

Summary

While discussion of this indicator will focus on the 2000–2003 reporting period, it has to be viewed in the context of intense community and Government discussion following the drought, bushfires and growing realisation that new approaches to water resource management in the ACT are required.

What the results tell us about the ACT

The total capacity of water storage was not able to sustain the combined impacts of urban use and the reduced rainfall pattern, as well as providing for environmental flows, during the reporting period. Storage levels dropped from 96% in December 2000 to 54% at the end of 2002, and further, to 43.5% by June 2003.

In the early part of the reporting period there was little significant change in urban water use other than changes that could be attributed to seasonal changes.

Water restrictions introduced

The 2002–03 drought was a driver for a suite of proposals for water-saving strategies at both the home and institutional levels and in strategic planning. For the first time since the 1960's, water restrictions were introduced from the start of summer 2002–03. They caused a significant reduction in water use, with a temporary lapse following the bushfire on 18 January 2003. Total licensed use resulted in a saving of 370 million litres in 2002–03 compared with 2001–02 in weather conditions that would otherwise have promoted far higher use.

The Cotter water supply dams were closed from April 2003 until after the end of the reporting period due to enormous runoff from the fire-damaged catchment following storms in February and March 2003. Canberra and Queanbeyan relied on supplies from the larger, but not replenishing, Googong Dam for the duration.

Water restrictions remained in place until the after end of the reporting period. There remains an urgent need to reduce per capita consumption and to pursue alternative sources such as increased effluent reuse which is currently at only 5%.

Moves towards such reduction were in progress at the end of the reporting period. The *Water ACT: a draft policy for water resource management* was released in early July 2003. Water ACT set targets to decrease per capita potable water use by 12% by 2023 in addition to the 20% reduction obtained since 1993. Development of the Water Resources Management Strategy—*Think water, act water*—will adopt the targets in Water ACT. It was well under way by the end of the reporting period. That strategy will also review the Water Resources Management Plan (1999), integrate all aspects of water management and lay the foundation for future practices in accordance with the draft policy for water resource management. It will be the task of that strategy to identify water use and efficiency initiatives.

ACT average annual runoff is calculated as approximately 465,000 megalitres with 272,000 megalitres designated as environmental flows and approximately 193,000 megalitres available for consumptive use. This is the first State of the Environment Report for which licensed use for both surface and ground water has been available for all subcatchments in the ACT.

Environmental flows affected

The review of the Environmental Flows Guidelines in 2004 should be used to incorporate recent research findings and ensure that the needs of the environment, including factors such the extent to which flows mimic critical natural patterns, are being met in all subcatchments. Studies in 2003 showed that the modified environmental flows allowed in the water supply catchments in response to the drought and the aftermath of the bushfires put strain on aquatic communities in these catchments. Ongoing monitoring and further studies will be required to minimise long-term damage.

Groundwater use exceeded recharge

Licensed use of groundwater in 2002–03 exceeded the recharge rate of 10% in four subcatchments. Allocations are reviewed after three years so that the long-term allocated volumes can be based on several years of actual metered use.

Supply—how much water *could* we have?

The ACT controlled water resource is comprised of water that runs off catchments within the ACT and the waters of the Queanbeyan River which enter the Googong Dam in NSW.

Water supply dams and their capacities

Four dams retain water for consumption by Canberra and Queanbeyan residents. Combined volume when full is 215,382 gigalitres (Table 1). Bendora, Corin and Cotter Dams are in the Cotter River system which was ravaged by the bushfires of January 2003. Googong Dam is in the Queanbeyan River system which was affected only by drought during the reporting period.

The dynamic water yield from the Cotter River scheme is much higher than from Googong reflecting different rainfall regimes and differently-sized catchments. Googong is larger by a factor of two but rainfall is lower, and costs of pumping and treating water from this storage are about five times those from the Cotter Catchment. In essence, there is a highly varied annual rainfall pattern both temporally and spatially across both catchments, although the Brindabella Range (Cotter Catchment) tends to be much wetter than the Gourock–Tinderry Range (Great Divide) catchment feeding the Queanbeyan River.

These systems and their catchments are described briefly below. More detail, along with maps, can be found in the *2000 ACT State of the Environment Report* (water supply indicator).

The Cotter River System

Corin Dam and Bendora Dam are on the upper Cotter River. Water from Corin Dam is routinely passed to the smaller Bendora Dam, which supplies the bulk of Canberra's drinking water under normal operating conditions.

The Cotter Dam on the lower Cotter River is significantly affected by forestry activity (sediment transport and increased turbidity) and to a lesser extent by recreational activity, including runoff from unmade roads. Until after the end of the reporting period it was not generally used for drinking water mainly because of the poor quality of the water, no treatment facility to bring it up to the quality of water supplied from Bendora Dam and because of its lower elevation and the need to pump the water. Recreation in any area upstream of the Cotter Dam wall is prohibited.

The Queanbeyan River System

The Googong Dam, whose catchment is in the Monaro–Tinderry–Gourock Ranges, is located 50 kilometres south-east of Canberra. Catchment landuse is a mix of nature reserve, low-intensity forestry (mainly native hardwood), rural residential, grazing (cattle and sheep) and a few small enterprises, such as a native crayfish farm, and recreation.

There are indications that grazing landuse in the catchment has become less intense over the past 55 years. Further study of the impact of modifications to drainage networks by earthworks is warranted, as these may be a means by which water quality can be improved in particular areas.

Face-value supply based on runoff into dams

Figure 1 shows calculated annual inflows into ACT water supply catchments and into the Queanbeyan River for Googong Dam (in NSW) as some 465 gigalitres. Of that, some 272 gigalitres are designated for environmental flows (discussed in more detail below), leaving about 193 gigalitres, on average, a year that is technically available for urban use. Other 'diversions' (water extracted for licensed use) and returns to the system are also shown in Figure 1 (next page).

