
- Increased supply from Melbourne (5,000 ML initially)
- A range of minor augmentations progressively implemented between 2007 and 2015 (900 ML)
- Use of recycled water for non–potable supplies (1,800 ML by 2015)

What if inflows return to average conditions?

Conservation and recycling initiatives would continue. The volume required from the Melbourne system could be varied as required.

Planning using long–term averages

Estimates of the Inner West's future water supply and use are based on averages of the past 50–100 years of inflows to reservoirs, with population growth as outlined on the opposite page. A gradual reduction in supply (over 50 years) is expected as a result of medium climate change. Under this scenario, the expected decline in inflows to the Inner West's reservoirs is 13 per cent by 2030 and approximately 28 per cent by 2055.

Planning for continued low inflows

However, over the past 10 years, inflows to the Inner West's reservoirs have been 33 per cent less than the long–term average.

The reduced inflows mean that reliability of water supplies is reduced. Target reliability for the Inner West's supplies is 95 per cent (ie. restrictions in place no more than five per cent of the time). The modelling results in Table 4.10 show that if low inflows continue, restrictions could be necessary 18 per cent of the time, sometimes at Stage 3 and 4 level.

Table 4.10 Time (as percentage) the Inner West would spend under restrictions under a continued low inflow scenario

Stage 1	Stage 2	Stage 3	Stage 4	TOTAL
5%	6%	5%	2%	18%

Note: Rules exist in the current supply agreement between Melbourne Water and Western Water that Western Water's customers receiving water via the Melbourne system will be subject to the same level of restrictions as Melbourne customers.

Shortfalls

In order to maintain reliability at 95 per cent with either average inflows or continued low inflows, it will be necessary to secure additional water. Table 4.11 shows the modelled volumes of water that could be needed (ie. the expected "shortfalls") for both long–term average conditions and continuing low inflow conditions. Immediate actions to address these shortfalls are described below.

Immediate actions in response to low inflows

If low inflows continue, the Inner West will need an extra 3,300 ML of water in the next two to three years, increasing to 8,000 ML by 2015. In comparison, based on long–term average inflows, the Inner West currently has a surplus of water and requires only 5,000 ML in 2015.

A range of immediate contingency and ongoing actions are outlined below to provide over 13,000 ML of water in 2015 – enough to meet the shortfalls under either of these scenarios and provide a buffer supply of water.

Augmenting supplies

If low inflow conditions continue, it is likely that a further upgrade to the existing infrastructure connecting the Inner West to the Melbourne supply system will be necessary. This will allow Western Water to purchase additional water entitlements from the Melbourne pool – providing an extra 5,000 ML initially, increasing to 7,000 ML by 2013 and 10,000 ML in the long–term.

Depending on future inflow conditions, the transfer of 50 per cent of the unallocated inflows (about 600 ML on average) in Lake Merrimu could add to supplies.

A range of minor augmentations will also be progressively implemented between now and 2015. These augmentations include the use of groundwater and increased storage capacity for Romsey and Lancefield, and the purchase of entitlements from Pykes Creek Reservoir to ensure sufficient supply for Myrniong and Bacchus Marsh. Collectively, these actions will provide about 250 ML a year by 2015, securing supplies for some of the Inner West's smaller systems.

Conservation and efficiency

Water sourced from Melbourne involves pumping long distances and is therefore costly compared with local sources. Conservation and efficiency measures will help to maximise the use of local sources rather than relying on water from the Melbourne system. Western Water will implement a range of conservation and efficiency programs in order to achieve its new conservation targets.

Table 4.11 Expected shortfalls for urban use in the Inner West [8]

	Now	2015	2030	2055
Long–term average conditions: Long–term average streamflow and gradual medium climate change impacts. Includes population growth.	3,000 ML surplus	–5,000 ML	–13,000 ML	–29,000 ML
Continuing low inflow conditions: Last 10 years of streamflow with effective step change now, which is equivalent to medium to high climate change.	–3,300 ML	–8,000 ML	–15,000 ML	–28,000 ML

4

Action 4.18

The Government requires Western Water to work with its customers to achieve a 25 per cent reduction in total per capita water use for the Inner West by 2015, increasing to 30 per cent by 2020. The basis of comparision is the 1990's average water use.

These targets mean total water use will need to be reduced from 373 litres of water per person per day (1990s use) to 280 litres by 2015 and 261 litres by 2020. This reduction will likely result in water savings of about 3,500 ML per year by 2015. It is expected that the reduction in residential water use (ie. in and around the home) will match the reduction in total water use.

In order to help meet the total conservation target, the metropolitan Pathways to Sustainability program will be expanded to target all commercial and industrial customers in the Central Region that use more than 10 ML a year (see Action 3.13 in Chapter 3). This program encourages these users to develop plans and voluntarily reduce their water use.

Recycled water

Western Water currently provides 88 per cent of the recycled water available from its local treatment plants to regional agribusinesses, councils and recreational users. By utilising all available recycled water from the existing plants for substitution of drinking water, Western Water will free up a further 240 ML by 2015. This could be increased to 800 ML in the long–term, as more effluent is directed to the plants for treatment.

Recycled water will be a valuable resource for the Inner West in the medium to long term with the potential to free up an additional 20,000 ML of drinking water by 2055. A portion of this could also be available to the environment. There are several ways this water could be provided.

The Werribee Irrigation District and the Bacchus Marsh Irrigation District have combined total average diversions of approximately 20,000 ML from the Werribee River system. Currently, it is not cost effective to supply Bacchus Marsh Irrigation District with recycled water from the Western Treatment Plant. However, in the future it may be possible to substitute these irrigation diversions with cost-effective, fit for purpose recycled water, freeing up significant quantities of drinking water.

While this is currently a relatively high cost option, the Government will continue to encourage the substitution of drinking water with fit for purpose recycled water to irrigators in the Werribee catchment, as highlighted in Chapter 3.

The capacity to supply irrigators' water right with recycled water would be subject to existing commitments from the Western Treatment Plant being maintained and suitable agreements between stakeholders.

Recycled water from Surbiton Park could be provided to new residential and commercial developments in Eynesbury township and Melton South. The latter is subject to a successful business case for funding of a new regional Class A recycled water plant. Class A recycled water would be delivered via a new dual pipe system for use in the toilet, domestic gardens, for fire services and the irrigation of public open spaces and recreation areas. All recycled water supplied will be a direct substitute for drinking water supplied for non–drinking uses to service the growth in the Inner West region.

What if inflows return to average conditions?

Annual reviews of water availability and actual use compared to the forecasts will be undertaken. If the reviews show that inflows have returned to more average conditions, the timing and volumes of actions will be reconsidered.

For the Inner West, this may mean decreasing the volume of water supplied by the Melbourne system as required.

Table 4.12 Immediate actions to address the urban water needs of the Inner West

Feasibility/Planning | Construction/Implementation | Water Available

Timing of implementation and volume of water provided (ML/year)

Conservation and efficiency	2007	2008	2009	2010	2011	2012	2013	2014	2015	2030	2055
Action 4.19 Western Water will implement a range of conservation and efficiency measures within the residential sector (homes) and non–residential sector in order to meet its new conservation targets.*	400	800	1,00	1,500	1,900	2,300	2,600	3,100	**3,500**	**6,500**	**9,600**
Alternative supplies	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.20 Western Water will develop opportunities for substitution of treated recycled water from Surbiton Park for non–potable uses in new residential and commercial developments in Eynesbury and Melton South.	240	260	450	630	800	970	1,150	1,330	**1,510**	**4,070**	**4,220**
Action 4.21 Western Water will increase the use of recycled water from local treatment plants in the Inner West for non–consumptive purposes.				120	120	120	240	240	**240**	**420**	**800**
Action 4.22 The Government will work with Melbourne Water and Southern Rural Water to continue to investigate technological advances and opportunities for substituting water requirements with recycled water in irrigation areas in the Werribee catchment.										**8,500**	**15,000**
Interconnections	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.23 Western Water will upgrade the existing infrastructure connecting the Inner West to the Melbourne supply system and purchase additional water rights from the Melbourne pool.			5,000	5,000	5,000	5,000	7,000	7,000	**7,000**	**7,000**	**10,000**
Augmentations	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.24 The Government will transfer 50 per cent of the unallocated inflows in Lake Merrimu to Western Water for supply to Bacchus Marsh and Melton urban needs.	600	600	600	600	600	600	600	600	**600**	**600**	**600**
Action 4.25 Western Water, Southern Rural Water and the Department of Sustainability and Enviroment will develop a wellfield between Romsey and Lancefield to increase storage capacity.			180	180	180	180	180	180	**180**	**180**	**180**
Action 4.26 Western Water will purchase additional entitlements through the water market from Pykes Creek Reservoir to ensure sufficient supply for Myrniong.			40	40	40	40	40	40	**40**	**40**	**40**
Action 4.27 Western Water will provide increased storage capacity in the Romsey/Lancefield system.			30	30	30	30	30	30	**30**	**30**	**30**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Total volume provided by options	1,200	1,700	7,400	8,100	8,700	9,200	11,800	12,500	**13,100**	**27,400**	**40,500**

* If population growth is different from what has been assumed, the volumes of water savings resulting from meeting Western Water's conservation targets will differ.

