Dams play a vital and ongoing role in supplying drinking water for the lower Hunter region. Around 90 per cent of the region’s drinking water supply comes from Chichester Dam and Grahamstown Dam, with the other ten per cent supplied from groundwater. These amounts can vary from year to year.

Hunter Water manages the dams, and works in partnership with Hunter Local Land Services, local councils, landholders, government agencies and other stakeholders to protect the health of the drinking water catchments.

Water can also be transferred between the lower Hunter and Central Coast water supply networks under an agreement developed in 2006, when the Central Coast experienced a severe drought. The ability to transfer water between the two regions will continue to be important in making best use of existing dams to benefit the communities in both regions.

**Contribution of dams to our water supply**

**Chichester Dam**

Chichester Dam has supplied the lower Hunter community with water for 90 years. The dam was built between 1917 and 1926, and first supplied water to the community in 1923.

The dam’s catchment is largely within the Barrington Tops National Park, which is a declared wilderness area. As a result, the catchment is one of the most pristine in Australia, with large areas unaffected by human activity.

Chichester Dam can store over 18 billion litres of water. A gravity pipeline transports water to the Dungog Water Treatment Plant. Around half the water from the dam is supplied to the Maitland, Cessnock and Beresfield areas. The rest is supplied to Newcastle, where it blends with water from Grahamstown Water Treatment Plant.

The cost of supplying water from Chichester Dam is the lowest of all Hunter Water’s sources, largely because water can be transported by gravity rather than pumping, using less electricity. The dam is small compared with its large catchment so it readily ‘fills and spills’ after medium to heavy rainfall, with water flowing over the spillway and down the river.

As a result of its reliability and low cost, water from Chichester Dam is used as often as possible. Averaged over the last ten years, the dam has supplied around 38 per cent of the region’s water supply, as shown in the pie chart overleaf.

**Grahamstown Dam**

Grahamstown Dam was built between 1955 and 1965 and is the lower Hunter’s largest drinking water supply dam. It can store around 182 billion litres of water.

Grahamstown Dam is called an ‘off-river storage’ because it is filled by pumping water from the Williams River at Seaham Weir, in addition to rainfall on its surface and run-off from its own catchment.

Due to its large surface area and shallow depth, a lot of water can be lost through natural processes like evaporation. In a hot dry summer, Grahamstown Dam can lose as much water by evaporation as it supplies to customers (about 200 million litres per day). Although early investigations looked at ways of covering the surface of the dam to reduce evaporation, the current
technologies are not viable because of the very large surface area of the water storage. Changes in technology will be monitored in case the feasibility changes in the future.

The Balickera pump station and canal are used to transfer water from the Williams River to Grahamstown Dam. The decision on when to pump from the Williams River depends on the amount of flow and water quality in the river, and whether there is space in the dam. The water licence issued by the NSW Office of Water sets rules on how and when water can be pumped.

Water from Grahamstown Dam is treated at Grahamstown Water Treatment Plant before being pumped to supply areas such as Medowie, Stockton, Kooragang Island, Newcastle and Lake Macquarie. Over the last ten years, Grahamstown Dam has supplied an average of around 52 per cent of the region’s water supply.

### Water supply sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Contribution 2003/04 to 2012/13</th>
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</thead>
<tbody>
<tr>
<td>Chichester Dam</td>
<td>38%</td>
</tr>
<tr>
<td>Tomaree Sandbeds</td>
<td>3%</td>
</tr>
<tr>
<td>Tomago Sandbeds</td>
<td>7%</td>
</tr>
<tr>
<td>Grahamstown Dam</td>
<td>52%</td>
</tr>
</tbody>
</table>

### Protecting the aquatic environment

Dams and weirs affect the natural flow of water in rivers and streams. To help lessen these impacts, some water is released from the storages back into the river downstream of the dam. These releases are called environmental flows. They help maintain the ecology and biodiversity of ecosystems that depend on water. Environmental flows are in addition to the flows that naturally spill when the dam fills in high-flow events.

Fishways can also be built at dams and weirs to allow fish to move up and down stream.

Chichester Dam and Seaham Weir are licensed by the NSW Office of Water. The water licences include conditions called ‘environmental flow rules’ which aim to help protect aquatic health by providing a share of water for the downstream environment.

Proposed refinements to environmental flow rules for Chichester Dam and new conditions for Seaham Weir have been modelled in parallel with developing the Lower Hunter Water Plan. This is important because environmental flows affect how much water is available for the water supply system. The proposed changes to the environmental flow rules aim to achieve more variability in flows to reflect natural wetting and drying conditions instead of a steady flow. This approach is consistent with the changes to environmental flow rules proposed by the NSW Office of Water for other rivers in the Hunter region.
Sharing water between regions

Helping neighbours in a drought

In the early 2000s, the Central Coast experienced its worst drought since records began in 1885. The water level in the main storage, Mangrove Creek Dam, dropped to around 10 per cent in early 2007. The lower Hunter storages were relatively full due to a series of weather events called ‘east coast lows’ that brought significant rain to our catchments. These weather events include the Pasha Bulker storm in 2007.

The lower Hunter was able to supply water to the Central Coast to help maintain supplies through that extreme drought. An agreement was signed in 2006 to transfer water between the regions, with the daily transfer rates depending on the storage levels in each region.