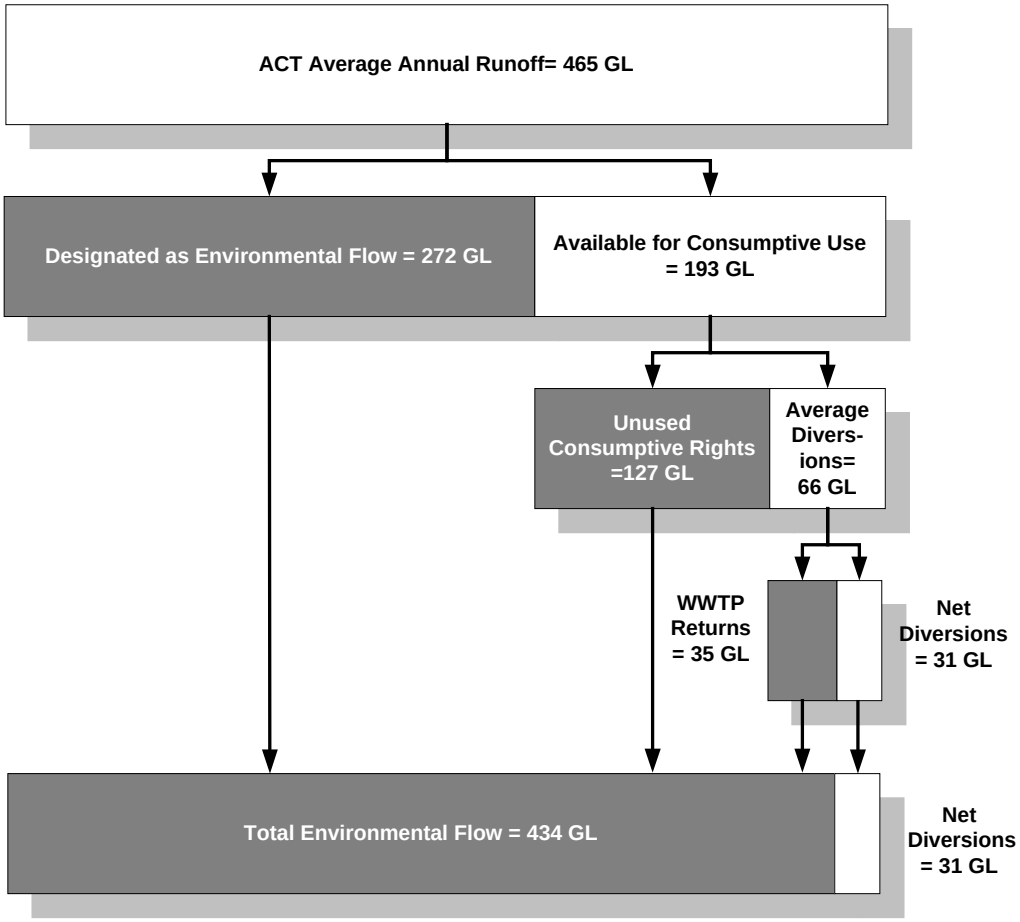
As the burnt vegetation recovers it will use more of the moisture that would otherwise have run off into the dams for consumption. Reduced availability has been modelled. Indications are that inflows will be reduced for many years to come.

Table 1: Dam capacities for ACT and Queanbeyan water supply

Reservoir	Bendora	Corin	Cotter	Googong
Catchment area (square kilometres)	91	196	192	890
Full volume (Gigalitres)	10 720	75 455	4 697	124 510
Level when full (metres)	778.20	955.54	500.69	663.00

Source: ACTEW giga = 1 billion (109)

Figure 1. Flow chart showing ACT environmental flows, water diversions and returns



Source: ACTEW, provided by Mark Nayar, Marsden Jacob Associates, 2003

Non-reticulated supplies

The non-reticulated sources of water in the ACT are bores, which are often used for rural and commercial applications and increasingly, in urban areas. Use of bores requires a licence.

Rainwater tanks are also used in rural areas and, increasingly, in urban areas.

Groundwater

There is a paucity of information on groundwater in the ACT and the actual sustainable yield is not known. Environment ACT estimated annual groundwater recharge in the ACT (*Water Resources Management Plan*, 1999). The long-term average recharge rate is directly related to rainfall, infiltration characteristics and the size of the recharge zone. From available information, a water balance method was used and then verified using a rainfall recharge method. Accordingly, the total annual groundwater recharge for the ACT is estimated at 73,300 megalitres. This is considered to be a best estimate based on derived upper and lower limits using the methodology described above, and the conceptual description of recharge processes of local groundwater systems.

The draft *Water ACT: a draft policy for sustainable water resource management* which the Government released in July 2003 states that the use of groundwater is limited by its variable distribution and quality, small quantity, generally low rate of flow and the cost of extraction.

Repeated State of the Environment Reports have advocated the need for a comprehensive study of the groundwater resources of the ACT. The ACT Government rejected a recommendation in the ACT 2000 SoE report to that effect.

How much water was available?

From the water supply dams

Only 44% of total capacity was available at the end of the reporting period, down from 57% at the beginning of the 2002 summer. By comparison, the reporting period commenced with Googong Dam virtually full, Bendora Dam at just under 90% and Corin and Cotter Dams at around 75%. For most of the previous reporting period (1997–2000), the

combined dam levels were at more than 80% capacity, except during April–July 1998 when levels dropped to less than 70% (see also weather).

During the reporting period it became evident to most Canberrans that 'percentage fullness' does not necessarily relate well to security of supply. The water stored in the Cotter catchments for the ACT and Queanbeyan (around 40% of total) became undrinkable after storms in February and March deposited huge amounts of bushfire detritus into the usual water supply dams. The dams in the Cotter system were closed for drinking water on 8 April 2003 and reticulated supply for Canberra and Queanbeyan subsequently became dependent on Googong for the remainder of the reporting period.

The calculated runoff into Canberra's three major water-harvesting reservoirs (Googong, Corin and Bendora) is 465 gigalitres. However, total inflows in the 12 months to the end of May 2003 totalled approximately 44.7 gigalitres (see Figure 1). This is the third lowest inflow for the corresponding period on record, with the lowest being 34.9 gigalitres in 1914–15, followed by 40.9 gigalitres in 1941–42. (To get an idea of the implications, there are now around 300,000 more residents than in the 1940's and a vastly different and more consumptive lifestyle.)

Hot, dry conditions during the same period (year to end of May 2003) caused high demand from Canberra water consumers, particularly for lawn and garden watering. From May, reduced temperatures, and hence evaporation rates, combined with increased (but still less than average) rainfall and associated inflows, meant that storage levels were able to remain static. (The median case in May would normally be increasing storages, with the rate of increase continuing through to September.)