The water supplied by many of the conservation and efficiency actions increases as more of the measures are taken up over time. In contrast, the actions that rely on water from rivers and aquifers are affected by climate change. These volumes are assumed to gradually decline over time under the long–term average and are assumed to have already declined under the low inflows scenario.

4

Protecting the environment

Werribee River

The Werribee River has a significantly changed flow regime due to several large in–stream structures throughout the catchment and a significant increase in the number of farm dams. However, some river reaches retain high environmental and social values. The key environmental objectives identified for the Werribee River are to:

- contribute to the protection of multiple threatened plant and animal species (including Australian grayling and tupong)
- improve water quality and fish habitat
- restore estuary and fringing red gums.

It is estimated that environmental flows would need to be increased by an average of 14,500 ML to meet the scientific recommendations. The Werribee River is significantly modified so the management response is to use opportunities to moderately increase the environmental flow and continue investment in complementary habitat works identified in the Regional River Health Strategy.

Action 4.28

The Government commits to enhancing environmental flows in the Werribee River by 6,000 ML by 2015. The benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required.

The Government's commitment to enhance the environmental flow regime of the Werribee River by 6,000 ML will provide for summer low flows for the entire river and freshes year round in the lower parts of the river to improve water quality and the estuary and to protect key plants and animals.

An additional 2,000ML as discussed in *Our Water Our Future* (Action 3.12) will be available for the environment when irrigators in the Werribee Irrigation District fully take up the use of recycled water.

To provide the full 14,500 ML would require consumptive use to be reduced by one third. This could not be achieved without a significant reduction in irrigation activity and without severely compromising urban supplies to Melton and Bacchus Marsh. However, several actions could be implemented in the medium to long term to further enhance the environmental flows of the Werribee River. These options (outlined in Table 4.14) will be further investigated in the Strategy review.

Tablw 4.13 Immediate actions to address the environmental water needs of the Werribee River

Feasibility/Planning | Construction/Implementation | Water Available

Interconnections	Timing of implementation and volume of water provided (ML/year)										
	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.28a Southern Rural Water, the Department of Sustainability and Environment and Melbourne Water will pursue piping the Werribee Irrigation District (to save water that is currently lost through channel leakage) and allocate the water saved for environmental flows in the Werribee River.									**4,000**	**3,600**	**3,000**
Action 4.28b The Department of Sustainability and Environment, Southern Rural Water and Melbourne Water will progressively substitute river water with Class A recycled water from the Western Treatment Plant in the Werribee Tourist Precinct to free up water for environmental flows in the Werribee River.				1,100	1,100	1,100	1,100	1,100	**1,100**	**1,100**	**800**
Action 4.28c The Government will allocate 50 per cent of the currently unallocated inflows in Lake Merrimu to an environmental entitlement for the Werribee River.	900	900	900	900	900	900	900	900	**900**	**760**	**600**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**

Table 4.14 Potential future options to provide additional water for the Werribee River

Future water recovery option	Volume
Transfer of water currently used in the Bacchus Marsh Irrigation District to the Werribee River (assumes Bacchus Marsh irrigators have cost-effective replacement supplies which are of sufficient quality to enable the substitution of river water with recycled water)	4,000 ML
Transfer of water currently used in the Werribee Irrigation District to the Werribee River (assumes Werribee irrigators have suitable replacement supplies of fit for purpose recycled water from Western Treatment Plant)	8,000 ML
Voluntary buy–back scheme for regulated diversion licences and transfer of the water as an environmental entitlement for the Werribee River	1,000 ML

Maribyrnong River

The Maribyrnong River and tributaries support significant environmental and social values. The condition of the catchment varies from moderate in the upper reaches to moderate to poor in the middle and lower reaches. Much of the Maribyrnong River and its tributaries remain unregulated (that is, flows are not supplied via a dam or weir). However, Jacksons Creek is the most flow–stressed creek in the system as a result of water being captured in Rosslynne Reservoir in its headwaters. Deep Creek, which is a large ephemeral tributary of the Maribyrnong River, is in moderate to poor condition.

The key environmental objectives identified in the Maribyrnong River are to improve baseflows, freshes and high flows and reduce water quality risks in Jacksons Creek

It is estimated that environmental flows would need to be increased by an average of 6,900 ML to meet the scientific recommendations. The Maribyrnong River is highly modified so the initial focus is to provide a moderate increase to the current flow. Investment in complementary habitat works identified in the Regional River Health Strategy will also continue.

The Government's commitment to enhance the environmental flow regime of the river by 3,000 ML will provide for improved freshes in Jacksons Creek to ensure water quality and habitat in pools remain adequate.

Action 4.29

The Government commits to enhancing environmental flows in the Maribyrnong River by 3,000 ML by 2015. The benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required.

4

Table 4.15 Immediate actions to address the environmental water needs of the Maribyrnong River

Feasibility/Planning | Construction/Implementation | Water Available

Interconnections	Timing of implementation and volume of water provided (ML/year)										
	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.29a The Government will transfer part of Western Water's Rosslynne Reservoir entitlement to the environment – after water is purchased from the Melbourne system for Western Water's urban needs.				2,050	2,050	2,050	2,050	2,050	**2,050**	**1,900**	**1,500**
Action 4.29b The Government and Melbourne Water will implement a voluntary buy–back scheme for unregulated surface water diversion licences in selected areas of the Maribyrnong catchment and regulated diversion licences on Jacksons Creek to retire the licences and transfer the water to the environment.				700	700	700	700	700	**700**	**700**	**700**
Action 4.29c The Government will transfer part of Western Water's Barringo Creek entitlement to the environment – after additional water is secured from the Melbourne system for Western Water's urban needs.				250	250	250	250	250	**250**	**200**	**200**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
				3,000	3,000	3,000	3,000	3,000	**3,000**	**2,800**	**2,400**

The rest of the 6,900 ML (3,900 ML) of water from the scientific environmental flow recommendations would be used to provide winter baseflows and winter freshes in Jacksons Creek below Rosslynne Reservoir and would also help to protect all natural high flow events, to help meet the recommended flow requirements. However, this volume of water could not be provided without severely compromising urban supplies to Gisborne, Sunbury and surrounding areas.

Several water recovery options could be implemented in the medium to long term to provide additional environmental flows for the Maribyrnong River. These options (outlined in Table 4.16) will be further investigated in the Strategy review.

Table 4.16 Potential future options to provide additional water for the Maribyrnong River

Future water recovery options	Volume
Voluntary buy–back scheme for regulated diversion licences and transfer of the water to an environmental entitlement for the Maribyrnong River	500 ML
Transfer of Keilor irrigator entitlements (assumes substitution with urban stormwater or recycled water for irrigation)	800 ML
Further transfer of Western Water entitlement (assumes additional water secured from the Melbourne system for Western Water to pump to Sunbury)	2600 ML

4

Greater Melbourne

Melbourne's water comes from the Yarra River, Tarago River and Thomson River within the region and Silver and Wallaby Creeks located in northern Victoria.

