Technical paper factsheet:
Supply system modelling

When developing the Central Coast Water Security Plan it was vital we understood how we could maximise the amount of water we could produce for each of the option types and portfolios we were considering.

We achieved this through a process called hydrological and supply system modelling.

Firstly, we took into consideration what is called our streamflow – which is simply the flow of water in our waterways such as rivers, streams and creeks, and flow into dams and weirs etc.

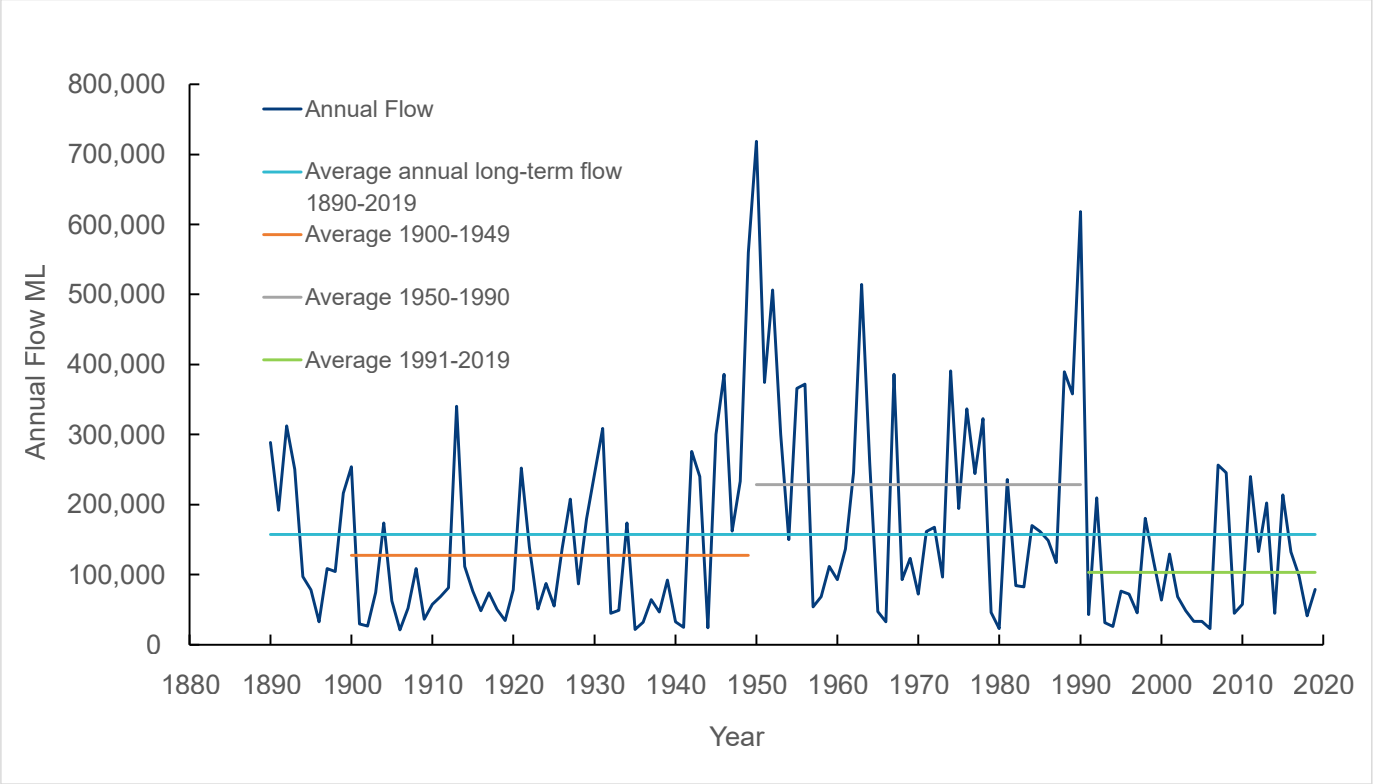

Figure 1 – Our annual streamflows for the Central Coast

Figure 1 shows our annual streamflow for the Central Coast dating back to 1880.

This investigation revealed that our streamflows vary from year to year, and we can experience periods of low flows (i.e. droughts) that last for several years, such as the millennium drought.

The historic streamflow record is only 120 years long and is not long enough to represent the likelihood of less frequent events, such as long-term droughts. In order to better understand climate extremes, we used this historic data to generate thousands of synthetic replicates of streamflow. We then took these synthetic streamflow replicates and placed them into a model to simulate storage levels in our dams. From these simulations, the probability of reaching different storage levels were determined.

We also used models to simulate the impacts of climate change to help us determine the uncertainty of our water supply in the future.

Figure 2 shows our supply and demand forecasts, with the blue triangle representing our boundaries of uncertainty when it comes to the impacts of climate change on supply. It also shows our uncertainties in our demand, with factors such as population growth, water conservation and climate change playing key roles in our uncertainty.