From under the ground

Environment ACT limits groundwater extraction to 10% of annual recharge to preserve that resource and allow for inaccuracies in the determination of recharge. This 10% value represents the 'sustainable yield' and, based on the estimated recharge of 73,300 megalitres, allows around 7,000 megalitres to be extracted each year. Licensed volume of groundwater only[1] for the period April 2002 to March 2003 was only 632 megalitres. However, all licensing must be considered in relation to estimated capacity of each of the catchments or subcatchments, as individual catchments could be over-allocated, as indeed, occurred during the reporting period (see the next section and Table 3 in particular).

Consumption—how much water was used?

Total use

Some 66 gigalitres of the 193 gigalitres available for consumptive use (see Figure 1), are consumed[2] annually under the licence issued by the Environment Protection Authority to ACTEW. Similar figures formed the basis of developing *Water ACT: a draft policy for sustainable water resource management* (July 2003). Of that 66 gigalitres, some 35 gigalitres are returned to the Molonglo-Murrumbidgee Rivers system via the Lower Molonglo Water Quality Control Centre as treated effluent. The result is a net abstraction of around 31 gigalitres a year. In addition, stormwater runoff returned to the river system is estimated as around 14 gigalitres a year.

Actual annual consumption (Table 2) reveals the higher use in the last two years of the reporting period. As the drought started to bite, urban use (ACTEW water) exceeded the allocation,

Table 2 Annual volumes of water used under licence, 2000–01 to 2002–03

Year	Licensed use (for urban use)[a] (ML/year)	Water use by ACTEW (ML/year)	Licensed use (private) (ML/Year)[b]	Total water use allowed by licence (ML/year)[c]
2000–2001	62,700	60,103	1484	61,587
2001–2002	62,700	67,033	2185	69,218
2002–2003	62,700	66,709	2140	68,849

Source: Environment ACT ML = Megalitres = million litres

a ACTEW licence for Canberra and Queanbeyan supply; b. Subsequent to publication of the 2003 State of the Environment Report Executive Summary on 31 March 2004, Environment ACT revised figures in this column as 3139, 3147.5 and 3160 megalitres, respectively; c. Subsequent to publication of the 2003 State of the Environment Report Executive Summary on 31 March 2004, Environment ACT revised figures in this column as 65,839, 65,847.5 and 65,860 megalitres, respectively

[1] Three types of licences are issued for water use—surface water only; groundwater only; and surface and groundwater combined.

[2] The industry term is 'diverted' or 'diversions'

demonstrating the need for water restrictions. Use was exacerbated by one single drought-related event on 16 October 2002—a dust storm. Residents responded by washing cars, houses and other affected property. As reported by ACTEW, water consumption for the 24 hours from 8.00am on Wednesday 16 October to 8.00am on Thursday 17 October was 187.6 megalitres. During the next 24-hour period, water consumption was 249.2 megalitres—an increase of 61.6 megalitres. That increase was equal to 30 Olympic-sized swimming pools of water.

Lower use in 2002–03 was a result of water restrictions.

Even by the end of the reporting period it was still relatively early days for reliable information on actual, versus licensed, use by licensees other than ACTEW. The issuing of licences for water extraction (both surface water and groundwater) by the Environment Protection Authority commenced before the end of the previous reporting period. However, initial licences were issued for a three-year transitional period with allocations based on prior use and estimated use. This was to enable the Environment Protection Authority to determine over that three-year period whether what was allocated in the first place was appropriate. The 2000–01 Environment ACT Water Report did not require all licensees to report actual use as a six month period is allowed for each licensee to set up a water metering system, and not all licences had been issued for a full year (the Water Reports being on an April–March reporting year). Comparison between the first year of the reporting period (2000–01) and the end of the reporting period (2002–03) is therefore not particularly viable.

Indications from relevant Water Reports were that licences for groundwater only (as opposed to licences for surface water only and for both surface water and groundwater) had increased from 165 megalitres to 609 megalitres during the reporting period.

In a number of subcatchments the licensed use had already exceeded 10% of the annual recharge as calculated by the end of the reporting period (Table 3).

Use by sector

Urban water use

The greater proportion of water use in the ACT—in detached houses (Table 4)—is consistent with the purpose of the city as national capital with predominantly tertiary, rather than secondary, industry. A breakdown of use within detached houses shows the area of highest consumption is outside, in the garden (Table 5). Table 5 also shows that, combined, use in bathrooms and toilets is almost as high, revealing both of these areas in the home as additional likely targets for savings.

What were the impacts of environmental flows?

Environmental Flow Guidelines for the ACT are underpinned by ecologically sustainable principles and legislation, as defined by the *Water Resources Act 1998* and the Territory Plan, and supporting legislation and strategies including the *Environment Protection Act 1977*, the *Nature Conservation Act 1980* and the *ACT Nature Conservation Strategy* 1998. The guidelines set out a methodology for calculating environmental flows, and were used as the basis of a Water Resource Management Plan for the ACT. Details are available from <http://www.environment.act.gov.au airandwater/water.html>.

The *Environmental Flow Guidelines* allow extraction of 10% of flows above the 80th percentile (that is, the flow that is exceeded 80% of the time)

Table 3. ACT subcatchments where licensed use exceeds the volumes of groundwater available

Subcatchment	Volume available for abstraction (ML/Year)	Volume licensed for use (ML/Year)
Fyshwick	68	73
Jerrabomberra	240	246
Woden	56	186
Woolshed	64	96

Source: Environment ACT, 2003

Table 4. Urban water use in the ACT

Use	% of total
Unmetered	10%
Units	6%
Government	11%
Commerce	19%
Detached homes	54%

Source: Water ACT: a draft policy for sustainable water resource management (July 2003)

Table 5. Average water use in detached residential houses

Use	Volume (kL/year)	% of total
Toilets	60	18%
Bathroom	66	20%
Laundry	43	13%
Kitchen	20	6%
Garden	128	39%
Other outdoor	13	4%
Average annual use	330	

Source: *Water ACT Policy* Water Resources Task Force Environment ACT July 2003.

in most catchments. For groundwater 10% of the average annual recharge is allowed for extraction. For the water supply catchments, however (Cotter and Queanbeyan), abstraction of 100% of flows above the 80th percentile is allowed. This translates to more than 50% of the inflow volumes into the dams being available for environmental needs downstream (see Figure 1).