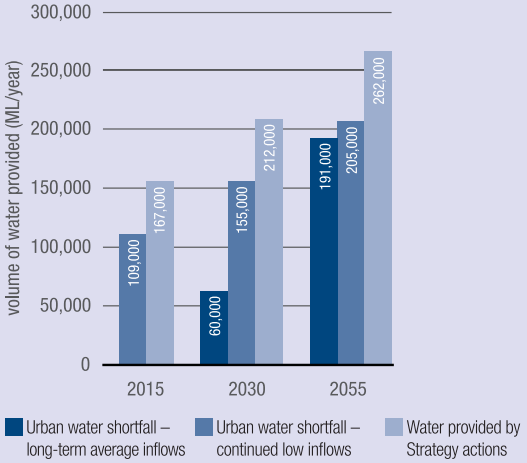
The system can currently supply 555,000 ML a year assuming long–term average inflows and 395,000 ML a year assuming continued low inflows. Current (unrestricted) demand is estimated to be 484,000 ML a year.

The population of Greater Melbourne is forecast to increase from its current level of 3.6 million to 4.4 million by 2030 and to 4.7 million by 2055.

Figure 4.5 Map of Greater Melbourne

The challenges and solutions

The chart below shows the expected shortfalls in Melbourne's urban water supply and the water that will be provided by the actions in this Strategy. The dark blue bars show the shortfalls based on long–term averages of rainfall and inflows to reservoirs. The mid–blue bars show the shortfalls that might be expected if the low inflows of the past 10 years continue. The Strategy provides an action plan to secure water under both of these scenarios. The light blue bars show the water provided by the Strategy actions.



Immediate actions in response to low inflows (and volumes provided)

- Accelerated conservation and efficiency programs for homes, businesses and within the distribution system, including maintaining existing water savings – to start immediately (79,000 ML by 2015)
- Local reuse and recycling initiatives (at least 6,200 ML by 2015) – this is in addition to existing commitments (3,500 ML)
- Investment in irrigation system efficiencies in the Yarra basin by 2010 (1,500 ML)
- Reconnect Tarago Reservoir by 2010 (up to 21,000 ML – previous commitment so already included in baseline)
- Upgrade the Eastern Treatment Plant to Class A standard by 2012
- Business cases for Eastern Water Recycling Proposal, desalination and stormwater options to enable decision and construction by 2015 (80,000 ML initially)

What if inflows return to average conditions?

Conservation and recycling initiatives would continue. The large scale augmentation (Eastern Water Recycling Proposal, desalination or stormwater) could be deferred until required.

As part of this Strategy, the Government has established a total average annual cap of 555,000 ML for urban consumption in Melbourne from the Yarra and Thomson Rivers and as the Silvan and Wallaby Creeks. This includes the granting of bulk entitlements for an average annual cap of 400,000 ML per year for urban use from the Yarra River. The cap puts a limit on how much water Melbourne can take from rivers to meet its future needs. Where interconnections to other systems are made, transfer volumes will be included in this cap. Melbourne will need to look at conservation and alternative supplies for future needs.

Planning using long–term averages

Estimates of Melbourne's future water supply and use are based on averages of the past 50–100 years of inflows to reservoirs, with population growth as outlined on the opposite page. A gradual reduction in supply (over 50 years) is expected as a result of medium climate change. Under this scenario, the expected decline in inflows to Melbourne's reservoirs is 11 per cent by 2030 and 23 per cent by 2055.

Planning for continued low inflows

However, over the past 10 years, inflows to Melbourne's reservoirs have been 29 per cent less than the long–term average.

The reduced inflows mean that reliability of water supplies is reduced. Target reliability for Melbourne's supplies is 95 per cent (ie. restrictions in place no more than five per cent of the time). The modelling results in Table 4.17 show that if low inflows continue, restrictions could be necessary 18 per cent of the time, sometimes at Stage 3 and 4 levels.

Table 4.17 Time (as a percentage) Melbourne would spend under restrictions under a continued low inflow scenario

Stage 1	Stage 2	Stage 3	Stage 4	TOTAL
5%	6%	5%	2%	18%

Shortfalls

In order to maintain reliability at 95 per cent with either average inflows or continued low inflows, it will be necessary to secure additional water. Table 4.18 shows the modelled volumes of water that would be needed (ie. the expected "shortfalls") under these two scenarios. Immediate actions to address these shortfalls are described on the next page.

Table 4.18 Expected shortfalls for urban use in the Greater Melbourne [9]

	Now	2015	2030	2055
Long–term average conditions: Long–term average streamflow and gradual medium climate change impacts. Includes population growth.	71,000 ML surplus	38,000 ML surplus	–53,000 ML	–178,000 ML
Long–term average conditions (with potential transfers) Long–term average shortfalls combined with potential transfers to the Inner West and Westernport.	71,000 ML surplus	33,000 ML surplus	–60,000 ML	–191,000 ML
Continuing low inflow conditions: Last 10 years of streamflow with effective step change now, which is equivalent to medium to high climate change. Includes population growth.	–89,000 ML	–100,000 ML	–146,000 ML	–192,000 ML
Continuing low inflow conditions (with potential transfers) Continued low inflow shortfalls combined with potential transfers to the Inner West and Westernport.	–95,000 ML	–109,000 ML	–155,000 ML	–205,000 ML

4

Immediate actions in response to low inflows

If low inflows continue, an additional 95,000 ML of water would be required over the next two to three years, increasing to 109,000 ML by 2015. In comparison, based on long–term average inflows, Melbourne currently has a surplus of water both now and in 2015.

A range of immediate contingency and ongoing actions are outlined below to provide about 167,000 ML of water in 2015 – enough to meet the shortfalls associated with the low inflow scenario and provide a buffer supply of water.

Tarago Reservoir reconnection

The existing infrastructure which connects Tarago Reservoir to the Melbourne water supply system will be reintroduced in 2010, boosting water supplies by about 15,000 ML, or up to 21,000 ML if inflows return to long-term average conditions. This water is already included in Melbourne's available supply as this was a previous commitment from *Our Water Our Future*. The Tarago infrastructure was removed from the system in 1994 because of water quality issues. Before being reintroduced, a water treatment plant will be built. A plan to improve the water quality of flows into the reservoir is also being developed.

Conservation and efficiency

A significant part of Melbourne's expected shortfall can be met by conservation and efficiency measures, including maintaining our existing water savings. However, these measures need to be implemented now to lock in savings for the future. As shown on page 36 in Chapter 3, these actions are extremely cost effective compared with alternatives.

Melbourne accounts for 46 per cent of water used in the Central Region and its efforts to conserve water are critical. Much has already been achieved in Melbourne to build a water conservation culture. In 2002/2003, the metropolitan water authorities set a target to reduce average per capita drinking water consumption in Melbourne by 15 per cent by 2010, compared with the average use in the 1990s. Melburnians are already exceeding this target through water–saving efforts and the introduction of permanent water saving rules. Melbourne's average per capita water consumption (including residential and non–residential) in the 1990s was equivalent to 423 litres per person per day. At present, it is only 331 litres per person per day. This means Melburnians have already achieved a 22 per cent reduction in per capita water consumption since the 1990s.

In light of this, and following advice from the Independent Panel, the water conservation target for Melbourne has been reviewed and extended.

Action 4.30

The Government requires the metropolitan water authorities to work with their customers to achieve a 25 per cent reduction in total per capita water use for Melbourne by 2015, increasing to 30 per cent by 2020. The basis of comparision is the 1990's average water use.

These targets mean total water use will need to be reduced from 331 litres of water per person per day (current use) to 317 litres by 2015 and 296 litres by 2020. It is expected that the reduction in residential water use (ie. in and around the home) will match the reduction in total water use. This would mean residential water use will need to be reduced from 208 litres of water per person per day (current use) to 186 litres by 2015 and 174 litres by 2020.

The metropolitan authorities have developed an accelerated conservation program which could save 79,000 ML by 2015. This would mean achieving the 30 per cent target by 2015 – five years early.