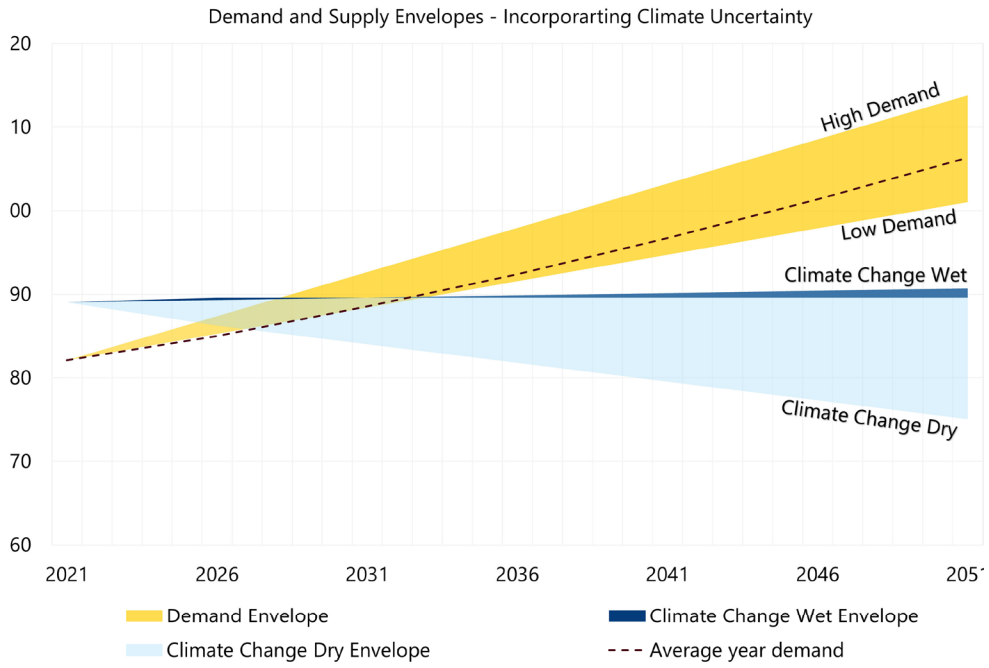

Figure 2 – The Central Coast's water supply and demand forecast

What is clear in **Figure 2** is that through time, our demand for water is expected to increase, while our supply is expected to decrease. Overall, this will mean our water storage levels will deplete.

In the event of our storage levels declining, we have a drought management plan that we can implement. However, timing is crucial, and if we see a drought unfolding, we want to ensure that we are plan ready to call on additional climate independent water supplies, such as desalination to provide water to the community. To balance this uncertainty and ensure that we continue to provide essential services during extreme drought, we have also included in the plan for water restrictions to be in place, the storage triggers for which are shown in **Figure 3**.

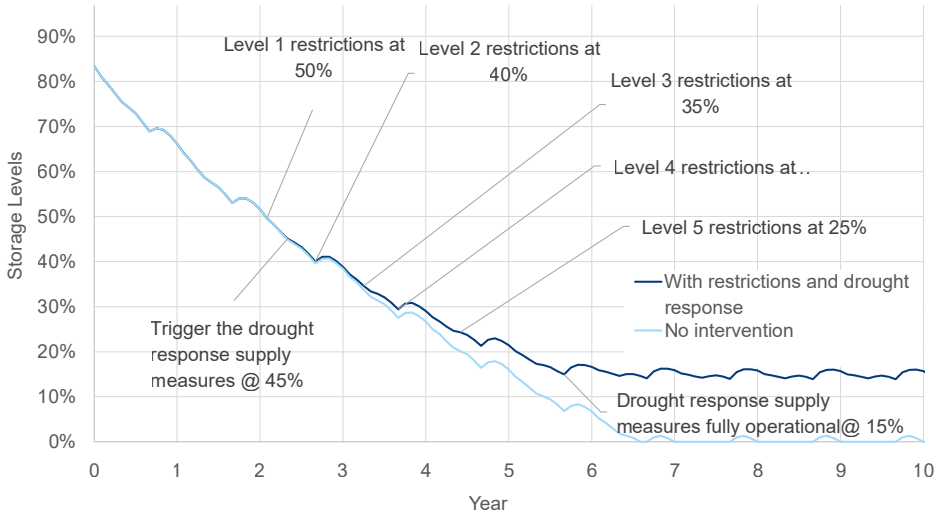

Figure 3 – Dam storage level triggers for water restrictions and drought response measures

Through our hydrological modelling process and statistical analysis, we have created a balance between potential under/over investments with risk in response to an extended drought. This will mean:

- restrictions beyond Water Wise Rules will not be in place for more than 5% of the time
- our drought infrastructure response should not be triggered more than 1 in every 50 years

The modelling results of our preferred portfolio.

The table below shows how much extra water we can produce by maximising the amount of water we could produce for each of the options within our preferred portfolio.

Option type within Portfolio 2		Additional water produced per day	Additional water produced per year
Groundwater		1.9 megalitres (ML)	0.7 gigalitres (GL)
Recycled water		1.1 ML	0.4 GL
Purified recycled water		4.3 ML	1.6 GL
Desalination: 30 megalitres per day (ML/d)	ON when dam levels reach 45% OFF when dam levels reach 55%	11.2 ML	4.1 GL
	ON when dam levels reach 50% OFF when dam levels reach 55%	1.9 ML	0.7 GL
	ON when dam levels reach 60% OFF when dam levels reach 65%	8.2 ML	3 GL
	ON 100% of the time	5.2 ML	1.9 GL

This factsheet is a summarised version of a technical paper used to inform the development of the draft Central Coast Water Security Plan.
If you would like to read the full technical paper, please contact us to request a copy.
wsp.enquiries@centralcoast.nsw.gov.au