In both 2001 and 2002 calendar years, rainfall fell short of the long-term average of 623 millimetres by more than 100 millimetres (see weather), with obvious implications for runoff into the water storage dams. Runoff into the storage dams was further negatively affected by radically uneven distribution of rainfall—with more than 40% of the total for 2002 occurring over a few days in February, and periods of below-average rainfall which lasted for several months at a time, particularly during 2002–03, when the water table was so low and rainfall so minimal that runoff did not eventuate.

Water released for environmental flows during the period (Table 6 and Figure 2) was of a different order of magnitude than the 272 gigalitres identified in Figure 1 for environmental flows. In practice, except for 2000 when rainfall was closer to an average year, environmental flow releases in the water catchments were just over half the volume consumed by Canberra and Queanbeyan residents. With the reduced inflows, water storage was not able to sustain the combined impact.

The volume of water available is only one aspect of environmental flows and their adequacy or otherwise must be assessed in the context of other factors such as timeliness, water temperature and the nature of the release, such as whether they mimic natural flows.

The *Environmental Flow Guidelines* were based on the best available information at the time they were developed and they will be reviewed during 2004. However, there is recognition of the need for an on-going monitoring and evaluation program of actual flows and their effect on stream structure and ecology. Through the partnership between Environment ACT and the Cooperative Research Centre for Freshwater Ecology (CRCFE), a major study into the effectiveness of the environmental flows in the Cotter water supply catchment was under way at the end of the reporting period.

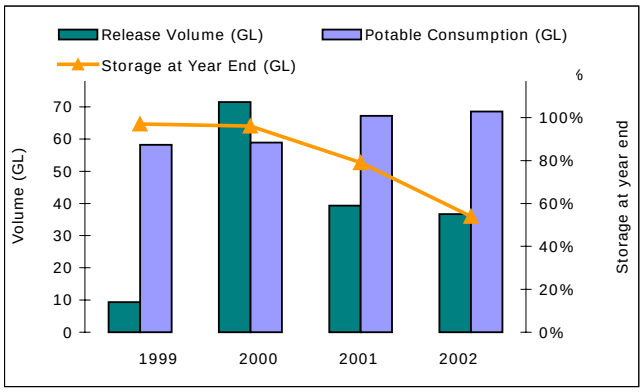


Figure 2. Environmental flow releases compared with urban water use for the ACT, December 1999 to December 2002. Source: Dr Gary Bickford presentation *Our Water Future Communitv Summit*

In December 2002 the Environment Protection Authority approved that ACTEW reduce the environmental flow releases to 50th percentile flows due to the lack of inflows into the dams and the diminishing water storage. The CRCFE's investigation of the effects of modified environmental flows in the Cotter River was interrupted by the bushfires that ravaged much of the catchment.

The interim report of that investigation (March 2003) stated that the modified environmental flow regime had had some adverse consequences for the ecological state of the biological communities downstream of dams in the Cotter River. The state of the Cotter River was described as being poorer than under the previous environmental flow regime and was not consistent with the condition of aquatic communities in the Cotter River tributaries and the Goodradigbee River and its tributaries, which had not been dammed. The Interim Report also suggested that recovery from the diminished flows would be limited under the regime that was operating at that time (Norris, 2003).

In response to the unbroken drought in June 2003, the CRCFE prepared three environmental flow scenarios for Environment ACT to protect ecological condition in the Cotter and Queanbeyan Rivers during the drought. The advice was based on data obtained during the CRCFE study of the effectiveness of the environmental flows in the Cotter catchment over the previous years. Its aim was to sustain target habitat and maximise the environmental and water quality benefit through

Table 6. Environmental flow releases compared with urban water use and rainfall for the ACT, Dec 1999 to mid-2003

Year	Release Volume (GL)	Potable Consumption (GL)	Rainfall (Mm)	Storage at Year End (% full)
1999	9.4	58.2	716.2	97%
2000	71.5	58.9	625.0	96%
2001	39.3	67.2	500.7	79%
2002	36.7	68.6	500.3	54%
2003*	2.3	28.1	161.2	43.5%

*6 Months data only; Source: Dr Gary Bickford presentation *Our Water Future Community Summit*

drought in such a way as there may be full recovery following the drought (CRCFE, unpublished, 2003).

There is clearly a need for ongoing monitoring of the situation in these water supply catchments as the combined effects of the drought and the bushfires continue.

Managing water demand and use

The first reporting period under new laws and policy

The *Water Resources Act 1998* came into full effect in December 1999, just six months before the end of the previous reporting period. It provides the framework for the Territory to manage its water resources effectively and sustainably, and applies to both surface and ground water. Reference to this Act appears in the 2000 SoE Report. Refer also to Environment ACT annual Water Reports from 2000–01 for detailed information on the legislative background to water resources management in the ACT (see <http://www.environment.act.gov.au/airandwater/water.html>).

In brief, the Act provides the legal basis for the allocation of water, licences to take water, drillers' licences, bore construction permits and work permits to control the construction of water control structure. Prior to the implementation of the Water Resources Act, little metering was done outside of the water supply catchments.

In implementing the Act, allocations for existing users were based on the users' estimates. Allocations include a review after three yeas so that long-term volume can be based on several years of actual metered use. This will allow necessary adjustments to be made at the catchment scale, where actual volumes used have sometimes exceeded those predicted in the *Water Resources Management Plan.*

The Act also provides for the preparation of the *Environmental Flow Guidelines* (first released in 1999) and the development of a *Water Resources Management Plan* (WRMP) (first released in 1999).

The *Environmental Flow Guidelines* set out the methods which identify the flows necessary to protect all ACT water bodies. They were developed on the basis of the best available scientific advice at the time, necessitating a number of pragmatic assumptions.

The *Water Resources Management Plan* provides the ACT Government with a decision-making framework and strategic direction for the long-term management of the Territory's water resources.

Both the Guidelines and the Management Plan were in the process of review at the end of the reporting period, in the context of preparation of the ACT's water resources management strategy which will integrate all aspects of water management and lay the foundation for future practices. *Water ACT: a draft policy for sustainable water resource management* (July 2003) set the parameters for the development of the Water Resources Management Strategy—*Think water, act water*.