To achieve this, it is necessary for Melburnians to first maintain their conservation behaviour and not revert to pre–drought water use levels. The Government will work to preserve the community's current water use behaviour through continued education campaigns and incentive programs and if necessary through adjustments to the permanent water savings rules or water restrictions. Simply maintaining the excellent water savings already achieved will save 42,000 ML a year by 2015.

Much of the water savings achieved to date may be a result of increased community awareness because of temporary water restrictions. Maintaining these savings without restrictions will be a significant challenge to the community and will require increased commitment from the water authorities. In order to do this, the metropolitan water authorities will maintain existing investment in water conservation programs. If water use does increase, metropolitan water authorities will look to boost investment in programs such as:

- convert conventional gardens to water–efficient gardens – using plants with low water needs and installing water efficiency devices (up to 350,000 gardens over the next nine years)
- work directly with more than 140,000 householders to show them how to save water in their home.

Other conservation actions will be implemented immediately to further increase savings to achieve the targets. Immediate action is essential to build on the current water conservation ethic evident in Melbourne and prevent a decline in community awareness after water restrictions are lifted.

Water authorities will begin work immediately to assist householders to voluntarily:

- install more than 1,000,000 water–efficient showerheads – to save 12,600 ML per year by 2015
- select water-efficient washing machines when buying a new machine (more than 400,000 machines - to save 8,500 ML per year by 2015
- choose water–efficient evaporative air conditioners over those that waste water – by ensuring all evaporative air conditioners on the market are water–efficient, nearly 800 ML will be saved each year by 2015.

Industry will also contribute to achieving Melbourne's 25 per cent water conservation target. Through the Pathways to Sustainability program, the metropolitan water authorities are currently working with the top 200 industrial, commercial and organisational water users to identify and implement water conservation actions. This program will be expanded to target all water users in Melbourne using more than 10 ML a year. This equates to about 1,500 users and will save an additional 5,000 ML a year by 2015.

Furthermore, in meeting the Government's requirement that the non–residential sector reduce its water usage going forward by at least 1 per cent per year, an additional 8,000 ML will be saved by 2015.

The metropolitan water authorities will also work with large water–using sectors where individual businesses may not use large volumes of water but across the sector, significant water savings can be achieved (eg. laundries, open space and hotels).

Although losses from water distribution systems are unavoidable, they can be reduced through good management. Melbourne water authorities lose very little water by international standards and by continuing to manage Melbourne's water distribution system efficiently and reducing leaks, water authorities can save an additional 2,500 ML a year by 2015.

All conservation programs have been developed based on the best available knowledge today, but our knowledge base needs to be improved. During implementation, the water authorities will review progress and performance and adjust the programs if required to ensure that the targeted water savings are achieved.

The Yarra system currently supplies about 20,000 ML to high value irrigation, particularly through the Yarra Valley region. Opportunities exist for the Melbourne water authorities to invest in technologies to improve on–farm efficiencies. This would save about 1,500 ML per year, which could then be used for urban purposes in Melbourne.

Large scale augmentation options

Several large–scale options are available to help meet Melbourne's anticipated shortfall, including:

- use of recycled water for industry through the Eastern Water Recycling Proposal (see Action 3.21)
- use of highly treated stormwater for blending with drinking water, potentially collected at Dight's Falls on the Yarra River – while not currently Government policy, options such as this may be necessary if medium or high climate change occurs (see Action 3.24)
- desalination of seawater for drinking (see Action 3.27)

As outlined in Chapter 3, the Government will work with metropolitan water authorities to complete feasibility studies for desalination and stormwater reuse options, and then proceed to business case unless inappropriate. The Eastern Water Recycling Proposal will proceed immediately to business case as a feasibility study has already been completed.

Business cases will be completed within two years to enable a decision about major augmentation options. This would enable construction to begin for the provision of 80,000 ML of water by 2015 if required. This volume could be increased over time as needed.

4

Reuse and recycling initiatives

Using less water through conservation and efficiency measures is an important action for all community members to take. However, it is also important to reduce our reliance on water from rivers and reservoirs.

Our Water Our Future set a water recycling target for wastewater from Melbourne's treatment plants of 20 per cent by 2010. The Melbourne water businesses have already achieved 14 per cent water recycling and by adding further recycling projects to their current water plans are on track to meet the target. The projects helping to meet this target are outlined in Chapter 2. The water savings from these projects are already included in Melbourne's future water supply as they are existing commitments from the Government's *Our Water Our Future* action plan. Recycling and reuse projects outlined in this Strategy do not duplicate these savings.

In order to provide additional savings, the metropolitan water authorities will work to encourage a range of local water reuse and recycling schemes, including:

- the installation of rainwater tanks in homes for use in the toilet, laundry and garden
- collection of stormwater at a neighbourhood scale for use in the toilet, laundry and garden
- dual pipe systems (in new residential and commercial developments near a recycled water source) to enable recycled water to be used for non–drinking purposes
- emerging opportunities for provision of recycled water for industry
- new urban developments in the municipalities of Hume, Mitchell and Whittlesea, where they are shown to be both cost-effective and environmentally beneficial.

Collectively, these schemes will free up at least 6,200 ML of drinking water by 2015. The Melbourne water authorities will work to increase this volume to at least 10,000 ML by 2030. This is in addition to the 3,500 ML of water provided by local reuse schemes the water authorities have previously committed to, which is already included in Melbourne's available water supply.

The Government will continue to work with Melbourne's water authorities and other key stakeholders such as industry and commercial enterprises to investigate opportunities to deliver an additional 25,000 ML of reuse and recycling by 2055 if cost barriers can be overcome. This will include an analysis of emerging technologies, and consider financial, social and environmental benefits and impacts such as cost, water savings, energy use, water quality impacts and community support. The Growth Areas Authority, local government and the development industry will also be closely consulted.

What if inflows return to average conditions?

Annual reviews of water availability and actual use compared to the forecasts will be undertaken. If the reviews show that inflows have returned to more average conditions, the timing and volumes of actions will be reconsidered.

For Melbourne, this would mean the large scale augmentation (Eastern Water Recycling Proposal, stormwater reuse or desalination) could be deferred until required.

Table 4.19 Immediate actions to address the urban water needs of Greater Melbourne *

Feasibility/Planning | Construction/Implementation | Water Available

Conservation and efficiency	Timing of implementation and volume of water provided (ML/year)										
	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.31 Melbourne water authorities will work to maintain existing water savings by: • converting up to 350,000 conventional gardens to water–efficient gardens – using plants with low water needs and water–efficiency devices • working directly with more than 140,000 householders to show them how to save water in their home.	39,000	40,000	40,000	40,000	41,000	41,000	42,000	42,000	**42,000**	**48,000**	**53,000**
Action 4.32 Melbourne water authorities will implement an accelerated range of voluntary conservation and efficiency programs to create new water savings in the residential sector, including: • water efficient showerhead program (to replace about 1,000,000 showerheads by 2015) • water efficient washing machine program (to replace almost 400,000 machines by 2015) • ensuring all evaporative air conditioners on the market are water–efficient.	600	2,300	4,400	6,900	10,100	13,200	16,200	19,000	**21,900**	**34,600**	**38,600**
Action 4.33 Melbourne water authorities will continue to manage the water distribution system efficiently and reduce leakage.	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	**2,500**	**2,500**	**2,500**
Action 4.34 Melbourne water authorities will expand the Pathways to Sustainability program to all water users within Melbourne that use 10 ML per year or more (approximately 1,500 water users) and implement additional actions to achieve the non–residential target on page 40.	1,400	3,000	4,600	6,000	7,400	8,800	10,200	11,600	**13,000**	**15,700**	**17,000**
Action 4.35 Melbourne water authorities will implement a range of efficiency measures in irrigation systems within the Yarra catchments and transfer the savings to Melbourne's urban supply.				1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Alternative supplies	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.36 Melbourne water authorities will invest in the voluntary uptake of a range of local water recycling and reuse schemes, including rainwater tanks, advanced greywater systems, dual pipe systems for recycled water in new residential and commercial developments and treatment plants for stormwater reuse.	200	400	800	1,200	2,000	3,000	4,000	5,000	**6,200**	**10,000**	**10,000**
Action 4.37 The Government will work with the metropolitan water authorities and stakeholders to investigate opportunities to reuse and recycle 30,000 ML of local water sources for non–drinking purposes within greater Melbourne by 2055.	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Action 4.38 These large scale alternative supply options are described in Chapter 2. Business cases will be completed to enable water to be available by 2015. Options include: • use of recycled water for industry through the Eastern Water Recycling Proposal (see Action 3.21) • desalination of seawater for drinking (see Action 3.24) • use of highly treated stormwater for blending with drinking water (see Action 3.27) If inflows return to average conditions, the construction of this option could be deferred until the medium term.									**80,000**	**100,000**	**140,000**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Total Volume provided by options	43,700	48,200	52,300	58,100	64,500	70,000	76,400	81,600	**167,000**	**212,000**	**262,000**

The water supplied by many of the conservation and efficiency actions increases over time as more of the measures are taken up over time. In contrast, the actions that rely on water from rivers and aquifers are affected by climate change. These volumes are assumed to gradually decline over time under the long–term average and are assumed to have already declined under the low inflows scenario.