The Central Coast water supply system

The main Central Coast water storages are the large Mangrove Creek Dam (190 billion litres) and the smaller Mardi and Mooney Mooney Dams. Water treatment plants located at Somersby and Mardi treat water from the dams to meet drinking water guidelines.

Since the last drought, over $100 million was invested by Gosford and Wyong councils and the Commonwealth Government to improve the security of the Central Coast’s water supplies. Completed in 2012, the new pipeline and pumping stations allow more water to be pumped into Mangrove Creek Dam from Wyong River and Ourimbah Creek, so the region has more resilience for future droughts.

How does the transfer link work?

The lower Hunter and Central Coast water supply systems are connected by a pipeline linking reservoirs at Morisset and Kanwal. This link can transfer up to 33 million litres of treated drinking water per day south to the Central Coast water supply network.
The transfers do not move water between dams, as it is more efficient to simply transfer water between the two drinking water supply systems. For example, Hunter Water can supply the northern customers of the Central Coast. When this occurs, less water would need to be drawn out of Mangrove Creek Dam. Similarly, when water is transferred north from the Central Coast to supply Hunter Water customers in south-western Lake Macquarie, more water can remain in Grahamstown Dam.

At present only 13 million litres of water a day can be transferred north to the lower Hunter network. Wyong Shire Council is planning to construct a new pipeline from Mardi to Warnervale which will supply Central Coast customers in the Warnervale area and also meet commitments under the existing transfer agreement.

When this pipeline is completed in around 2017, the capacity to transfer water north to the boundary of the lower Hunter system will increase to 30 million litres a day.

Hunter Water will also need to modify its water supply system to remove ‘bottle-necks’ in order to receive 30 million litres a day of water from the Central Coast. This involves building a new pipeline, constructing a new water pumping station at Wangi, and modifying the existing water pumping stations at Morisset and Fennell Bay.

The price for water transferred under the existing water transfer agreement between the two regions is set by the Independent Pricing and Regulatory Tribunal. The water quality would be similar, as both water utilities must treat the water to meet the Australian Drinking Water Guidelines.

Transferring water between regions is a core component of the Lower Hunter Water Plan. The existing two-way agreement with the Central Coast can facilitate better use of existing storages, so that both regions are more resilient to cope with drought.

A ‘watching brief’ on other options

Lostock Dam is located on the Paterson River approximately 93 kilometres north-west of Newcastle. The dam is managed by State Water and can store around 20 billion litres of water when full. It supplies water for agricultural irrigation, but the volume of water available is not used to its full capacity.

If the lower Hunter region were to access water from Lostock Dam for drinking water supply in the future, a new water treatment plant and pipeline to connect to the existing water supply network near Maitland would be required. Transferring water from Lostock Dam has not been included in the Lower Hunter Water Plan at this time because the higher cost and longer lead time to construct the infrastructure required make it less suitable as a drought response compared with other measures. The potential to access water from Lostock Dam may be revisited in future planning processes.

It is important to note the NSW Government has ruled out building Tillegra Dam and it is not an option for future supply.
Chapter 2

Looking to the future

- Wyong Shire Council and Hunter Water will construct new pipelines and water pumping stations to increase the transfer capacity so that up to 30 million litres a day of water can be transferred north in accordance with the existing water transfer agreement. This work is currently planned to be completed in 2017.

- The Central Coast councils and Hunter Water will continue working together to improve the modelling tools that simulate what would happen under different drought scenarios, and optimise the arrangements for inter-region transfers. A new integrated water supply model will provide better information to optimise the existing transfer arrangements, and support opportunities to work together on options for both drought and future longer-term planning.

- The Metropolitan Water Directorate, Central Coast councils and Hunter Water will continue working together on options to enhance the existing transfer agreement to benefit both regions. Options include the potential to consider transferring water outside drought periods, if one region has plentiful supplies and the other region’s storages are lower, or increasing the transfer capacity between the regions. The aim would be to optimise the combined storage levels so that both regions are in a better position if a drought occurs.

- The NSW Office of Water (NOW) is responsible for implementing environmental flow rules through regulatory instruments such as water sharing plans and water licences. NOW will continue to consult with key stakeholders in the lower Hunter and Central Coast as relevant water sharing plans in the two regions are reviewed, and environmental flow rules are refined and implemented.

What would happen in a drought?

The two-way connection between the lower Hunter and Central Coast drinking water networks can provide additional water during drought to customers in either region. The daily transfer rate depends on water levels in the storages in each region, up to the maximum rate set by the agreement. For example, if storages in the lower Hunter were dropping, Hunter Water could purchase water from the Central Coast, allowing more water to remain in Grahamstown Dam for future use. Transfers would stop if the Central Coast storages were too low.

In a different drought scenario, Hunter Water could supply water to customers at the northern end of the Central Coast, as occurred in 2006-07.

Modelling indicates that there are different situations when each region can help the other. Transferring water between the Hunter and Central Coast helps to make better use of the combined water in existing storages, so both regions are more resilient to cope with drought.

In a very severe drought, both regions may be reduced to very low storage levels. This is why it is important for both regions to have other contingency plans in place for extreme events, which may be very unlikely but could have major consequences for the households and businesses in each region. These contingency measures can include supplies that do not depend on rainfall (discussed further in Chapter 8).

‘Inter-regional transfers make use of some existing infrastructure and are a good flexible long term investment.’

Community Comment

Consultation Workshop 2013