At the end of the reporting period, two full years of data on use had been collected by Environment ACT to compare with allocations and licensed volumes. As actual use is averaged over a three-year period, the end of this reporting period was too early to make any conclusive assessment of the Act's effectiveness in managing water demand in the Territory.

Groundwater

The ACT controls groundwater under territory land except for the groundwater that occurs under leases which pre-date the *Water Resources Act 1998*.

Environment ACT has put in place a process whereby an increase in demand for groundwater in a particular catchment triggers the initiation of a study to determine whether this should be permitted. For groundwater the Jerrabomberra sub-catchment was divided into three zones as recommended in the *Groundwater Yield Assessment in the Jerrabomberra Creek Catchment* –February 2001 Report.

Previous state of the environment reports have pointed out the need for quantitative data on the overall quantity and quality status of groundwater in the ACT. The Government's rationale behind not conducting a Territory wide study is based on costs. The condition of the resource, as described in the Jerrabomberra subcatchment study (*ibid.*) and the ACT's draft water resource strategy document (EACT, 2003) indicate that further study is essential.

Response to drought 2002–03

Water restrictions and their effectiveness

The severe drought conditions during 2002–03 provided a good test of the ACT's legislation and management in water demand management. In November 2002, the ACT Government released the *Summer Water Use Strategy—Summer 2002–2003.* This document outlined the Government's plan for managing rural and urban water during the summer period, including the introduction of mandatory water restrictions. The Water Restrictions Scheme forms part of the *Utilities*

(Water Restrictions) Regulations 2002, which are made under the *Utilities Act 2000*.

The Water Restrictions Scheme provides for five levels of restrictions, each triggered by threshold values of storage levels or daily rate of available potable water. ACTEW Corporation Limited may only introduce a new stage when either:

- 'water storages…reach or fall below the percentage level specified …', or
- 'when the quantity of water of potable quality available to ACTEW, on a sustainable basis, falls to or below the daily rate specified … for that stage.'

Rapid drawdown of the major reservoirs triggered the introduction of voluntary restrictions on 16 November 2002. This was followed by Stage 1 restrictions (requiring 15% reduction in water use) on 17 December 2002 at 55% total storage, and Stage 2 restrictions (requiring 25% reduction in water use) on 29 April 2003 at 45% total storage. Stage 2 restrictions remained in place until after the end of the reporting period.

The occurrence of the bushfires in the ACT on 18 January 2003 increased water demand. This was due largely to a public announcement on the 18 January 2003 that the restrictions scheme was not compulsory during the high fire danger period. For the immediate period following the fires, there was a noticeable increase in water use, although the targeted reduction of 15% was still achieved.

ACTEW records daily consumption and has years of data. The effectiveness of water restrictions is evident when actual consumption is lower than consumption that would be expected in similar weather conditions if restrictions weren't in place.

In summer consumption increases as lawns and gardens dry out; in winter consumption decreases. There was significant evidence of reduced water use as a result of the introduction of voluntary and mandatory water restrictions being applied from the start of summer 2002–03.

ACTEW calculated its total water consumption estimate for 2002–03 of 65,400 megalitres would have been 75,000 megalitres without restrictions (Gary Bickford, pers. comm.).

How did other licensees fare?

Private licence holders within the ACT found that there was a natural restriction on the ability to take water during the recent dry summer months. For example, many surface water users found that pools within the rivers from which they normally took water were dry. Similarly, as groundwater recharge was affected by the lack of rain, some groundwater licence holders found that they were unable to obtain previous yields from the bores or that they were unable to obtain water at all.

The Environment Protection Authority imposed restrictions on some surface water users. This related to licences that contained a specific condition whereby restrictions applied once water levels reached a particular point. For example, restrictions were imposed on the group of irrigators along the reach of the Molonglo River immediately upstream of Lake Burley Griffin. These licences contain a specific condition relating to the water level below the spillway in Lake Burley Griffin. The licence holders were notified that when the level below the spillway reached varying, predetermined levels, they would be required to restrict their water use by 15% or 30% (depending on the spillway level). All relevant licence holders cooperated with this condition, as was reflected in their metered water usage during the restriction times.

ACTEW's 'Stop the Drop' campaign

To encourage residents and businesses to reduce water use, ACTEW, through ActewAGL, launched a significant media and education campaign 'Stop the Drop' at the start of the 2002–03 summer period. This campaign included television advertisements, radio talkbacks, six brochures on water conservation/efficient water use (in addition to previously produced pamphlets on water conservation) and a competition to encourage Canberrans to send in their water saving tips. Close to 700 entries were received and a booklet was produced to promulgate the water-saving knowledge produced through the campaign. The booklet, *Saving Water In Canberra*, and brochures are available at hardware stores, nurseries and gardens, shopfronts, Canberra Connect and the Internet.

Other water conservation measures

Improved and more efficient appliances

National and local initiatives were established or were in the planning stages during the reporting period. For example, a compulsory, national water efficiency labelling scheme was approved by the relevant Commonwealth and State Environment Ministers in May 2003; the scheme will commence by mid-2005. This will provide information to the community about the water efficiency of appliances based on a A to AAAA rating, with AAA representing a high level of water efficiency and the minimum ideal level. The ACT will support this by ensuring that only water efficient appliances are available for sale within the Territory.

At a local level, ActewAGL continued its water meter replacement program in an effort to reduce unaccounted-for water due to ageing and inaccurate meters. This enables more efficient and accurate billing, which may impact on the customers' demand for water and reduce losses.

Rebates for water saving appliances

The ACT Government assisted the community to meet target water use savings by providing household incentives, including:

- **Rebates on AAA showerheads**. An audit of $30 rebates on AAA showerheads from 6 December 2002 to 12 January 2003 indicated that the number of showerheads sold was 3,876 with the value of rebates paid being $111,675. The total water saving for the whole program was estimated to be 81 megalitres a year. The program is also a relatively cost-effective means of reducing greenhouse gas emissions*. (ref: AAA Showerhead rebate Program: Audit and Evaluation. Prepared by Energy Strategies in association with Artcraft Research, April 2003)*
- **Subsidies towards fitting AAA rated 6/3 litre dual flush toilets to households**. Each dual flush toilet cuts water use by around 18 kilolitres per year. During the reporting period, some 58% of toilets were dual flush. If all old/inefficient toilets were replaced by dual flush toilets, there is a potential for annual savings of 1000 megalitres.
- **Rainwater tank rebate scheme**. ACTEW, through ActewAGL, has been administering a rainwater tank rebate scheme, funded by the ACT Government, since 1997. A $500 rebate is given for tanks in excess of 9000 litres and $200 for tanks that range in size from 4500 to 8999 litres. Rebates to the end of the reporting period are shown in Table 7 below. A revised scheme was proposed to include waiving the development and plumbing approval fees to encourage the installation of larger tanks. Scaled subsidies according to tank size will be available, and an additional subsidy will be provided for connection to the toilet or washing machine cold water supply.