4

Protecting the environment

Yarra River

The Yarra River is a Victorian icon with high conservation, social and economic values. A combination of flow and non–flow related issues influence the condition of the Yarra River and its tributaries. The key environmental objectives identified for the Yarra River are to:

- protect assets requiring environmental flows, including the threatened native fish species Australian grayling, Macquarie Perch, river blackfish, mountain galaxias, common galaxias and platypus populations
- scour sediments and fine silts
- flush water in pools to improve water quality and maintain habitat for fish and macroinvertebrate species during times of low flows.

The Government commits to providing the additional flows estimated to be required to meet the scientific environmental flow recommendations in the Yarra River by reducing the cap on entitlements from 420,000 ML per year to 400,000 ML per year. Of this, 17,000 ML per year can be stored and released as needed to maximise environmental benefits. This water will be available from July 2007, however it may be provided in stages from 2007 if restrictions in Melbourne become more severe.

The additional flows will improve the number and duration of fresh and high flow events that provide triggers for Australian grayling spawning, flush sediments from stream beds, freshen pools and inundate wetlands. In addition, the Government will continue to invest in complementary habitat works identified in the Regional River Health Strategy and the upper reaches of the Yarra River will be protected by maintaining the closed water supply catchments.

A lack of overbank flow means that wetlands (eg. Banyule wetlands) are now watered less often. However, it is recognised that overbank flows in urban areas such as the lower Yarra floodplain cannot be reinstated because of impacts on established communities.

Action 4.39

The Government commits to meeting the scientific flow recommendations in the Yarra River by 2007. The benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required.

If required, potential future opportunities to provide additional environmental flows to the Yarra River, above the environmental flow recommendations that have been met under Action 4.39, will be addressed in subsequent iterations of the Strategy.

Tablw 4.20 Immediate actions to address the environmental water needs of the Yarra River

Feasibility/Planning | Construction/Implementation | Water Available

	Timing of implementation and volume of water provided (ML/year)										
Interconnections	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.39a The Government will reduce the cap on entitlements in the Yarra River from 420,000 ML to 400,000 ML in order to meet the scientific flow recommendations. An environmental entitlement of 17,000 ML will be established that can be stored and released as needed to provide operational flexibility to maximise environmental benefits in the Yarra. Melbourne Water will develop, trial and review an operating strategy for use of this entitlement over the next three years.	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	**20,000**	**18,000**	**16,000**
Action 4.40 Melbourne Water will investigate alternative options to provide water to wetlands where it is not possible to provide overbank flows.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	**20,000**	**18,000**	**16,000**

Bunyip/Tarago Rivers

The Bunyip/Tarago Rivers are in moderate condition with sufficient flows to maintain river health as low summer flows are generally provided through irrigation releases to irrigation users downstream.

Action 4.41

The Government commits to enhancing environmental flows in the Tarago/ Bunyip Rivers by 3,000 ML by end 2006. A scientific study is currently underway to inform the development of a preferred environmental flow regime.

An environmental entitlement will be created for the Tarago River. This will provide water for important summer freshes that are required for water quality purposes and for native fish such as the Australian grayling. Increased flows may also provide for channel maintenance.

A scientific study of the environmental flow requirements of the Bunyip/Tarago Rivers is underway to provide additional information about the flows required to protect the rivers' ecological assets. If additional flows are required, further opportunities to provide these will be investigated as part of the Strategy review in seven years.

Bulk entitlements from the Bunyip/Tarago system will be granted to the Melbourne retail water authorities, Gippsland Water and Southern Rural Water. Information from the scientific study will be used to develop water supply system operating rules that optimise environmental benefits. These rules will be incorporated in the legal bulk entitlements orders when bulk entitlements are granted for the Bunyip/Tarago.

Thomson River

Melbourne is also supplied with water from the Thomson Reservoir on the Thomson River. The Thomson River is discussed in the West Gippsland section.

Potential future actions to provide additional water for the Thomson River are also discussed in the West Gippsland section.

Tablw 4.21 Immediate actions to address the environmental water needs of the Yarra River

Feasibility/Planning | Construction/Implementation | Water Available

Timing of implementation and volume of water provided (ML/year)

Interconnections	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.41a The Department of Sustainability and Environment will create an environmental entitlement to enhance the environmental flow regime of the Bunyip/Tarago Rivers.		3,000	3,000	3,000	3,000	3,000	3,000	3,000	**3,000**	**2,900**	**2,600**
Action 4.41b Melbourne Water will conduct a scientific study of the environmental water requirements of the Bunyip/Tarago Rivers and undertake an assessment of flows against those recommended in the study.	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
		3,000	3,000	3,000	3,000	3,000	3,000	3,000	**3,000**	**2,900**	**2,600**

4

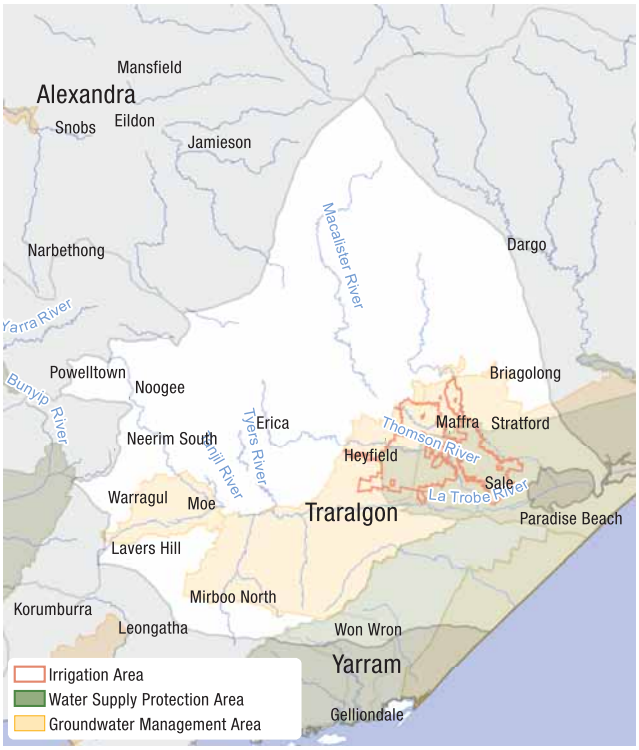
West Gippsland

Important sources of water for West Gippsland are the Tarago River (to supply Warragul and Drouin) and the Tanjil and Tyers Rivers, which are tributaries of the Latrobe River (to supply towns and industry in the Latrobe Valley). The Macalister and Thomson Rivers provide water to the Macalister Irrigation District.

The system can currently supply 71,000 ML a year assuming long–term average inflows and 56,000 ML a year assuming continued low inflows. Current (unrestricted) demand is estimated to be 63,000 ML a year.