From Table 4 earlier, it can be seen that Government is a significant water user. During the reporting period, the ACT Government put in place a number of measures to reduce its water use. During 2001, sportsgrounds, parks and toilets across Canberra were equipped with water saving fittings resulting in 30% water savings. A research program undertaken in collaboration with CSIRO has indicated that a refining of the computerised irrigation system in parks and sportsgrounds could yield a further 10–20% in water savings.

An ACT Schools replacement program was under way at the end of the reporting period to change high water use toilets and taps to more water efficient models.

Household domestic water auditing and tune-up

Households were provided with written advice on water efficiency, together with the fitting of an AAA showerhead, up to two tap valves or flow regulators and up to two tap washers in order to increase water use efficiency. In addition, audits and associated written reports will be provided for garden water use efficiency supported by the provision of appropriate products to save water.

Water pricing

Water pricing is an integral part of the implementation of the Water Resources Act. Consequently, a water abstraction charge of 10 cents per kilolitre was imposed on all users in 2000, with ACTEW being the most significant participant. Water pricing has the potential to encourage water savings by households as well as discourage the profligate use of water by industry. ACTEW has paid the abstraction charge on all water delivered to its customers since 17 May 2000. This is a ‘pass through’ charge to customers and is intended to cover water management and environmental costs.

Table 7. Rainwater tank rebate data 1997–2003

Year	Tank Size 4500L +	Total Rebates	Tank Size 9000L +	Total Rebates	Total Number of Tanks	Total Rebates
2002–03	5	$1,000	7	$3,500	12	$4,500
2001–02	4	$800	16	$8,000	20	$8,800
2000–01	8	$1,600	11	$5,500	19	$7,100
1999–2000	26	$5,200	17	$8,500	43	$13,700
1998–99	18	$3,600	12	$6,000	30	$9,600
1997–98	13	$2,600	9	$4,500	22	$7,100
Total	**74**	**$14,800**	**72**	**$36,000**	**146**	**$50,800**

Source: ACTEW

The abstraction charge will undergo two more increases in the future:

- from 10 to 20 cents per kilolitre(1 January 2004)
- from 20 to 25 cents per kilolitre (1 July 2005).

ACTEW had an ongoing demand initiative to reduce the 'water price step' each year in increments of 25 kilolitres a year until the step reached 175 kilolitres a year (Table 8).

Table 8. Water pricing in the ACT 1999–2003

Year	Water Price Step (kL/yr)
1999-00	276
2000-01	251
2001-02	225
2002-03	175

Source: ACTEW

Currently this step is calculated on an annual basis and enables customers to 'bank' water that is not used in winter for use in summer at the lower rate. The Independent Competition and Regulatory Commission was in the process of reviewing ACTEW's water pricing structure at the end of the reporting period. In this review, daily and quarterly water steps were to be considered as a means for reducing water demand. This will in effect act as a seasonal pricing measure and eliminate the current winter banking effects.

The introduction of volumetric pricing in early 1991 led to a reduction in per capita water use by 20%. However, studies since then have shown that the amount of water used does not decrease much if the price of water rises. The effect of very high prices is not known.

Education

ACTEW, through ActewAGL, runs an extensive community education program to inform the community on water conservation measures. There is a specific section of the ActewAGL website dedicated to this purpose. ActewAGL's education officer visits schools and community groups to educate on water conservation in an effort to reduce demand for water. From 1999–00 to 2002–03 about 20 schools were visited, ranging from Kindergarten to Years 7 and 8, in addition to about five community groups. There was a significant increase in school visits after the start of summer 2002–03 due to the drought and water restrictions increasing the community's awareness.

The Xeriscape Garden was developed as an outcome from the community consultation process that was instrumental in formulating the *ACT Future Water Supply Strategy* in 1993.

The primary objectives of the Xeriscape Garden are:

- to demonstrate the seven principles of Xeriscape Gardening through which a reduction of water consumption and costs to both the community and the consumer can be achieved
- to display wastewater reuse technologies that augment and provide other sources of water
- to demonstrate best practice in applying ecologically sustainable principles to Australian garden design and maintenance.

Since opening in 1994, the Xeriscape Garden has seen the introduction of a number of community horticultural groups working under the auspices of the Canberra Horticultural Society.

ACTNOWaste has a solid waste recycling demonstration area while ActewAGL has developed two additional areas within the Xeriscape site. The Garden has become a community education centre providing education and awareness on a range of issues relating to ecological sustainability. On average there is about one school visit a month to the gardens through the Spring to Autumn period.

The Xeriscape Garden was severely damaged in the January firestorm with eighty percent of the garden destroyed. The three main structures remain intact and rebuilding of the rest of the garden will commence in 2003–04.

The effectiveness of education programs is very difficult and costly to determine but evidence from elsewhere supports the inclusion of education programs as a part of any strategy that aims to change behaviour.

Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) aims to manage the water cycle within urban settings by reducing mains water use, the discharge of wastewater, and stormwater runoff. Water Sensitive Urban Design also aims to improve and/or protect social, design and visual amenity values associated with urban planning. This approach to planning can be effectively incorporated into existing or new areas. Reuse schemes such as Southwell Park and the North Canberra Effluent Reuse Scheme are examples of Water Sensitive Urban Design in existing areas.

The use of shallow grassed drains in place of roadside kerbs and gutters is being incorporated into Canberra's streets. The urban wetland constructed at David Street, O'Connor, intercepts pollutants from upstream.

At a block scale, the application of Water Sensitive Urban Design increases pervious areas and directs surface runoff so that stormwater is retained for infiltration, or is slowed down prior to delivery to the drainage system. These measures are intended to support the target to reduce the one-in-three-month storm event to no more than pre-urban size (Environment ACT, 2003).