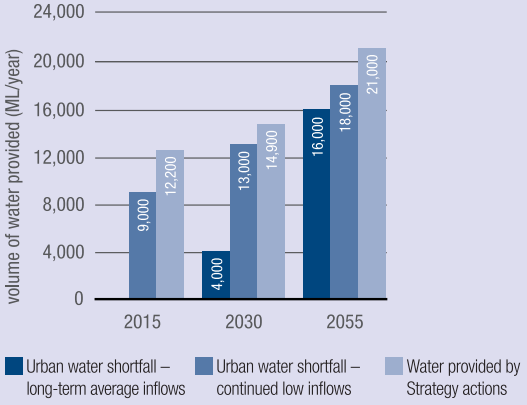
The population of West Gippsland is forecast to increase from its current level of 114,000 to 121,000 by 2030 and by 128,000 by 2055[10].

Figure 4.6 Map of West Gippsland



The challenges and solutions

The chart below shows the expected shortfalls in West Gippsland's urban water supply and the water that will be provided by the actions in this Strategy. The dark blue bars show the shortfalls based on long–term averages of rainfall and inflows to reservoirs. The mid–blue bars show the shortfalls that might be expected if the low inflows of the past 10 years continue. The Strategy provides an action plan to secure water under both of these scenarios. The light blue bars show the water provided by the Strategy actions.



Immediate actions in response to low inflows (and volumes provided)

- Conservation and efficiency programs for homes, businesses and the water distribution system to start immediately (4,100 ML by 2015)
- Stage 1 of the Gippsland Water Factory to be completed by 2010 (3,000 ML)
- Access to water freed up through the Eastern Water Recycling Project by 2015, if business case is successful (5,000 ML). Alternatively, Gippsland Water will investigate implementing Stage 2 of the Gippsland Water Factory and groundwater opportunities.

What if inflows return to average conditions?

Conservation and the Gippsland Water Factory initiatives would continue as planned. The Eastern Water Recycling Proposal (or access to water from an alternative source) could be deferred until the long term.

Planning using long–term averages

Estimates of West Gippsland's future water supply and use are based on averages of the past 50–100 years of inflows to reservoirs, with population growth as outlined on the opposite page. A gradual reduction in supply (over 50 years) is expected as a result of medium climate change. Under this scenario, the expected decline in inflows to West Gippsland's reservoirs is 4 per cent by 2030 and approximately 19 per cent by 2055.

Planning for continued low inflows

Over the past 10 years, inflows to West Gippsland's reservoirs have been 21 per cent less than the long–term average.

The reduced inflows mean that reliability of water supplies is reduced. Target reliability for West Gippsland's water supplies is 95 per cent (ie. restrictions in place for about five per cent of the time). The modelling results in Table 4.22 show that if low inflow conditions continue, restrictions could be necessary 12 per cent of the time, sometimes at Stage 3 and 4 levels.

Table 4.22 Time (as a percentage) West Gippsland would spend under restrictions under a continued low inflow scenario

Stage 1	Stage 2	Stage 3	Stage 4	Total
6%	1%	1%	4%	12%

Shortfalls

In order to maintain reliability at 95 per cent with either average inflows or continued low inflows, it will be necessary to secure additional water. Table 4.23 shows the modelled volumes of water that could be needed (ie. the expected "shortfalls") for both long–term average conditions and continuing low inflow conditions. Immediate actions to address these shortfalls are described below.

Immediate actions in response to low inflows

If low inflows continue, an additional 7,000 ML of water could be required in the next two to three years, increasing to 9,000 ML by 2015. In comparison, based on long–term average inflows, West Gippsland would still have a surplus of water until 2015.

A range of immediate contingency and ongoing actions are outlined to provide over 12,000 ML of water in 2015 – enough to meet the low inflow shortfalls and provide a buffer supply of water.

Conservation and efficiency

Conservation and efficiency remains an important focus for West Gippsland, and Gippsland Water will implement a range of conservation programs. It is expected that these programs will result in water savings of about 4,200 ML per year by 2015.

These will include improving the efficiency of the water distribution system by replacing the existing Blue Rock Reservoir to Moondarra water turbine pump with an electric pump will also assist in meeting this conservation target.

As outlined in Action 3.13, the metropolitan Pathways to Sustainability program will be expanded to target all commercial and industrial customers in the Central Region that use more than 10 ML a year. This program encourages these users to develop plans and voluntarily reduce their water use.

Who: Gippsland Water and Dept. of Sustainability and Environment
Timeframe: 2007

Action 4.42

As part of its water supply demand strategy, Gippsland Water will, in consultation with the Government and stakeholders, establish an appropriate benchmark and refine targets for total water use (see page 39 of Chapter 3).

Who: Gippsland Water and Dept. of Sustainability and Environment
Timeframe: 2007

Action 4.43

Gippsland Water, in consultation with the Government and stakeholders, will develop a separate target for major industry, based on industry best practice.

Table 4.23 Expected shortfalls for urban use in West Gippsland

	Now	2015	2030	2055
Long–term average conditions: Long–term average streamflow and gradual medium climate change impacts. Includes population growth.	8,000 ML surplus	4,000 ML surplus	–4,000 ML	–16,000 ML
Continuing low inflow conditions: Last 10 years of streamflow with effective step change now, which is equivalent to medium to high climate change. Includes population growth.	–7,000 ML	–9,000 ML	–13,000 ML	–18,000 ML

4

Reuse and recycling

The Gippsland Water Factory is a recycling scheme that will enable recycled water from residential and industrial areas to be used for paper manufacturing. Stage 1 of the project recently received Government funding. This will free up 3,000 ML of drinking water for urban use in West Gippsland by 2010.

This Factory could also be a foundation asset for the Eastern Water Recycling Proposal (see Action 3.21 in Chapter 3 for details about how this proposal will be progressed). If implemented, this proposal could free about 9,000 ML of water for urban use in Gippsland. Alternatively, if this option is not implemented, alternative options such as Stage 2 of the Gippsland Water Factory (7,000 ML a year) or groundwater resources could be implemented.

Future groundwater resources

Gippsland Water should continue to investigate alternative supply options.

There are significant groundwater resources in the Latrobe Valley. There are already large volumes of groundwater extracted from the Rosedale and Stratford aquifers as a result of the coal mining activities of the power generators. It is unlikely that additional groundwater could be extracted from these aquifers. However, it is possible that additional groundwater could be taken from the Moe groundwater management area, which has an estimated yield of 8,200 ML, of which about 2,000 ML is already allocated.

What if inflows return to average conditions?

If inflows return to average conditions, the conservation and efficiency and Gippsland Water Factory initiatives will continue as planned. Large scale augmentations would be implemented as needed.

Table 4.24 Immediate actions to address the urban water needs of West Gippsland

Feasibility/Planning | Construction/Implementation | Water Available

	Timing of implementation and volume of water provided (ML/year)										
Conservation and efficiency	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.44 Gippsland Water will implement a range of conservation and efficiency measures within the residential sector (homes), commercial/industrial sector (excluding major industry) and the water distribution system. This includes replacing the water turbine pump from Blue Rock Reservoir to Moondarra with an electric pump.*	460	910	1,370	1,820	2,280	2,730	3,190	3,640	**4,200**	**4,900**	**5,000**
Alternative supplies	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.45 Gippsland Water to complete the Gippsland Water Factory to enable the substitution of river water with recycled water for industry.				3,000	3,000	3,000	3,000	3,000	**3,000**	**3,000**	**3,000**
Action 4.46 Future water available from large scale augmentations, including the Eastern Water Recycling Proposal, Stage 2 of the Gippsland Water Factory or groundwater.				5,000	5,000	5,000	5,000	5,000	**5,000**	**7,000**	**13,000**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Total volume provided by options	500	900	1,400	9,800	10,300	10,700	11,200	11,600	**12,200**	**14,900**	**21,000**

* If population growth is different from what has been assumed, the volumes of water savings resulting from meeting Gippsland Water's conservation targets will differ. These volumes may also vary as a result of the conservation targets that will be set as part of Gippsland Water's water supply demand strategy in 2007.

The water supplied increases from the short term to the long–term for many of the conservation and efficiency actions as more of the measures are taken up over time. In contrast, the actions that rely on water from rivers and aquifers decrease over time as a result of potential climate change impacts.