In some circumstances, developers will contribute to the cost of works to meet obligations to Water Sensitive Urban Design (for example, the cost of in-ground retention tanks). New greenfield developments or large scale redevelopments will be expected to integrate best practice for Water Sensitive Urban Design including the use of water efficient appliances, greater use of alternative water sources and water efficient landscaping.

Adaptive management

Adaptive management refers to *'a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs'.* This means that a better understanding of the physical processes and responses assists in the long term, effective management of resources. Short-term actions by the ACT Government in relation to adaptive management will address issues of monitoring and data collection and collation, and collaboration between agencies and the community.

Recycling and effluent reuse

In Queanbeyan, 3,000 megalitres of treated sewage is returned to the Molonglo River from the Queanbeyan sewerage Treatment Plant. In the ACT, about 32,000 megalitres is returned to the Molonglo River from the Lower Molonglo Water Quality Control Centre (LMWQCC). Both treatment plants discharge effluent that meets a very high standard.

Effluent reuse is where high quality treated effluent is used for non-potable purposes thereby conserving precious water resources. Generally, treated effluent is reclaimed to meet water demands for uses other than drinking water.

Effluent reuse can be conducted at several levels: at the household level, suburb level and regional (or basin) level. Currently in the ACT about 5% of treated effluent is reused. *Water ACT: a draft policy for water resource management* sets the target of 20% reuse by 2013.

Household level—greywater

Greywater is the wastewater generated from the laundry, kitchen and bathroom, excluding the toilet effluent. Greywater is relatively easy to reuse and can save a household 20–40% of its water use.

However, greywater can also contain significant quantities of nutrients and salt which can have a detrimental effect on plants and animals. To manage this, the application of greywater should be rotated around the garden supplemented with mains water applications. Diverting greywater onto the garden is a popular method of saving water with the community, particularly during the drought, but actual volumes are not known.

Suburb level—the Lower Molonglo wastewater sewage treatment scheme

Lower Molonglo Water Quality Control Centre is the central wastewater treatment plant for the ACT and treats about 30 gigalitres a year of wastewater to produce a very high quality effluent. A proportion of the wastewater treated at the Lower Molonglo treatment plant is supplied to nearby Hardy's Vineyards (100 hectares) and Belconnen Golf Course (30 hectares) for irrigation. The Lower Molonglo treatment plant is remote from the rest of the city and major reuse opportunity from here is driven by agricultural or industrial activity near the plant.

The data below relate to 2001–2002:

- total amount of water treated at LMWQCC—32,289 megalitres
- total amount of water recycled and used for various purposes—1644megalitres
- Hardy's Vineyard—76 megalitres
- Belconnen Golf Course—107 megalitres
- LMWQCC—1,461 megalitres

Volumes of water recycled represent just over 5% of total water treated at Lower Molonglo water treatment plant.

Suburb level—the Southwell Park Scheme

A small treatment plant at Southwell Park supplies 30 megalitres of treated effluent for irrigation of 10 hectares of nearby sporting fields each year. This process is known as water mining and it is where wastewater is extracted from a sewer, treated, and then used for irrigation, with the solids returned to the sewer for further treatment at the central treatment plant at Lower Molonglo.

Suburb level—the North Canberra Effluent Reuse Scheme

The North Canberra Effluent Reuse Scheme will utilise treated effluent from the Fyshwick Sewage Treatment Plant to irrigate parks and ovals in central Canberra.

Currently work is being undertaken to increase the treatment capabilities at Fyshwick Sewage Treatment Plant to ensure that a safe and reliable

effluent quality is produced for use through the North Canberra Effluent Reuse Scheme. Costs can be up to three times higher than potable water.

Other infrastructure for the North Canberra Effluent Reuse Scheme, stages 1 and 2, has already been constructed and can irrigate around 70 hectares of ovals in North Canberra or 280 megalitres a year of irrigation water, when the treatment plant is fully operational. In a drought year, this amount is expected to rise up to 800 megalitres.

There are strategies under consideration to enable significant expansion of the current scheme. These strategies utilise Ainslie and Lower Red Hill Reservoirs to extend the supply of treated effluent to irrigate 235 hectares of ovals and sports fields. It is expected that the total scheme would cost between $10 and $12 million if fully implemented, and would supply 1.2 gigalitres of treated effluent in an average year, rising to 1.7 gigalitres in a drought year. The eventual extent of such a scheme is depicted in Figure 3. Such a scheme could increase the total annual supply volume during a drought year by approximately 0.8%.

Basin Level—effluent discharge

Each year about 30 gigalitres of treated effluent is returned to the Molonglo River through the Lower Molonglo Water Quality Control Centre. The total amount returned via the centre to the river in 2001–02 was 30,645 megalitres. This volume of water is used and reused several times over down the reach of the river to the river mouth for downstream irrigation and urban water supply demands.

This source was under consideration at the end of the reporting period as a further source of potable water for the ACT, by pumping it into the Cotter catchment, mixing it with existing water as it flows down the catchment and pumping the blended water into the water supply system at Mount Stromlo.

Future water supply

The Water Resources Strategy *Think water, act water* draws together all water resource issues. It was completed after the end of the reporting period. The strategy takes a catchment perspective, including water quality and quantity, and the use of the water cycle as a basis for integrating stormwater, water supply and wastewater management. Information refers to both surface and groundwater resources.

Major elements included in the strategy are water supply and conservation of water, water quality, water reuse, water sensitive urban design, environmental flows, and riparian vegetation. Community consultation and input was a part of the strategic development of that document.

Concurrently, ACTEW was pursuing a strategic Investment and Benchmarking Project. Both of these initiatives were intended to revisit water use and water demand measures to contribute to an integrated strategy for the ACT region, similar to that undertaken by ACTEW in the early 1990's with the production of the *ACT Future Water Supply Strategy*.

Planning for the provision of a long-term reliable water supply

The ACT is committed to providing long-term water supply reliability, as set down by *Water ACT: a draft policy for sustainable water resource management* (July 2003). A number of objectives established to address this commitment relate to increasing water use efficiency.

Initiatives include water efficient appliances, effluent reuse, water pricing, education, water sensitive urban design, and adaptive management.