The power generators

As a result of the privatisation of the power industry, the three major power generating companies in the area have their own entitlements to take water from the Latrobe River, and have not been included in the above urban needs and actions.

Assuming long–term average inflows, the power stations in the Latrobe Valley with bulk water entitlements should have 100 per cent reliability. If low flow conditions continue, modelling indicates the power stations could experience restrictions in supplies.

In order to manage this risk, the power stations should develop water conservation plans, including contingency measures, similar to those developed by the water authorities for managing urban water shortages. The Government will work with the power companies to inform them of the risks associated with a continued low inflow scenario and assist in identifying options to meet their future water needs.

Protecting the environment

Latrobe River

The Latrobe River has significant environmental, social and economic values. The river's condition is good in the upper reaches but poor in the middle and lower reaches due to water extraction. Two major tributaries, the Tanjil River (Blue Rock Reservoir) and Tyers River (Moondarra Reservoir), are also significantly affected by water harvesting.

The key environmental objectives identified for the Latrobe River are increased flows to provide a diverse range of habitats, allow for fish spawning and prevent build–up of sediment in the river channel, particularly in the five to 10 kilometres below the Blue Rock Reservoir. The lower Latrobe has been heavily channelised in the past. The reinstatement of the original river meanders will change the volumes required to reinstate the flow components. As a result of technical uncertainties in the environmental flow study, a review has been completed by an independent Technical Audit Panel. The results of the revised report and the review will be used to design the environmental flow rules to be tested by the research program (see Action 4.47b).

The Government will temporarily transfer 10,000 ML of unallocated water in Blue Rock Reservoir for use in the Latrobe River and complete a research program to determine the most effective method to meet its river health objectives.

This 10,000ML will be available for a period of seven years to coincide with the proposed timing for the next review of the Strategy. It is in addition to the Government's commitment to providing 25,000 ML to the estuarine reach of the Latrobe River from enhancements to the environmental flow regime in the Thomson and Macalister Rivers.

Action 4.47

The Government commits to enhancing environmental flows in the Latrobe River by an additional 10,000 ML by 2006 for seven years (to coincide with the proposed timing for the next review of the Strategy). During this time, a research program will be conducted to determine the most effective method to use the environmental flows and complementary works to meet river health objectives.

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Table 4.25 Immediate actions to address the environmental water needs of the Latrobe River

Feasibility/Planning | Construction/Implementation | Water Available

	Timing of implementation and volume of water provided (ML/year)										
	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.47a The Government will temporarily transfer part of the unallocated share of Blue Rock Reservoir and unallocated entitlements in Lake Narracan to provide 10,000 ML of water a year for flows (for seven years) in the Latrobe River.	10,000	10,000	10,000	10,000	10,000	10,000	10,000	n/a	**n/a**	**n/a**	**n/a**
Action 4.47b West Gippsland Catchment Management Authority and the Department of Sustainability and Environment will conduct a seven year research program on the Latrobe River to confirm the water required to maintain river health and protect ecological assets and identify complementary river health works which could be used in conjunction with environmental flows to meet the river health targets for the river as set out in the West Gippsland Regional River Health Strategy.								n/a	**n/a**	**n/a**	**n/a**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Total Volume provided by options	10,000	10,000	10,000	10,000	10,000	10,000	10,000	n/a	**n/a**	**n/a**	**n/a**

Options to provide additional water to the Latrobe River will be investigated in the Strategy review, which is planned to coincide with the completion of the seven year research program. Possible options to provide this water are outlined in Table 4.26.

Table 4.26 Potential future options to provide additional water for the Latrobe River

Future water recovery options	Volume
Transfer of an unallocated entitlement in Blue Rock Reservoir as an environmental entitlement for the Latrobe River (assumes sufficient urban supplies provided by the Eastern Water Recycling Proposal)	31,000 ML

Thomson and Macalister Rivers

The Thomson and Macalister Rivers are presently identified as flow–stressed. Studies have found river health to be poor and/or degrading in sections of both systems. However, both rivers retain very high environmental values. The key environmental objectives identified in the Thomson/Macalister Rivers are:

- maintain the environmental and social values of upper Thomson River – Heritage River listing (canoeing, fishing etc)
- improve water quality
- facilitate localised fish movement
- contribute to the protection of multiple threa10ed plant and animal species (including Australian grayling and blackfish) through migration/spawning flows
- protection of the Ramsar–listed Gippsland Lakes

It is estimated an additional 57,000 ML would be needed to meet the recommendations of the scientific environmental flow study for the Thomson and Macalister Rivers.

After a community consultation process and consideration of the recommendations of the Thomson Macalister Environmental Flows Task Force, the Government decided, through *Our Water Our Future*, to provide 25,000 ML per year to meet critical environmental flow requirements. Some of these flows will be provided by water efficiencies resulting from channel automation technology which is being implemented in the Macalister Irrigation District with funding from the Government. Channel automation technology will also reduce nutrient run–off into the region's rivers and creeks.
To date, 10,000 ML has already been provided to the Thomson River. A further 8,000 ML will be provided by 2012, and 7,000 ML will be provided to the Macalister River by 2012.

Action 4.48

The Government commits to enhancing environmental flows in the Thomson/Macalister Rivers by 15,000 ML by 2012. This is in addition to the 10,000 ML which has already been provided as a result of the *Our Water Our Future* action plan. The benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required.

Table 4.27 Immediate actions to address the environmental water needs of the Thomson/Macalister Rivers

Feasibility/Planning | Construction/Implementation | Water Available

	Timing of implementation and volume of water provided (ML/year)										
	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.48a The Government, together with Southern Rural Water and West Gippsland Catchment Management Authority, will continue to invest in channel automation technology in the Macalister Irrigation District and other water efficiency projects, and progressively transfer the water saved (15,000 ML) to the Thomson and Macalister Rivers as follows: • 5,000 ML to the Macalister River by 2007 • 8,000 ML to be provided to the Thomson River by 2012 • 2,000 ML to be provided to the Macalister River by the end of 2012.	5,000	7,000	9,000	11,000	13,000	15,000	15,000	15,000	**15,000**	**14,300**	**12,800**

Provision of the full 57,000 ML of water recommended in the scientific study would have significantly reduced the reliability of irrigation supplies, particularly in drought years, and also compromised supplies to Melbourne.

Options to provide additional water to the Thomson and Macalister Rivers will be further investigated in the Strategy review. Some initial options are outlined in Table 4.28.

Table 4.28 Potential future options to provide additional water for the Thomson/Macalister Rivers

Future water recovery options	Volume
Further transfer of water from the Macalister Irrigation District to the Thomson/Macalister Rivers (assumes further water efficiency savings created in the MID through channel automation technology)	22,000 ML
Voluntary buy–back scheme for regulated diversion licences and transfer the water as an environmental entitlement for the Thomson/Macalister Rivers	1,000 ML
Transfer of water freed up by the substitution of river water with recycled water from the Eastern Water Recycling Proposal (or alternative recycling initiative from the Eastern Treatment Plant)	10,000 ML

Gippsland Lakes

The Ramsar–listed Gippsland Lakes and a floodplain wetland system comprising the Gippsland Lakes, Sale Common and Heart Morass are located downstream of the Thomson and Latrobe River confluence. Flows have been reduced in this section of the river and the needs of this estuarine section of the river have not been investigated at this stage. However, in late 2005 the Government returned 10,000 ML to the Thomson River which will benefit this reach of the river. Flows to the Lakes will be further enhanced by the 10,000ML being provided to the Latrobe River.

In addition, *Our Water Our Future* committed to undertaking an assessment of the impact of further river extractions on the Gippsland Lakes to determine the environmental flows to ensure the long–term health of the lakes. The East and West Gippsland Catchment Management Authorities have begun a $300,000 study. The first stage, a scoping study, is expected to be completed by July 2007.

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Westernport

Westernport Water sources water from Candowie Reservoir. It also has an agreement for supplies from South Gippsland Water's Lance Creek Reservoir.