On current population projections and per capita consumption, existing water supply infrastructure is expected to meet demand until around 2020. However, options for water storage and reliable water supply are as political as they are technical. The outcomes of ACTEW's *Future Water Options* proposals will be discussed in the next SoE report.

Decreasing per capita potable water use is one way of ensuring future water supply. The *Water ACT: a draft policy for water resource management* (July 2003) sets targets to decrease per capita potable water use by 12% by 2023 in addition to the 20% reduction obtained since 1993.

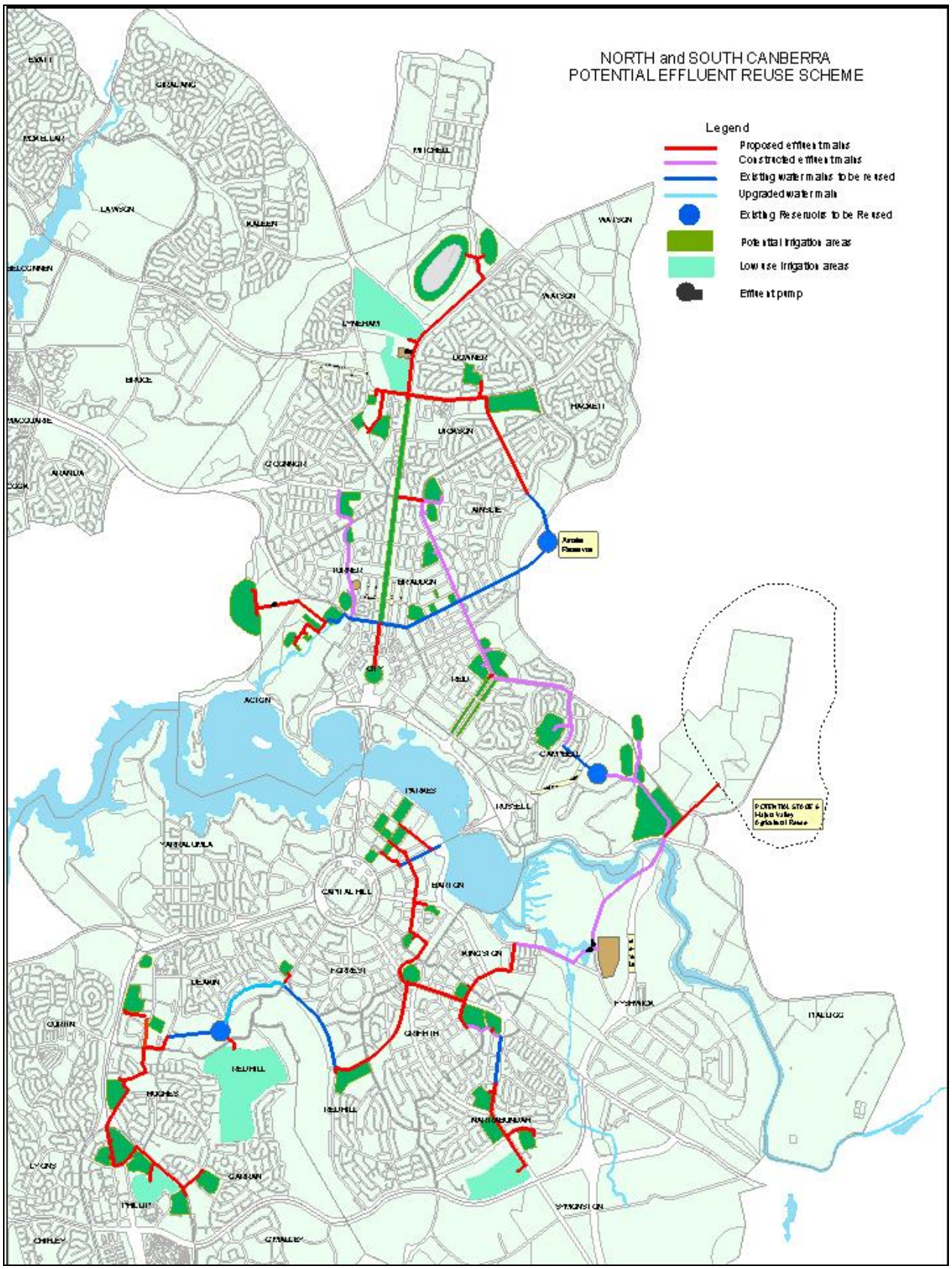
Water trading

Water trading has been identified as a means of ensuring that water is put to its most efficient use, in economic terms. Water used in the wine industry, for example, generates higher economic returns than water used to irrigate pasture for the dairy industry. In the ACT, water allocations are tradeable, and the mechanisms to allow trading are in place. However, to date there has been no demand for this facility.

Murray-Darling Basin Commission Cap

The territory has made a commitment to participate in the Murray-Darling Basin cap on water extraction. The Independent Audit Group of the Murray-Darling Basin Ministerial Council proposed a cap of 38 megalitres in 1999. However, the Territory had not announced a water cap at the end of the reporting period.

Figure 3: North and South Canberra Potential Effluent Reuse Scheme



Source: *Water Resources Management Plan* (1999)

Depending on the level and form of cap announced by the Territory it is possible trading will be required to support future growth in its water needs. As the States have not yet agreed to a set of conditions for interstate water trading, it is not possible to set a timeframe for agreement on a water cap for the Territory. However, the ACT is committed to seeking agreement to a cap that recognises existing water rights in the ACT while protecting the Murray-Darling systems requirements (EACT, 2003).

A key short-term aim of the ACT Government is to complete a Memorandum of Understanding with the NSW and Commonwealth Governments that will include a water cap, by the end of 2004 (EACT 2004). In the meantime, the *Water Resources Act, 1998* and the Water Resources Plan protect the Territory's water resources from over-allocation.

Data sources and references

Data for this indicator were provided by Environment ACT and ACTEW Corporation Limited (see <http://www.actew.com.au> for ACTEW's annual reports showing its company profile and relationship to ActewAGL).

There are slight differences in the numbers used by ACTEW and Environment ACT for reporting purposes—for example, for annual consumption of water. ACTEW's figures were based on financial year reporting while Environment ACT figures were based on an April–March reporting year. Factors such as the need to rely on some estimates as well as data being averaged over differing time periods have contributed to these discrepancies. Choices were made in this document about which figures to adopt.

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