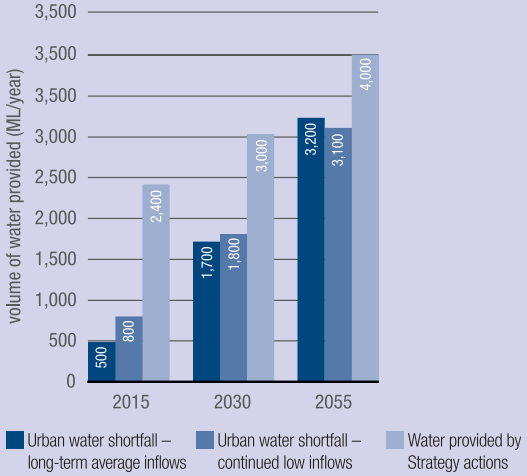
The system can currently supply 2,400 ML a year assuming long–term average inflows and 1,900 ML a year assuming continued low inflows. Current (unrestricted) demand is estimated to be 2,000 ML a year.

The population of Westernport is forecast to increase from its current level of 12,000 to 19,000 by 2030 and to 32,000 by 2055.

Figure 4.7 Map of Westernport

The challenges and solutions

The chart below shows the expected shortfalls in Westernport's urban water supply and the water that will be provided by the actions in this Strategy. The dark blue bars show the shortfalls based on long–term averages of rainfall and inflows to reservoirs.



The mid–blue bars show the shortfalls that might be expected if the low inflows of the past 10 years continue. The Strategy provides an action plan to secure water under both of these scenarios. The light blue bars show the water provided by the Strategy actions.

Immediate actions in response to low inflows (and volumes provided)

- Conservation and efficiency programs for homes and businesses to start immediately (310 ML)
- Interconnection with one or more of the following: the Bass River; groundwater bores near the Candowie Reservoir; Corinella aquifer; or the Melbourne supply system by 2008 (2,000 ML by 2015)
- Local reuse and recycling initiatives to commence by 2009 (80 ML)

What if inflows return to average conditions?

Conservation and local reuse and recycling initiatives would continue as planned. The volume of water accessed through a Melbourne connection or the Corinella aquifer could be varied as required.

Planning using long–term averages

Estimates of Westernport's future water supply and use are based on averages of the past 50–100 years of inflows to reservoirs, with population growth as outlined on the opposite page. A gradual reduction in supply (over 50 years) is expected as a result of medium climate change. Under this scenario, the expected decline in inflows to Westernport's reservoirs is 12 per cent by 2030 and approximately 24 per cent by 2055.

Planning for continued low inflows

Over the past 10 years, inflows to Westernport's reservoirs have been 21 per cent less than the long–term average. The reduced inflows mean that reliability of water supplies is reduced.

Shortfalls

In order to maintain reliability at an acceptable level with either average inflows or continued low inflows, it will be necessary to secure additional water. Table 4.29 shows the estimated volumes of water that could be needed (ie. the expected "shortfalls") for both long–term average conditions and continuing low inflow conditions. Immediate actions to address these shortfalls are described below.

Table 4.29 Expected shortfalls for urban use in Westernport

	Now	2015	2030	2055
Long–term average conditions: Long–term average streamflow and gradual medium climate change impacts. Includes population growth.	400 ML surplus	–500 ML	–1,700 ML	–3,200 ML
Continuing low inflow conditions: Last 10 years of streamflow with effective step change now, which is equivalent to medium to high climate change. Includes population growth.	–100 ML	–800 ML	–1,800 ML	–3,100 ML

Immediate actions in response to low inflows

If low inflows continue, an additional 100 ML of water would be required over the next two to three years, and almost 800 ML by 2015. In comparison, based on long–term average inflows, Westernport currently has a surplus of water available for urban use and 500 ML would be required by 2015.

A range of actions are in Table 4.30 to provide 2,400 ML of water in 2015 – enough to meet the shortfalls forecast under either scenario, as well as a buffer supply of water.

Conservation and efficiency

Conservation and efficiency remains an important focus for Westernport. A range of programs will be implemented by Westernport Water to achieve its new conservation target.

Action 4.49

The Government requires Westernport Water to work with its customers to achieve a 25 per cent reduction in total per capita water use for Westernport by 2015, increasing to 30 per cent by 2020. The basis of comparision is the 1990's average water use.

This conservation targets mean water use in Westernport will need to be reduced from 323 litres per person per day (current use) to 280 litres per person per day by 2015 and 261 litres by 2020. By 2015, this reduction will result in water savings of about 300 ML each year.

As outlined in Chapter 3 (Action 3.13), the metropolitan Pathways to Sustainability program will be expanded to target all commercial and industrial customers in the Central Region that use more than 10 ML a year. This program encourages these users to develop plans and voluntarily reduce their water use.

Reuse and recycling

In addition to using less water, it is also necessary to decrease our reliance on rivers and reservoirs by using alternative sources of water. Recycling water from the Cowes Wastewater Treatment Plant and Westernport Water's purification plant will help to achieve this.

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Interconnections

Further water supplies will be needed immediately as the 500 ML of water Westernport obtains from South Gippsland Water's Lance Creek is not a guaranteed supply. The agreement between Westernport Water and South Gippsland Water is such that if South Gippsland requires this water, it has priority over Westernport's needs.

In order to provide secure supplies to meet Westernport's immediate needs, Westernport Water will need to implement an augmentation action by 2008 for an initial volume of 1,000 ML. Westernport Water currently has a range of options for this, including augmenting supplies in Candowie Reservoir through an interconnection with the Bass River or extracting groundwater from a nearby aquifer. Alternatively, Westernport Water could interconnect to the Melbourne supply system or extract groundwater from the Corinella aquifer.

The interconnection with Melbourne has been evaluated in some detail; however the groundwater and Bass River interconnection options also represent potentially viable alternatives for meeting Westernport's immediate water needs. There is the potential to extract about 2,000 ML of water from the Bass River within its sustainable diversion limit.

A comparative assessment will be undertaken to determine the most appropriate action to secure water by 2008. The volume of water accessed through this option could be increased over time, in order to meet Westernport's longer term needs. Alternatively, investment could be made in another augmentation.

What if inflows return to average conditions?

If inflows return to average conditions, the conservation and efficiency and recycling initiatives would continue as planned. However, the volume of water accessed through the Melbourne connection or Corinella aquifer could be varied as required.

Table 4.30 Immediate Actions To Address The Urban Water Needs Of Westernport

Feasibility/Planning | Construction/Implementation | Water Available

	Timing of implementation and volume of water provided (ML/year)										
Conservation and efficiency	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.50 Westernport Water will implement a range of conservation and efficiency measures within the residential and commercial/ industrial sectors and the water distribution system in order to meet its new conservation targets.*	50	70	110	140	180	210	250	280	**310**	**900**	**960**
Alternative supplies	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.51 Westernport Water will increase recycling of wastewater from the Cowes Wastewater Treatment Plant and Westernport Water's purification plant.		80	80	80	80	80	80	80	**80**	**80**	**80**
Interconnections	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Action 4.52 Westernport Water will immediately undertake a comparative assessment of augmentation options, including an interconnection with: the Bass River; groundwater bores near the Candowie Reservoir; Corinella aquifer; and the Melbourne supply system,to determine which option should be implemented by 2008.		1,000	1,000	1,000	1,000	1,000	1,000	1,000	**2,000**	**2,000**	**2,000**
Action 4.53 Westernport Water will investigate a range of potential augmentation options to be implemented in the long term, including an interconnection with: the Bass River; groundwater bores near the Candowie Reservoir; Corinella aquifer; and the Melbourne supply system.											**1,520**
Total	2007	2008	2009	2010	2011	2012	2013	2014	**2015**	**2030**	**2055**
Total volume provided by options		1,200	1,200	1,200	1,200	1,300	1,300	1,400	**2,400**	**3,000**	**4,000**

* If population growth is different from what has been assumed, the volumes of water savings resulting from meeting Western Water's conservation targets will differ.

The water supplied increases from the short term to the long-term for many of the conservation and efficiency actions as more of the measures are taken up over time. In contrast, the actions that rely on water from rivers and aquifers decrease over time as a result of potential climate change impacts.